

## SECTION 11331

### SCREENING EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

###### A. Scope

1. Furnish and install two (2) fully automatic, heavy-duty, mechanically cleaned bar screens with appurtenances for screening of raw sewage, SC-1 and SC-2
  - a. Arrange screen discharge to a washer/compactor
2. Furnish and install one manually cleaned, heavy-duty bar screen with appurtenances
  - a. Provide rake for manual cleaning
3. Location: Preliminary Treatment Area of the Headworks Building

###### B. Additional Requirements Specified Elsewhere

1. Section 01340: Shop Drawings, Product Data and Samples
2. Section 01400: Quality Control
3. Section 01600: Materials and Equipment
4. Section 01730: Operating and Maintenance Data

###### C. Related Requirements Specified Elsewhere

1. Section 03300: Cast-in-Place Concrete
2. Section 03600: Grout
3. Section 05500: Metal Fabrications
4. Section 05501: Anchor Bolts and Drilled-In Anchors
5. Section 11332: Screenings Compactor
6. Division 13: Utility Control System
7. Division 14: Conveying Systems
8. Division 16: Electrical

##### 1.2 QUALITY ASSURANCE

###### A. Suppliers Qualifications

1. All equipment supplied by a single manufacturer or supplier
  - a. Equipment to be the standard product of the manufacturer with specified optional accessories
  - b. Minimum 5 years experience in the manufacture of mechanical screening equipment of the type specified herein
  - c. Provide list of installations where screening equipment of similar size has been in operation for at least 5 years

B. Design Basis

1. Aqua Guard® model AG-MN-A, as manufactured by Parkson Corporation, Fort Lauderdale, Florida
  - a. Provide certified price/cost proposals from the manufacturer demonstrating competitive pricing of similar equipment from other projects within the last 24 months

1.3 SUBMITTALS

A. In accordance with Section 01340

B. Manufacturer's Literature and Illustrations

C. Manufacturer's Specifications and Illustrations

1. Sufficient data to verify compliance with specifications and to illustrate construction and assembly of products
  - a. Screens, frames, carriage assembly and rakes
    - 1) Manufacturer
    - 2) Type, model and screen size
    - 3) Materials and fabrication standards
    - 4) Design speed
    - 5) Bearing type and life calculations
    - 6) Dimensions
    - 7) Weights
    - 8) Self-cleaning appurtenances
  - b. Motors
    - 1) Manufacturer
    - 2) Type and model including class
    - 3) Rated horsepower (hp)
    - 4) Voltage, single or three-phase, full load and locked rotor current draw
    - 5) Temperature rating and service factor
    - 6) Dimensions
    - 7) Weight
  - c. Drive
    - 1) Manufacturer
    - 2) Type and model
    - 3) Input and output speeds
    - 4) Gear ratios
    - 5) Service factor (24-hour continuous service)
    - 6) Attachment to motor
    - 7) Fluid and other maintenance requirements
  - d. Discharge chute
    - 1) Dimensions
    - 2) Connection
    - 3) Support
    - 4) Materials
    - 5) Fabrication

2. General
  - a. Materials
  - b. Parts
  - c. Devices
  - d. Accessories
  - e. Dimensions
  - f. Net weights
  - g. Electrical wiring diagrams
  - h. Control descriptions and diagrams
  - i. Data on shop coatings

D. Shop Drawings

1. Fabrication
2. Assembly
3. Installation
4. Anchor bolt setting template

E. Certification of Compliance

1. Manufacturer's affidavit of compliance certifying
  - a. All equipment and materials comply with these specifications
  - b. Equipment has been properly installed and is operating within specification tolerances
  - c. All tests have been performed with satisfactory results

F. Operating and Maintenance Manuals in accordance with Section 01730

1.4 JOB CONDITIONS

A. Application

1. Plant influent
2. Raw sewage (municipal)

B. Design Flows

1. Initial conditions
  - a. Average daily flow: 0.75 MGD
  - b. Peak hour flow: 1.3875 MGD
2. Design conditions
  - a. Average daily flow: 2.50 MGD
  - b. Peak hour flow: 4.625 MGD
3. Future conditions at initial channel width with baffles, each screen unit
  - a. Average daily flow: 4.25 MGD
  - b. Peak hour flow: 7.8625 MGD
4. Service area build-out will require removal of channel baffles and replacement of screen units

### C. Installation Conditions

1. To be installed in concrete channels in the Preliminary Treatment Area of the Headworks Building as indicated on the Drawings
  - a. Install mechanically cleaned bar screens in service channels
  - b. Install manually cleaned bar screen in bypass channel
2. Interior, heated location
  - a. Minimum air temperature = 40°F
  - b. Maximum air temperature = 90°F
3. Site elevation: 5,423 feet above mean sea level (AMSL)
4. Mechanically cleaned bar screen physical characteristics
  - a. Flow channel width: 2'-6"
  - b. Channel depth at one channel width upstream of screen: 4'-8"
  - c. Operating floor height above channel bottom at foot of screen: 4'-11½"
  - d. Channel recess at foot of screen: 3½"
  - e. Discharge chute height above operating floor: 4'-0" minimum
  - f. Screen support columns to bear on concrete supports integral to channel walls with bearing surface at operating floor level
    - 1) Allow for grout pad or high density polyethylene leveling shims
5. Manually cleared bar screen physical characteristics per Drawing details

D. All electrical equipment, components and work in the Preliminary Treatment Area of the Headworks Building shall conform to NEC Class 1, Division 1, Group D

E. All materials shall be resistant to corrosive conditions including exposure to hydrogen sulfide

1. Metal: 316 or 416 stainless steel or other material of equal corrosive resistance
2. Except as specifically noted where materials are specified

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE AND DESIGN REQUIREMENTS

#### A. Mechanically Cleaned Bar Screen

1. Number required: 2
2. Nominal screen width: 2'-6"
3. Angle of inclination: 75° from horizontal
4. Maximum downstream water level at design peak flow: 1'-6"
5. Maximum loss of head through clean screen at design peak flow: 13" of water
6. Screen to provide dual filtration of all materials to minimize compaction of captured materials and to minimize headloss through the screen
  - a. Coarse filtration to remove all material larger than 8 millimeter diameter
  - b. Fine filtration
    - 1) Horizontal clear spacing: 3 millimeter maximum
    - 2) Vertical clear spacing: 15 millimeter maximum
    - 3) Minimum rake lifting capacity per cycle: 500 lbs
7. Screen shall be capable of presenting a clean filtration surface to oncoming liquid stream at all times during continuous operation

8. Trash and screenings automatically transported by screen for deposit into a screenings washer/compactor
9. Automatically self-cleaning through interaction of filter elements
  - a. Remove captured material from screen surface
  - b. No external spray or backwash water or external mechanical device (including drive sprocket) required
  - c. Doctor blades will not be permitted
10. Jam- and binding-proof
  - a. No rake mechanisms near screen
  - b. Drive components located out of path of trash collected on screen
  - c. If drive mechanism located in screening face, it must be located after trash is unloaded from screening elements
11. The tension of the moving screen belt assembly shall be completely supported by a stainless steel link chain having a minimum cross sectional area of 0.144 square inches at any point. The chain shall connect the filter shaft ends on both sides of the belt assembly so that no weight is supported by the screen filter elements
12. Filter shafts shall be spaced on 4" centers along the travel direction of the belt
13. Routine maintenance shall be possible from the operating floor with the screen mounted in the channel. For major maintenance it shall be possible to pivot or remove the screen from the channel without dewatering or entering the channel. No mounting or fastening of screen to channel sidewalls or bottom will be permitted
14. A ½" thick, curved, stainless steel rail shall be provided at foot of screen for the screen rollers
15. No submerged bearings or sprockets will be allowed
16. Drive unit
  - a. 750:1 double reduction worm gear
  - b. Anti-friction bearings
  - c. AGMA 24-hour Class II service
  - d. Self-contained
  - e. Direct coupled
17. Manual, central lubrication system
  - a. Lubrication lines and grease fittings from all grease points to centrally located area accessible from operating floor

## 2.2 MATERIALS

### A. Mechanically Cleaned Bar Screen

1. All moving wetted parts or all wetted parts on which moving parts ride including shafts, side plates, chain links, guide rails and drive sprocket inserts or any other guiding or load bearing part of screen: 304 stainless steel unless otherwise noted
2. Screening elements: High impact plastic, metal screening elements not permitted
  - a. Parkson Corporation Aquaguard standard manufacture material
3. Rollers and bushings: 400 series stainless steel, heat treated, minimum hardness 39 Rockwell C
  - a. Screening rollers: 1.75" diameter

- b. Rails: ½" thick 304 stainless steel
- 4. Stationary frame and support legs: 3/16" thick 304 stainless steel
- 5. Cross members: 1" Schedule 40, 304 stainless steel pipe
- 6. Main drive shaft and sprockets: 304 stainless steel
- 7. Take-up screws: 316 stainless steel
- 8. Brush shaft: 304 stainless steel
- 9. Brush hubs: Aluminum or UHMW polyethylene
- 10. Front seal brush and rotating brush: Nylon bristles
- 11. Side seals: Neoprene rubber with 304 stainless steel supports
- 12. Nuts, bolts and fasteners: 316 stainless steel
- 13. Discharge chute: 304 stainless steel
- 14. Filter shafts: ¾" diameter 304 stainless steel
- 15. Other appurtenances including drive supports, chains, chain guard, brush sprockets, guide rail supports, bearing housings, etc.
  - a. Manufacturer's standard coating material

B. Manually Cleaned Bar Screen

- 1. Per Drawing details

## 2.3 ANCHOR BOLTS

A. Mechanically cleaned bar screen

- 1. Manufacturer to specify type, size, number required, etc.
  - a. Refer to Section 05501 for general requirements
- 2. Manufacturer to provide anchor bolt setting template and/or setting instructions
- 3. Anchor bolts will be furnished by installation contractor

B. Manually cleaned bar screen

- 1. Per Drawing details

## 2.4 MOTOR AND CONTROLS

A. General

- 1. All electrical work and equipment located in the Preliminary Treatment Area of the Headword Building shall conform with NEC Class 1, Division 1, Group D

B. Motor

- 1. Maximum nameplate horsepower: 1.5 hp
- 2. Rating: 460 Volt, 60 hertz, 3-phase
- 3. TEFC severe-duty squirrel cage motor

C. Overload Protection

- 1. Electrical motor overload shock relay measuring trip on high current draw, stop motor and send alarm

2. Adjustable

D. Control System

1. Provide one control panel for each screen
2. Each screen to be independently operated through dedicated control panel
3. Control panels to be wall mounted in the Electrical and Control Room of the Headworks Building as indicated on the Drawings
4. The Preliminary Treatment Area of the Headworks Building will include hazardous environment monitoring devices. Should a hazardous environment condition occur, it will be indicated in the SCADA system which will in turn send a shutdown signal to the equipment in the area. The screen control panel must be able to accept this signal and upon its activation immediately de-energize all equipment in the Preliminary Treatment Area
5. Initiation of screen operation
  - a. Adjustable timer
  - b. In-channel differential level sensors
  - c. In-channel high water alarm float
6. Provide a local emergency stop pushbutton at each screen in a NEMA 7 enclosure
  - a. Local stop pushbutton will serve as local disconnect switch
  - b. Provide stop pushbutton with locking hasp or cover for equipment lockout
7. Control panel
  - a. Number required: Two (2), one for each screen
  - b. Enclosure rating: NEMA 4
  - c. Control panel component rating: NEMA 4X
  - d. Completely prewired and factory tested prior to shipment
  - e. Main disconnect switch capable of being locked in the Off position
  - f. Accept input power of 480 VAC, 3-phase, 60 hertz
  - g. Include all logic devices, programmable relays, timers and appurtenances for proper screen operation
  - h. Include the following minimum electrical devices
    - 1) FVNR motor starter and motor overload protection
    - 2) Transformer for 120 VAC control system power
    - 3) Main circuit breaker
  - i. Include the following minimum pilot and control devices
    - 1) Hand/Off/Auto selector switch for screen operation
      - a) When in Hand, screen to operate continuously
      - b) When in Auto, screen to operate as follows
        - (1) Two solid state timers shall automatically initiate screen operation
          - (a) One frequency of run timer shall include a minimum adjustable range of 60 to 7,200 seconds in 60 second increments
          - (b) One duration timer with a minimum adjustable range of 5 to 900 seconds, adjustable in 5 second increments
        - (2) When an operator adjustable input for differential water level from upstream side to downstream side of screen is reached, as determined by the two in-channel ultrasonic differential level sensors, this shall initiate screen operation according to

the duration timer. This operation shall reset the automatic frequency timer cycle

- (3) When a predetermined level is reached in the channel upstream of the screen, a float switch contact will close. This shall energize an adjustable 0 to 60 second time delay relay which when timed out shall initiate screen operation and also energize the high channel level alarm. If the float switch contact opens before the time delay relay has timed out, the timer shall reset. With the screen running, when the float switch contact opens, screen operation and the high channel level alarm shall terminate. This operation shall not interrupt the automatic frequency timer cycle
- 2) Control power indicating light: White
  - 3) Screen run indicating light: Green
  - 4) Torque overload indicating light: Red
  - 5) High upstream channel level indicating light: Red
  - 6) System reset pushbutton
  - 7) Emergency stop pushbutton
  - 8) Motor current monitor
    - a) Analog or digital ammeter
  - 9) Run time meter
    - a) Nonresettable
  - 10) Run output contact
  - 11) General fault output contact (activate for high channel level and any shutdown condition listed below)
  - 12) Input contact for screen shutdown signal from SCADA system
- j. Provide circuitry and devices to shut down screen upon the following conditions
    - 1) Torque overload fault
    - 2) Control panel emergency stop pushbutton activation
    - 3) Local emergency stop pushbutton activation
    - 4) Receipt of SCADA system shutdown signal
  - k. Clearly label all front panel mounted items and devices on the outside front of the panel
  - l. Clearly label all wires and terminal points inside the control panel
  - m. All power and control wiring shall be 600 Volt insulated copper and sized for the required load, 14 AWG minimum
  - n. All circuit breakers shall be thermal magnetic molded case units
  - o. All selector switches, pushbuttons and pilot lights shall be heavy-duty, water/oil tight, corrosion resistant units rated for NEMA 4X service
  - p. All terminal blocks shall be pressure connector type with marking strips and covers suitable for copper connectors sized for the application
  - q. All control relays shall be industrial plug in type rated for the appropriate application load

E. Shop prime and coat in accordance with Sections 01600 and 09900

## 2.5 PAINTING AND COATINGS

A. All surfaces to be painted or coated except



1. Stainless steel
  2. Aluminum
  3. Galvanized
  4. Nickel or chromium
  5. Rubber and plastic
- B. All surfaces to receive prime, intermediate and/or finish painting or coating at the factory
- C. Surface Preparation
1. Non-immersion service: Steel Structures Painting Council (SSPC) - SP6 Commercial Blast Cleaning
  2. Immersion service: Steel Structures Painting Council (SSPC) - SP10 Near White Blast Cleaning
- D. Painting or Coating System
1. Manufacturer's standard coating system
  2. Use only mercury-free, lead-free, fume-proof paint or coatings
  3. Paint or coatings must be suitable for atmosphere containing hydrogen sulfide
- E. Color
1. Manufacturer's standard color system
- F. Refer to Section 01600 for additional requirements

## 2.6 SPARE PARTS AND ACCESSORIES

- A. Mechanically Cleaned Bar Screen
1. Furnish spare parts as recommended by the manufacturer
  2. The following spare parts shall be furnished as a minimum for each screen
    - a. One set seals and bearings for drive unit
    - b. One year supply of lubricants
    - c. Ten percent (10%) replacement screen elements, twenty (20) minimum
    - d. Ten (10) side plates
    - e. Ten (10) snap rings, each size
      - 1)  $\frac{3}{4}$  inch
      - 2)  $\frac{63}{64}$  inch
    - f. Four (4) rotating brush elements
    - g. One (1) rotating brush core assembly
  3. Furnish all accessories as specified herein
- B. Manually Cleaned Bar Screen
1. Provide rake for cleaning screen
    - a. Profile to match bar screen configuration

- b. Minimum 8 foot long handle
- c. Type 3031 aluminum
  - 1) Plate: Minimum ¼" thick
  - 2) Tubing or pipe: Minimum Schedule 40

## PART 3 - EXECUTION

### 3.1 FACTORY TESTING

- A. Equipment to be completely factory assembled and tested prior to shipment
- B. Shop test equipment for a minimum of 16 hours prior to shipment
- C. Perform manufacturer's standard battery of tests
- D. Provide written report of tests performed, duration, results and corrective measures taken to resolve unsatisfactory results
- E. Repeat testing until all results are satisfactory and meet all specification and performance requirements

### 3.2 PRODUCE DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01600 for requirements

### 3.3 INSTALLATION

- A. Inspection
  - 1. Inspect materials and equipment for signs of damage, pitting, rust, decay or other deleterious effects of storage, transportation, handling, etc.
    - a. Replace or repair any materials or equipment showing such effects to the satisfaction of the Engineer and Owner
      - 1) Repair only with new factory-supplied materials
    - b. Replace damaged materials or equipment with identical new materials or equipment
- B. Equipment Installation
  - 1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements
    - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner
    - b. Perform all work in accordance with manufacturer's instructions
      - 1) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents
      - 2) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding

- c. Shimming between machined surfaced is not permitted
- 2. Provide lubricants as recommended by the manufacturer
  - a. Provide sufficient quantity to
    - 1) Fill all lubricant reservoirs
    - 2) Replace all lubricant consumed during testing, startup and operation prior to acceptance of equipment by Owner

C. Paint and Coatings

- 1. Recoat all shop coated surfaces damaged prior to product acceptance to the satisfaction of the Engineer and Owner
  - a. Use paint and/or coating materials identical to those used by manufacturer for shop priming and painting
  - b. Utilize surface preparation procedures as specified herein or as may be appropriate for repairs needed

D. Adjustment and Cleaning

- 1. Perform all required adjustments, tests, operational checks, cleaning and other startup activities required

3.4 FIELD TESTING

- A. Ensure all bearings and gear reducers are properly lubricated
- B. Make all necessary initial adjustments to put equipment into operation
- C. Operate equipment for 24 hours
- D. Log drive motor amperages
- E. Equipment: No indication of binding, unusual loads, intermittent operation, or other problems
- F. Perform all other manufacturer's standard battery of tests

3.5 FIELD QUALITY CONTROL

- A. Provide Manufacturer's Field Service
  - 1. Minimum two trips to project site at one-half (½) day each
  - 2. Qualifications of manufacturer's representative
    - a. Authorized representative of the manufacturer
    - b. Experienced in the application and installation of the subject work, materials and equipment
  - 3. Services provided by representative
    - a. Provide guidance regarding proper installation
    - b. Supervise installation of equipment furnished under this section
    - c. Inspect, check, adjust and test equipment installed, as required, and approve final installation

- d. Be present when equipment is placed in operation
  - e. Revisit site as often as required to correct all problems and until equipment installation and operation are acceptable to Engineer and Owner
4. Manufacturer's representative to instruct Owner's personnel in the operation and maintenance of the equipment furnished. Minimum one-half day including classroom and field training. May be combined with startup services
- B. Furnish three (3) copies of written report to Engineer certifying that
- 1. Equipment is properly installed and lubricated
  - 2. Equipment is in accurate alignment and balance
  - 3. Equipment is free from any undue stress imposed by connecting piping, anchor bolts, etc.
  - 4. Equipment has operated satisfactorily under full load conditions and as specified through full operating range

END OF SECTION