

Clarification letter #2 For Bid No. S50-C24166

2.1.0 MANUFACTURERS

- A. Screen [s] shall be as manufactured by Duperon Corporation, 515 N. Washington, Saginaw, Michigan, TF 989.383.8479. The screens shall be FlexRake® Model, Full Penetration.

2.1.1 BASIS OF DESIGN

- A. The mechanically cleaned bar screen shall have a head sprocket only, with no sprockets, bearings, 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 run continuously without an 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. 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 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.

2.1.2 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 the Appendix. See Appendix for materials of construction and design requirements such as: slot opening, angle of installation, channel dimensions, etc. The Bar screen assembly shall be shipped in one piece.

1. **Screen Bars:** Bars shall be stainless steel and be rectangular shaped with minimum dimensions of 0.25 inch x 1.00 inch. Bars shall be individually replaceable without welding.
 2. **Side Fabrication:** The screen framework shall be stainless steel bent plate with a minimum thickness of 0.25 inch. Horizontal members shall be of stainless steel bent plate with a minimum thickness of 0.25 inch 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 stainless steel. The dead plate shall span the entire width of the unit and transition from bar screen to discharge point.
 4. **Discharge Chute:** The discharge chute shall be 11ga. (0.12 inch) 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 constructed of UV Stable UHMW PE rollers and stainless steel supports and components.
- B. Return Guide/Closeouts:** Return guide/Closeouts shall be 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 stainless steel and UV Stable UHMW-PE debris blade assembly shall be installed to assist in removing debris from the scraper/stagers on the mechanically cleaned bar screen unit as recommended by the manufacturer.
- D. Screen Enclosure:** A 14ga. SSTL Enclosure shall be installed to cover the screen above the operating deck level. Front Enclosure has options for removable covers for maintenance. Removable panels can be 16ga. SSTL or ¼" thick Polycarbonate to allow for visual observation during screen operation. Rear Enclosure has hinged removable door provided with ¼ turn latches with an integral viewing door to provide a look inside. See Appendix for materials of construction.
- E. Link System:** The link system shall be stainless steel. See Appendix for materials of construction.
- F. Scrapers:** Scrapers shall be 1.00 inch thick UV Stable UHMW-PE with thru bar technology that fully clean (3) sides of the rectangular bar. Scrapers shall be spaced 21 inches apart. The scrapers move at no greater than 28 inches per minute at standard operating speed of ½ rpm allowing for approximately 1 debris discharge per minute.

G. 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.
 1. 304 SSSL- Drive Sprockets and end castings shall be cast stainless steel. See Appendix for materials of construction.
 2. 304 SSSL-. Drive Shaft shall be stainless steel. See Appendix for materials of construction.

Gearbox shall be shaft-mounted, right angle type and incorporate cycloidal and spiral bevel gearing with a total ratio of 809:1. The gear reducer output shaft speed shall be controlled by a volts/hertz type inverter or per rake manufacturer's recommendation. 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 motor shall be AC induction type, 3 phase 240/480 volt and mounted to the gear reducer. Motor shall be ½ hp, designed for 1800 RPMs base speed and rated for Class I, Groups C & D, Class II Groups F & G environments and for use with an inverter. Motor shall have a 4/1 speed range, EPNV enclosure, NEMA design B with a 56C frame size. Service factor shall be 1.0 with 1600V, Class F insulation rated for temperatures up to 40 degrees C. The motor will have 1600 volt insulation, optimized for IGBT type inverters and shall be UL listed.

Motor shall have built in thermostat to protect from overheating that is to be filed wired to corresponding terminal in control panel for redundant (ambient) overload protection.

2. **Bearing:** Bearing shall be greased ball bearing type, non self-aligning, sealed and lubricated.
3. **Speed Reducer:** Speed reducer shall be 0.50 to 2.2 (in high flow conditions) output rpm, 11,417 in.lb. output torque 809:1.

H. Standard Coating: All steel bar screen components shall be coated with a urethane moisture-cure two coat paint system in accordance with the paint manufacturer's specification. Products will be MC Zinc and MC Ferrox and MC Luster, as manufactured by Wasser, or equivalent. Standard color is Safety Blue. Material shall meet all state and federal VOC and other regulatory requirements.

2.1.3 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 unless specified otherwise.

1. Main control panels require shading from the sun and shall be operated within a temperature range between 35°F and 104°F. Sunshields, visors or other structures needed to provide shade are by others.
2. Controls for BOTH mechanical bar screens shall be located in same Control Panel. Controls shall be designed to accept 3 PH/480 VAC incoming power.
3. Controls shall be designed to accept incoming power supply per plans/specs and shall include a step-down transformer as needed to achieve 120V.
4. Control Panel 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.
5. Controls shall be tested by the panel builder and by the rake manufacturer prior to shipment to owner. The rake manufacturer shall verify all overload settings in the rake controller to insure proper overload and speed settings required for the application are properly programmed.
6. Control panel 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.
7. The panel and all 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.
8. All field wiring and power cables between the barscreen Main Control Panel and the Local Push Button Station shall be provided by others under the Electrical Section.

B. Components:

1. The control panel shall be a NEMA 4X, 316SS rated enclosure (dead-front style with continuous hinge, exterior, lockable door) and include the following logic devices for proper screen operation:

- a. Control Power "Hand-Off-Auto" selector switch where Hand mode enables the pushbuttons located on the remote push button station. Auto mode enables cycle timer and remote start capabilities.
- b. Speed controller preprogrammed for speed/overload control by the panel builder and verified by the rake manufacturer.
- c. Rake controller with required differential level and field adjustable cycle timing programs. User-defined to be programmed by the rake manufacturer per owner specifications to maintain good flow conditions.
- d. The VFDs shall be controlled by a single Siemens S7-315-2PNIDP PLC. The PLC shall be used to control the VFD to operate the screen at different speeds based on the differential level. The PLC shall include discrete and analog inputs and outputs as required.
- e. At each bar screen control panel, provide one single pole fuse for lights and another for the receptacles.
- f. Provide and install a Siemens Scalance X204-2 managed ethernet switch and a power supply for the X204-2 in the Bar Screen Control Panel and in the cabinet which contains the Analyzer Building PLC. Provide a CAT6 cable connection from the X204-2 to each PLC.
- g. Dry contact input for motor thermostats to shut down equipment if motor overtemp condition occurs.
- h. Dry contact output signals for each piece of equipment for "Run", "VFD Fault", "Motor Overtemp", "In Auto", and "High Level" conditions.
- i. Flashing alarm light to energize with "VFD Fault", "Motor Overtemp", and "High Level" signals.
- j. Dry contact input terminals for "Remote Run", "Motor Thermostat", and remote stations.
- k. Intrinsically safe barriers for transducer terminations.
- l. Main control power breaker with lockable, thru-door operator.
- m. Elapsed time meters
- n. Emergency stop mushroom pushbutton
- o. Push-to-Test type indicator lights for:

1. "Power On" indicating light (white)
 2. "VFD Fault" alarm light (amber)
 3. "Motor Overtemp" alarm light (amber)
 4. "High Level" alarm light (amber)
 5. "Screen Forward" run indicating light (green)
2. Provide two (2) NEMA 7 remote push button stations, one for each piece of equipment with the following controls: Forward, Jog Reverse and E-Stop push buttons.
 3. Provide (4) Siemens Sitran Probe LU transducers, two (2) for each barscreen. Transducers must have 20 ft range, a built-in transmitter and connect directly to intrinsically safe terminations in the panel. Transducers that require a separate transmitter shall not be allowed.

c. Functional Requirements:

1. The rake controls shall operate manually in Hand mode and enable the Forward and Jog Reverse buttons on the local push button station. When the rake HOA is in Auto mode, the rake shall be controlled by a rake controller.
2. The rake controller shall include a differential level control program that automatically accelerates/decelerates the rake as the differential level increases/decreases, respectively. The differential values shall be field adjustable for rake run point and each acceleration set point.
3. If the downstream fed equipment has a Fault, or is otherwise not running, then rake shall stop operation immediately. Signals shall be set to SCADA for all fault conditions for all equipment.
4. The controller program shall have cycle timing logic, which shall have field adjustable run and standby times.
5. The controller program shall manage the high level alarm activated by the upstream float switch. When the float contact closes, a "High Level" alarm light will flash, and a discreet "High Level" output signal will be sent to the customer's remote monitoring system.
6. The rake shall start operation in Auto mode whenever a call to run is received by differential level program, cycle timer program or by a dry contact input from another source (such as SCADA), which all run in parallel.
7. The "VFD Fault" shall be cleared by turning the disconnect Off, then waiting for the VFD to de-energize, then turning the disconnect back On.
8. The "Motor Overtemp" faults shall clear automatically when the motor cools to be within normal operating range. Both faults, along with a High Level from float, shall energize a flashing alarm light.

9. Controls shall be built by a UL approved panel builder and bear the UL approved logo. Controls shall be tested by panel builder and by rake manufacturer prior to shipment by owner. The rake manufacturer shall verify all overload settings required for the application are properly programmed.
10. The rake manufacturer shall provide two (2) ultrasonic transducers to be installed overhead in front and behind the bar screen. The transducers shall connect to corresponding, intrinsically safe terminations in the main control panel and utilize the rake manufacturer's stand rake controller. The rake controller logic shall include at a minimum differential level and cycle timing program. Automatic speed ramping and reducing as the differential increases and decreases is preferred for the rake controller logic.
11. Controls shall have an inner door pocket that includes a copy of as-built drawings from the manufacturer as well as any other pertinent documentation necessary to properly operate the controls.
12. Additional Electrical Load Connected to Bar Screen Control Panel:
 - a. Provide 480-120/240 volt single phase transformer capacity for the quantity of lights and receptacles indicated on project drawings MC-E05.
 - b. Loads are as follows:
 6. Lights (250 VA for each)
 7. Receptacles (1800 VA for each).
 - c. At each bar screen control panel, provide one 120 volt circuit breaker for lights and one 120 volt circuit breaker for receptacles.

2.1.4 DESIGN CRITERIA

Channel Width	4 ft.
Channel Depth	17.0 ft.
Discharge Height above Operating Floor	4.5 ft.
Water Depth	16.83 ft.
Open Space Between Bars	0.75 in.
Screen Incline from Vertical	As needed to fit existing space