



BARBADOS WATER AUTHORITY

TENDER FOR  
THE  
SUPPLY AND  
INSTALLATION OF  
WASTEWATER  
SCREENING SYSTEM

July 2021

## 1. **GENERAL**

The Barbados Water Authority (BWA) is desirous of receiving quotations for the Supply and Installation of medium screens at the River Road Lift Station (RRLS) located along the south side of the constitution river in the city of Bridgetown.

### **BACKGROUND**

Sewage flowing from areas lower in elevation than the Bridgetown Sewage Treatment converge at the RRLS. Sewage from areas such as Dunlowe Lane, sections of Bridgetown, Martindales Road, The Queen Elizabeth Hospital, Halls Road, Country Road, and Upper Roebuck Street, are directed to the River Road Lift Station, and are subsequently redirected via raw waste pumps to the Bridgetown Sewage Treatment Plant for further treatment before being discharged to the marine outfall.

Significant quantities of “rags” and other debris are consistently found in sewage flows and these rags and debris result in the loss of efficiency, and sometimes the blockage of the raw waste pumps rendering them inoperable until the rags and debris have been manually removed. This clogging of pumps can result in overflows in the collection systems as continued flows to the lift station cannot be redirected.

### **BWA BSTP IMMEDIATE NEEDS ASSESSMENT**

The BWA Wastewater Division is currently investigating various process improvements to address concerns with the existing system at the RRLS.

1. With the increase of food and other industries, the SCSTP is experiencing increased levels in Fats, Oils and Grease (FOG) within the sanitary collection system.
2. The current spacing of the existing bar screens at the RRLS still allows for significant rags and debris to pass through and affect the operations of the raw waste pumps.

3. The existing bar screens require continuous manual cleaning and the removal of the debris up several flights of stairs that are located in the wet well.
4. The prevention or neutralising of any odours being generated from the screenings at the RRLS.
5. The Consultant/Contractor shall review the existing facility to develop, plan and design improvements to address these concerns.

Quotations submitted to the Authority should include a break-down of the materials and labour costs and shall also clearly indicate deliverables, timelines and milestones. Should you have any queries, please do not hesitate to contact Ms. Shenelle Bayley or Mr. Brian Stuart at (246) 434-4220.

## **2. INSTRUCTIONS TO TENDERERS**

- 2.1 All bidders must supply the following information in their bids. Failure to provide the information will render the bid null and void: -
- a. Registration number of company;
  - b. Country in which company is registered;
  - c. The date on which the company was first incorporated and the names and addresses of all company directors. Certified copy must be issued by the Corporate Affairs Registry.
  - d. A certified copy of company's Certificate of Incorporation, as evidence that the company is in existence at the date of the bid; Failure to provide the certified copy Certificate of Incorporation will render the tender null and void. Certified copy must be issued by the Corporate Affairs Registry.
  - e. Registered office of the company
  - f. In the case of sole proprietorships or partnerships, the names and addresses of owners must be supplied. If the business is registered under the Registration of Business Names Act, a copy of the registration must also

be provided. Certified copy must be issued by the Corporate Affairs Registry.

- g. Barbadian bidders must provide a copy of their VAT Registration Certificate and Tax Identification Number (TIN).
- h. Bidders should be aware that the labour clauses of (Public Contracts) Act, Cap. 349 shall, in so far as is applicable to the subject of the tender, apply to any contract made in respect of the tender.
- i. The number of calendar days required to start and complete the job once notified.
- j. Tenders should be submitted in a document marked **“Tender for THE SUPPLY AND INSTALLATION OF SCREENING SYSTEMS AT THE RIVER ROAD LIFT STATION”** addressed to:

**The Chairman  
Tenders Committee**

**[bwatenders.committee@bwa.gov.bb](mailto:bwatenders.committee@bwa.gov.bb)**

To reach the office no later than Friday August 6, 2021 at 4:30pm.

- k. No Tender will be considered unless it complies with the conditions set out in this Notice.
- l. The Barbados Water Authority does not bind itself to accept the lowest or any tender.
- m. Any tender delivered after the closing date and time or any extension thereof shall not be considered.
- n. The Barbados Water Authority reserves the right to withdraw this tender notice at any time.
- o. The BWA reserves the right to annul the process at any time prior to the award of Contract without incurring any liabilities.

- 2.3 All tenders must be quoted in either **Barbados or US Dollars, CIF Bridgetown Barbados**. Prices quoted in Barbados dollars by local bidders must be **duty free and exclusive of VAT**. Tenders quoted in US dollars will be evaluated using the prevailing exchange rate at the date of closing of the tender. Payments in US dollars shall be made at the buying rate set by The Central Bank of Barbados at the time of payment.

- 2.4 **Payment terms and a delivery schedule must be included in your response.**
- 2.5 The BWA reserves the right to refuse any tender that does not conform to the requirements of this document.
- 2.6 The successful bidder(s) will be required to enter into a formal contract with the Barbados Water Authority.

### **3. PENALTIES**

The Barbados Water Authority reserves the right to apply and enforce penalties against a tenderer for delays occasioned by him in the execution of these works. The penalty shall apply from the stated completion date of the particular phase. The total penalty shall not exceed 5% of contract sum for the initial first late month, and 10% for any late months thereafter. When the lack of performance directly impacts the BWA's operations penalties in the form of a retention on payments due to the tenderer will be applied.

### **4. DELIVERY CONDITIONS**

The successful Tenderer(s) will be furnished with a delivery schedule with specific dates for the execution of the works as agreed between the tenderer and the BWA. Failure to adhere to the delivery schedule will result in penalties as stated in clause 3. Delivery of the works have to be coordinated with the BWA (e.g. it may be convenient to do most of the work at night) so that disruptions to the water supply to customers is minimized.

## **CONDITIONS OF TENDERING**

### **1. Acceptance of Tender and Tenderer's Expenses**

The BWA shall not reimburse the tenderer for any expense incurred in the preparation of this tender.

### **2. Firm Price**

No price variation clause may be included in the Tender. Prices must be quoted in Barbados or US dollars (for overseas companies) and such prices shall include r all materials, labour, plant, equipment, transport, handling of materials and plant, tools and appliances, management fees and all/any other things necessary for the execution of the works. Price(s) quoted in Barbados dollars must also be inclusive of VAT and any taxes that may apply at the time of contract signing.

3. **Payments**

Payments may be made after the completion of each item of work or when the entire job is completed. The method to be followed shall be agreed by the BWA and the Contractor prior to the starting of the contract. Prior to any payment, the Contractor shall submit to the BWA a statement in a form acceptable to the BWA, signed by the Contractor the cumulative amounts and value of work carried out as of the date of the statement and accompanied by schedules and other such data to assist the BWA in evaluating the value of work carried out. The statement shall also show the cumulative amount and value of work paid by the BWA as of the date of the statement and the balance amount and value of work claimed by the Contractor.

4. **Insurance**

The Contractor shall obtain adequate insurance and shall indemnify the BWA against all claims for death, injuries, damage to property and losses sustained by the Contractor during the performance of duties under this Contract.

5. **Addenda**

Any interpretation of, or change in the Tender Document prior to the specified closing date, will be made only by Addendum issued by the Barbados Water Authority to each Bidder to whom the Tender Document has been issued and it shall become part of the Tender Document.

6. **Contract Documents**

The Contract documents will comprise of the following:

- (a) The Schedule of Requirements
- (b) The Conditions of Contract
- (c) The Technical Specifications

7. **Compliance with Conditions of Tendering**

The Tenderer must comply with all the above Conditions of Tendering. Failure to comply with or breach of any of the Conditions shall disqualify the Tender.

8. **Performance Security**

- 8.1 The successful Tenderer(s) shall furnish the performance security for the performance of the contract in a form acceptable to the BWA within twenty-seven (27) days of the receipt of notification of award from the BWA. The performance security shall be in a sum equivalent to ten percent (10%) of the contract price. The proceeds of the performance security shall be payable to the Barbados Water Authority as compensation for any loss resulting from the successful tenderer's failure to complete its obligations under the contract. If the tenderer shall be in default of any of the terms and conditions of the contract, the BWA shall be entitled to make a claim against the performance security. The claim shall be in writing to the agency, bank or insurance company that issues the performance security.
- 8.2 The performance security shall be valid for one (1) year after the date for completion of the tenderer's obligations, and shall be denominated in the currency of the contract or in a freely convertible currency acceptable to the BWA and shall be in one of the following forms:-
- a) A bank guarantee irrevocable letter of credit, issued by a bank located in Barbados, acceptable to the BWA and in the form provided in the Bidding Document or another form acceptable to the BWA; or
  - b) A cashier's or certified cheque payable to the BWA.
- 8.3 The performance security will be discharged by the BWA and returned to the tenderer not later than one (1) year following the date of completion of the tenderer's performance obligations, including any warranty under the Contract.

9. **Evaluation Criteria:**

The BWA will seek to select the most economically and technically advantageous tender with the optimum price/quality split. The Tenderer with the lowest initial quote will not necessarily be selected since the BWA will consider the whole life cycle costs of the goods to include cost of spare parts, maintenance, energy consumption and disposal. The BWA may make its final determination on a

combination of the following:

- (a) Experience of the proposed personnel relative to the project requirements
- (b) Equipment Specifications
- (c) Cost
- (d) Project Execution Plan

1. **Termination of Contract**

This Contract shall be terminated by any one of the parties to the Contract by a written notice of sixty (60) calendar days. The BWA shall be entitled to terminate this Contract and to recover from the Contractor the amount of any loss resulting from such determination due to non-performance by the Contractor.



## **Appendix**

### MECHANICALLY CLEANED BAR SCREEN SPECIFIC REQUIREMENTS

#### PART 1: GENERAL

##### 1.01 SCOPE

- A. Contractor shall furnish and install one (1) mechanically cleaned bar screen with multiple rake blades. Each screen shall be manufactured from AISI 316L stainless steel. Fabrication and assembly shall be in conformance with these specifications.
- B. Each screen shall be furnished complete with bar rack, dead plate, discharge chute, side frames, covers, rake blades, drive chains, sprockets and bearings, scraper assembly, drive motor, gear reducer, anchor bolts, controls and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation.
- C. Contractor shall coordinate all details of the equipment with other related parts of the work. He shall verify that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations required to accommodate equipment differing in dimensions or other characteristics from these specifications.
- D. Contractor shall install the equipment according to instructions and recommendations of the equipment manufacturer.
- E. Power supply is 400 Volts, 50 Hz, 3-phase.

##### 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM) Publications:
  - 1. Section A322: Carbon and Alloy Steel Bar Specifications.
  - 2. Section A507-10: Standard Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold Rolled.

B. Anti-Friction Bearing Manufacturers Association (AFBMA):

1. Standard 9-90 Load Ratings and Fatigue Life for Ball Bearings.
2. Standard 11-90 Load Ratings and Fatigue Life for Roller Bearings.

## 1.02 SUBMITTALS

The manufacturer shall furnish four (4) sets of bound submittals in addition to one (1) electronic version on CD/DVD/USB DRIVE. The following information shall be submitted to the Engineer to establish compliance with this specification. Submittals shall include the following:

- A. Product Data: Include the following:
  - 1. Descriptive literature, brochures, and/or catalogs of the equipment.
  - 2. Motor characteristics and performance information.
  - 3. Gear reducer data including service factor, efficiency, torque rating, and materials.
  - 4. Parts list including a list of recommended spare parts.
- B. Shop Drawings: Include the following:
  - 1. Manufacturer's installation drawings.
  - 2. Wiring and schematic diagrams.
- C. Operations and maintenance manual
- D. Installation reference list.
- E. Detailed installation instructions.
- F. Equipment weights and lifting points.
- G. Recommendations for short and long term storage.
- H. A copy of the manufacturer's warranty
- I. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental Protection Management System according to ISO 14001.

#### 1.04 QUALITY ASSURANCE

- A. To ensure quality, conformance, and reliability with regard to the manufacturing and production of the equipment, the manufacturer shall meet all requirements listed hereafter:
- B. Manufacturer shall have a minimum of twenty (20) years experience producing equipment substantially similar to that required and shall be able to submit documentation of at least fifteen (15) independent installations using the same size or larger equipment as detailed in the below. Each installation must have been in satisfactory operation for at least five (5) years.
- C. The Contract Documents represent the minimum acceptable standards for the screening equipment for this project. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. The entire unit shall be Manufacturer's standard product, but shall be modified, redesigned, furnished with special features or accessories, made of materials or provided with finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.
- D. The entire unit shall be manufactured from AISI 316L stainless steel shapes. All components made of stainless steel shall be passivated by full submergence in a pickling bath for perfect surface finishing. No stainless steel components may be fabricated or assembled in a factory where carbon steel products are also fabricated, in order to prevent contamination by rust.
- E. Electric motors, gear reducers, and other self-contained or enclosed components shall have an acrylic enamel finish.
- F. All stainless steel parts of the unit shall be fully submerged into a pickling bath for at least 8 hours to remove welding spots and to protect the stainless steel against corrosion. Glass bead blast or chemically treated stainless steel shall not be allowed.
- G. Fabrication shall be done in compliance with all applicable ASTM standards or equivalent international standards.
- H. All welding in the factory shall use shielded arc, inert gas, MIG or TIG method. Filler wire shall be added to all welds to provide for a cross section equal to or greater than the parent metal. Butt welds shall fully penetrate to the interior surface and gas shielding to interior and exterior of the joint shall be provided.

- I. Bolts, nuts and washers shall be selected from AISI 316L stainless steel such that they are anti-seizing.
- J. Manufacturer shall have established an ISO 9001 certified quality management system. Equipment suppliers not utilizing ISO 9001 facilities shall not be considered or approved for this project. Equipment supplier shall provide evidence of certification before being named as an acceptable manufacturer.
- K. Manufacturer shall have established an ISO 14001 certified environmental protection management system designed to monitor and help minimize the harmful effects on the environment caused by its manufacturing processes. Equipment suppliers not utilizing ISO 14001 facilities shall not be considered or approved for this project. Equipment supplier shall provide evidence of certification before being named as an acceptable manufacturer.
- L. All welding is performed in accordance with American Welding Society (AWS) D1.1 Structural Welding Code, or equivalent.
- M. Manufacturer shall provide screen, motors, gear reducers, controls, control panels, and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system. The manufacturer shall test-run the fully assembled machine in his factory before shipment.
- N. Manufacturer shall provide services by a factory-trained Service Specialist, specifically trained on the type of equipment specified. The Service Specialist requirements include, but are not limited to the following:
  - 1. The Service Specialist shall be present during initial energizing of equipment to determine directional testing as described in Section 4.01 C (Installation).
  - 2. The Service Specialist shall inspect and verify location of anchor bolts, placement, leveling, alignment and field erection of equipment, as well as control panel operation and electrical connections.
  - 3. The Service Specialist shall provide classroom and/or field training on the Operation and Maintenance of the equipment to operator personnel. These instructions may include the use of slides, videos, literature, and/or oral presentations.
  - 4. Manufacturer shall state field service rates for a Service Specialist to Owner and Contractor. In the event that the field service time required by this section should not be sufficient to properly place the equipment into operation, and the

requirement for additional time is beyond the manufacturer's responsibility, additional time shall be purchased by Contractor to correct deficiencies in installation, equipment, or material without additional cost to Owner.

#### 1.05 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT

- A. All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.
- B. Contractor shall be responsible for unloading of the machinery and shall have equipment on-site available at the time of delivery permitting proper hoisting of the equipment.

#### 1.06 ENGINEER'S APPROVAL OF ALTERNATE EQUIPMENT

- A. Manufacturer of alternate equipment shall submit a pre-approval package to Engineer at least two (2) weeks prior to bid date. Alternate manufacturer shall submit the following information and supporting documentation:
  - 1. Standard equipment drawings showing the equipment meeting the specifications in this section. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
  - 2. Detailed installation drawings illustrating how the proposed screen fits in the channel. The drawings shall include plan, elevation, and sectional views of the installation. Drawings shall include details of the discharge chute, details of the seal between screen and side walls of the channel, and details of anchor bolt locations.
  - 3. Hydraulic calculations for the proposed screen verifying that the screen is capable of processing the peak flow.
  - 4. Motor characteristics and performance information.
  - 5. Reference list of all installations of same and similar equipment.
  - 6. Complete bill of materials for all equipment.
  - 7. Certification by the manufacturer that all stainless steel equipment will be manufactured in a stainless steel only factory.

8. Certification that the entire equipment will be passivated by submersion in an acid bath as specified in chapter 2.03.
9. Documentation of required maintenance for all equipment including an approved list of lubricants and the required quantities.

## PART 2:

### 2.02 PERFORMANCE AND DESIGN REQUIREMENTS

1. Each screen shall be capable of processing a peak flow of 350 liter/second of municipal wastewater with a bar spacing of 10 mm Tear Drop Design. Inclination of the bar rack shall be 85 degrees. Effective screen area shall have a minimum of 55% free open-area for water flow. The Screen shall lift and discharge screenings (maximum 65 ft or 20 m) above the bottom of the channel onto a discharge chute without use of brushes or spray washers. The operating floor level shall be 19' 6" above the bottom of the channel. Depth of Channel 4'. (All dimensions to be confirmed onsite by contractor) The screening system shall be equipped with a means of automatically washing and compacting screenings. Compaction of screening should remove the majority of water contained within the screenings and present these screenings for bagging and disposal.
2. The maximum upstream water level shall not exceed 1000 mm above channel bottom. The screen shall be capable of processing the peak flow without exceeding the maximum upstream water level based on a 35% reduction of the screen's free open-area.
3. The travel speed of the rakes shall be between 26 and 39 feet per minute (8 to 12 m/min).
4. All parts shall be designed and manufactured to handle the forces that may be exerted on the screen during fabrication, shipping, erection, and proper operation according to the O&M manual.
5. All components shall be so designed that jamming at any point will not result in structural failure, but will cause the drive motor to stall. All components, including the gear reducer, shall be designed to withstand, without damage or permanent distortion, the full stalling torque of the drive motor and/or the maximum differential head at any channel water depth.

## 2.03 BAR SCREEN DESIGN SPECIFICATIONS

### A. MATERIALS

1. Screen shall be manufactured from AISI 316L stainless steel shapes (rods, angles, and channels), pipes, and sheets. In particular, side frames and guides, bar rack, rake assembly, scraper assembly, shafting, discharge chute, fasteners and anchor bolts shall be made of this material.
2. Screen shall be manufactured in a stainless steel only factory to prevent contamination of the stainless steel with rusty dust.
3. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid (pickling bath) to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Sand blasting, bead blasting, spray pickling or hand pickling of stainless steel surfaces shall not be acceptable
4. Chains and sprockets shall be made of hardened stainless steel. Chain rollers shall be made of polyamide. bushes and pins bushings 318 LN (Duplex)
5. Lower sprocket bearings shall have a stainless steel casing including a shaft made of white cast iron and a ceramic (silicium carbide) low friction bushing or similarly approved by the Engineer.
6. Upper sprocket bearings shall have a paint coated cast iron casing and include ball bearings with grease nipples that are double-sealed with Nilos rings or similarly approved by the Engineer.

### B. CONSTRUCTION

***The construction of the screening system shall meet or exceed the following, or ~~be be a similar of~~ similarly design to be approved by the Engineer.***



1. The bar screen shall remove debris (screenings) from the incoming wastewater by means of a positively cleaned bar rack that is installed in a concrete channel. The screen shall retain debris at the bar rack. A multitude of rake blades shall remove and lift the debris to a discharge mechanism. The bar rack shall be cleaned by a series of rakes engaging the bar rack from the upstream side (front) at the bottom of the channel and then moving up along the bar rack. The debris shall be lifted above the channel and dropped on a discharge chute at the downstream side (back) of the screen. Screens with single rakes shall not be approved. Screens employing brushes and spray water for screenings removal shall not be approved.
2. The bar rack shall consist of equally spaced, straight bars that are inclined from the horizontal with the inclination angle specified above. The lower ends of the bars shall be provided with a minimum 10/64" (4 mm) thick curved base plate such that the rakes positively remove all screenings from the bottom of the bar rack. Bars shall have a teardrop (up to a bar spacing of ½ inch or 12 mm) cross section. Teardrop bars shall have a width of 5/16" (8 mm), a depth of minimum 2.4" (60 mm) and a tail width of 13/64" (5mm). The bar rack shall be made up of equally sized sections securely fastened to the frame of the screen and be readily removable. Screens without the ability to replace bar screen sections will not be acceptable for this project.
3. The bar screen shall be provided with a dead plate extending from the bar rack to the discharge chute. The dead plate shall be made of a minimum 10/64 inch or 4 mm thick stainless steel plate and shall be stiffened by structural members so that it is flat without undulation so that the tips of the rake's teeth ride at a distance between 5/64 and 10.64 inch (1 to 2 mm) over the dead plate. The dead plate shall be securely fastened to the side frames.
4. A discharge chute shall be provided that fully encloses the discharge section of the screen. An access hatch with hinges and a handle shall be provided in the chute permitting easy access. The discharge chute shall be mounted to direct screenings into the appropriate receiving container or conveyor. The chute shall have a slope of minimum 60 degrees. The discharge chute shall be made of a minimum 10/64 inch or 4 mm thick stainless steel plate.
5. A frame shall be provided supporting all required loads. Side frames shall be made of 0.16" (4 mm) thick 304 stainless steel plates with a minimum of four axial edges and shall have a width of minimum 23 inches (584 mm). The side frames shall be connected with each other through channels having a minimum thickness of 10/64 inch (4 mm) and a minimum cross section of 4-1/4" x 2" (108 x 49 mm). The side frames shall be connected to support frames. The support frames shall be securely anchored onto the operating floor.

6. The screen shall be provided with easily removable, sufficiently stiffened covers made of 3/64 inch (1.5 mm) thick stainless steel plates with edges on all sides. The covers shall be provided with turn locks and handles.
7. 10/64 inch (4 mm) thick neoprene strips shall be fastened to the side frames to seal the lateral gaps between the side frames and the channel walls.
8. Each side frame shall include separate roller tracks to guide the rakes. The roller tracks shall be bolted to the frame so that they can easily be replaced. The roller tracks shall be made of 10/64" (4 mm) thick L-profiles.
9. Drive chains for the rakes shall be roller type chains and shall have links made from 316 stainless steel. The chain bushes and pins shall be made from Duplex Stainless Steel. Each chain shall be rated for a maximum load of 120,000N (26,977lbs.f). Drive chains, chain guides, sprockets and their bearings shall be replaceable without the need for removing the screen from the channel. Screens utilizing drive chains constructed from alternative materials will not be acceptable for this project due to the corrosive nature of waste water.
10. Chain rollers shall be made of polyamide and shall have a diameter of 2-3/4 inch (70 mm) and shall be a minimum of 1-1/4 inch (32 mm) wide.
11. Each screen shall be provided with four sprockets with a reference diameter of 13 inches (327 mm). The lower sprockets shall be solid. The upper sprockets shall be split to facilitate maintenance. The sprockets shall be made of minimum 1-1/8" (29 mm) thick 316 stainless steel plates. Screen designs that utilize sprockets constructed of differing materials will not be acceptable for this project.
12. Stainless steel guards shall be provided bolted to the screen frame and partially cover the lower sprockets to provide protection from large debris.
13. Upper bearings shall be flange bearings, and shall be provided with grease nipples for easy lubrication. The bearings shall be designed for use with biodegradable grease. Their diameter shall be a minimum of 2 inch (50mm). The casing shall be made of paint coated cast iron.
14. Lower bearings shall be slide bearings in a stainless steel casing. They shall include white cast iron shafts and silicon carbide slide bushings with a length of 2" (50 mm) and an internal diameter of minimum 2-5/16" (59 mm). Bearings employing slide bushings

made of plastic material shall not be accepted. Screen designs that utilize guide tracks or shoes will not be acceptable for this project.

15. Rakes shall include rake bars made of  $\frac{1}{4}$ " (6 mm) thick channel profile having a cross section of  $4\text{-}1\frac{1}{4}$ " x  $2\text{-}3\frac{3}{8}$ " (105 x 60 mm). Rake blades with a thickness of  $\frac{5}{16}$ " (8 mm) and a depth of minimum  $6\text{-}1\frac{1}{2}$ " (170 mm) shall be bolted on the rake bars. The rake blades shall have teeth matching and engaging the bars of the bar rack. The rake blades shall each consist of several pieces with teeth such that only one of the pieces needs to be replaced in case that a tooth should be damaged.
16. A pivoting scraper mechanism shall be positioned at the point of discharge and shall be attached to the side frames. The scraper shall clean the rake on each pass and return to its rest position with minimal shock. The scraper shall be designed such that screenings do not wrap around the rake or scraper. The scraper shall be provided with a scraper bar made  $\frac{10}{64}$ " inch (4 mm) thick channel profile with a minimum cross section of  $1\text{-}1\frac{1}{2}$ " x  $2\text{-}11\frac{1}{16}$ " (39 x 68 mm) and an adjustable  $\frac{3}{8}$  inch (10 mm) thick wiper made of Polyethylene. The scraper shall be connected with the frame through a pair of minimum 20 inch (500 mm) long scraper arms that shall be made of  $\frac{10}{64}$ " inch (4 mm) thick channel profile with a minimum cross section of  $2\text{-}3\frac{3}{4}$ " x  $2\text{-}3\frac{3}{8}$ " (68 x 59 mm). A pair of shock absorber elements made of neoprene shall be provided.
17. The drive shaft shall have a diameter of minimum  $3\text{-}1\frac{1}{8}$  inch (80mm) and a wall thickness of minimum  $\frac{13}{64}$ " (5 mm).
17. The drive shaft shall include an integral rocker arm assembly on the drive end that flexes if the screen rakes get jammed.
18. The rocker arm assembly shall consist of a drive unit mounted to a stainless steel arm. The stainless steel arm will be held in place by a flanged roller bearing connected to the drive shaft and two heavy duty tension springs. The flange bearing shall be connected to the rocker arm by four bolts. The rocker arm position shall be maintained in the standard operating position by the two tension springs. An intrinsically safe proximity switch shall indicate the position.
19. The drive unit shall be designed for continuous service and intermittent spray water contact.
20. The bevel gear reducer shall be a totally enclosed unit. Gear reducer shall have ball or roller bearings throughout with all moving parts immersed in oil. Gear reducers which require periodic disassembly of the unit and manual re-greasing of bearings are not acceptable. The nominal input power rating of the gear reducer shall be at least equal to

the nominal horsepower of the drive motor. Gear reducer shall be designed and manufactured in compliance with applicable AGMA or equivalent standards. During continuous operation the oil temperature shall not exceed 200 degrees F (95 degrees C).

21. The rake assembly shall be driven by an electric motor. The motor shall be 2GExeIICT3Gb. The motor shall sized for, 400 Volts, 50 Hz, 3-phase. The motor shall be rated for operation in a 104 degree F (40 degree C) environment.

## 2.04 CONTROLS AND INSTRUMENTATION

### A. GENERAL

The control system shall be provided by the screen supplier.

### B. LOCAL CONTROLS ON EACH SCREEN

1. One (1) compliance with UVV and VDE standards, stainless steel cabinet for local control.

### C. WATER LEVEL SENSORS

1. Bar screen manufacturer shall provide Air sparge system with baffle plate water levels for control of screen operation. Contractor shall provide wiring to the control panel.

### D. CONTROL PANEL

1. A single main control panel shall be furnished with a UP54 corrosion-resistant stainless steel enclosure together with a single local push button station rated IP 66, II 2G EEx ed IIC T6.
2. Control panel shall contain all power and control devices necessary for the proper function of the screen and shall include the following:

Basic controls for bar screen:

Drive motor control incl. soft starter

Control of overload protection via proximity switch.

Level control system combined with an adjustable timer  
Installation material control panel fixing at a wall, control panel, consisting of:

5 x shield terminals (different sizes), cable label

Additional control equipment additional components:

Control panel extension for provision of interfaces for customer supplied bus  
Connection; for mechanical treatment Interface provision for a customer-supplied bus  
connection by means of Ethernet or Profibus; DP in switch systems for Mechanical  
Preliminary Treatment

Data provision for the superior control system without start-up

Extra for material control panel

Control panel heating with thermostat Control panel heating with thermostat

Control panel extension for emergency cutoff relays, Control panel extension for  
emergency cutoff relays, required for manual operation via local control.

Cover over control units on control panel Cover (frame window) over control units on  
control panel (lockable)

Siemens (S7-1200 und KP400)

3. Control panel shall consider a Gateway, AnyBus or similar.

#### E. SEQUENCE OF OPERATION

1. In AUTO position the screen shall be controlled by the water level sensor. Screen operation shall be started when the water level sensor monitor a certain water level difference, when level sensor detects high water level, or when a certain time has passed since the last operation of the screen. Screen operation shall be stopped with an adjustable delay time after the water difference is below a certain value and after the level sensor ceases to indicate high water alarm, or after a certain run time has expired (if operation was started by timer).
2. If the screen rakes experience a jam, the force will cause the rocker arm described above to rotate around the drive shaft, compressing one of the tension springs. This motion shall be limited by a rocker guide. When the rocker arm rotates out of the normal operating position a proximity sensor will send a signal to the PLC causing the motor to enter a self-clearing mode. The self-clearing mode with attempt to reverse the direction of travel of the rakes for a set period before resuming forward operation. This cycle will be attempted up to three (3) times; if the self-clearing mode should prove unsuccessful then the system shall initiate an alarm signal.

3. Reset is manually performed after correction of any cause for a trip-out.
4. In HAND position the operator shall be able to run the rake assembly selecting the respective FORWARD or REVERSE direction from the FORWARD-OFF-REVERSE selector switch.

### PART 3: SPARE PARTS

The following Spare Parts shall be included and supplied together with the equipment:

- a) 2 sets of rake plates
- b) 2 lower bearing assemblies
- c) 2 proximity switches

Spare parts shall be packaged with labels indicating the contents of each package, and shall be delivered to Owner as directed.

### PART 4: EXECUTION

#### 4.01 INSTALLATION AND TESTING

- A. Contractor shall verify all dimensions in the field to ensure compliance of equipment dimensions with the drawings. Contractor shall notify Engineer of significant deviations.
- B. Installation of the equipment shall be in strict accordance with the contract documents and the manufacturer's instructions and drawings. Manufacturer shall supply anchor bolts for the equipment. Contractors shall install the anchor bolts in accordance with the manufacturer's recommendations
- C. Supplier shall furnish the services of a factory-trained Service Specialist for one (1) trip including a total of two (2) days to inspect the installation, support the start up with the operators, and provide operator training.
  1. Equipment shall not be energized, or "bumped" to check the electrical connection for motor rotation without the Service Specialist present.

2. The Service Specialist shall make all necessary adjustments and settings to the controls.
3. The Service Specialist shall demonstrate proper and sequential operation of the screen. The screen shall operate automatically based on the water level differential.

END OF SECTION