

## SECTION 11325 - GRIT HANDLING UNITS

### City of San Diego, CWP Guidelines

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**NTS: This specification will be used when a dewatered grit concentration of at least 50 percent is desired.**

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#### **PART 1 -- GENERAL**

##### 1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing [two] integral separation/classification and dewatering units with appurtenances.

##### 1.2 RELATED SECTIONS

- A. The WORK of the following Sections apply to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 11000 Equipment General Provisions
2. Section 11199 Horizontal Recessed Impeller Pumps

##### 1.3 SPECIFICATIONS AND STANDARDS

- A. The current editions of the following apply to the WORK of this Section:

1. ASTM A 167                      Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
2. ASTM A 240                    Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
3. ASTM A 276                    Stainless and Heat-Resisting Steel Bars and Shapes
4. ASTM A 312                    Seamless and Welded Austenitic Stainless Steel Pipes
5. ASTM A 479                    Stainless Steel and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels

#### 1.4 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Manufacturer's descriptive literature.
2. Dimensioned shop drawings.
3. Mounting support details.
4. Certified performance data, based on tests of similar capacity equipment, showing moisture content versus rate of dewatered grit produced.
5. The report from a field performance test conducted at an actual full-scale operating installation. Pilot or bench tests are not acceptable. The report must clearly show the performance of the entire grit handling system. Data for the separation/classification and dewatering unit shall include the inlet flow rate and pressure, grit separation performance, underflow rate from the grit classifier, unattached organic content in the underflow grit, and dry solids content of the grit cake. The test report shall be sufficient, in the CONSTRUCTION MANAGER'S judgement, to prove the capability of the proposed equipment to fully meet the performance requirements. Failure to submit the test report shall be cause for rejection of the proposed equipment.
6. Information on at least one successfully performing separation/classification and dewatering unit of comparable size and complexity installed in the recent past with the name, telephone number, and address of the facility owner.

#### 1.5 SERVICES OF MANUFACTURER

- A. Inspection, Startup and Field Adjustment: An authorized service representative of the manufacturer shall visit the site for no less than [3] days to furnish the services indicated in Section 11000.
- B. Instruction of OWNER'S Personnel: The authorized service representative shall also furnish the services indicated in Section 11000 for instruction of the OWNER'S personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment of not less than [2] days.

#### 1.6 QUALIFICATIONS

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NTS: In the paragraph below, requiring experience of more than one successful installation requires sound justification and prior written approval from the City Project Manager.

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- A. **Manufacturer:** Manufacturer specializing in grit separation/classification and dewatering equipment with a minimum of one installation removing 50 micron or finer grit from a comparable flow installed in the recent past.

## **PART 2 -- PRODUCTS**

### 2.1 GRIT SEPARATOR/CLASSIFIER SECTION

#### A. Performance

1. Each grit separation/classification unit shall be designed at a flow of [ ], head loss of no more than [ ] and an inflow solids concentration not to exceed [0.5%]. Each unit shall remove minimum 95% of all grit equal to and larger than 50 microns (specific gravity 2.6) in size.
2. The underflow grit shall, on a weighted average, contain no more than [15] percent by weight of unattached organic material.

#### B. Design:

1. The grit separation/classification units shall be characterized by a dominant, strong free vortex which utilizes centrifugal and gravitational forces and secondary boundary layer velocities for the separation, collection, and classification of grit from the inflow. Defining characteristics of the dominant free vortex/secondary boundary layer type units are as follows:
  - a. Dominating increasing tangential velocity profile towards the center of the unit.
  - b. The ability to handle increasing flows with no loss of the grit removal efficiency and with increasing headloss requirements.
  - c. The ability to classify (wash) the lighter organic material from grit to meet the required organic solids content.
  - d. No requirements for electrical or mechanical components, flow deflecting/guiding weirs or baffles, or compressed air lines within the units to meet the required performance.
  - e. A single all-hydraulic process within each unit to achieve grit separation, collection and classification from water or wastewater.
  - f. No moving parts within the units.

2. Vortex grit units which do not have a dominant, strong free vortex/secondary boundary layer or which performance decreases with increasing flow do not meet the above specifications and shall not be accepted.
3. The grit separation/classification units shall be maximum [42] inches in diameter and shall be fabricated from 304 stainless steel. The steel shall conform to the materials specifications below. Welding shall conform to the most current standards of the American Welding Society. The grit separation/classification units shall be fabricated from 1/4-inch thick 304 stainless steel standard dished and flanged heads, top and bottom, with 3/16-inch thick stainless steel walls. Exterior surfaces shall be bead or pumice blasted to a uniform finish.
4. A minimum 24-inch diameter access shall be provided in the top of each grit separation/classification unit. All internal elements shall be removable from inside each unit.
5. Each grit separation/classification unit shall be self-standing on three legs to provide a clearance of 24 inches between the bottom of the grit underflow pipe of the unit and the bottom of the support leg foot plates. The foot plates shall be supported from the clarifier of the grit dewatering escalator unit.
6. A 4-inch electrically actuated plug valve shall be provided to isolate the underflow of each unit. The plug valve shall be connected directly to the grit underflow pipe of each grit separation/classification unit.
7. A 1-inch NPT connection at the base of the cone of each grit separation/classification unit shall be provided to fluidize accumulated grit. A manually actuated 1-inch bronze ball valve and a 1-inch solenoid valve shall be provided to regulate the fluidizing water flow rate.
8. The discharge boxes shall direct degritted flow from the discharge channel of the grit separation/classifications unit into a discharge pipe.
9. The discharge boxes shall be fabricated from 3/16-inch thick 304 stainless steel reinforced with sufficient structural members to prevent deflection. The steel shall conform to the material specifications below.

## 2.2 GRIT DEWATERING ESCALATOR SECTION

- A. The grit underflow from each grit separation/classification unit shall be transported by gravity flow to a dewatering unit.
- B. **Performance:** The grit dewatering escalator units shall have a capacity of [ ] cubic yards/hr of dewatered grit with a cake dry solid concentration of [50] percent. The grit dewatering escalator clarifier design shall be based on a settling rate of 3.3 gpm/sf.

- C. Each grit dewatering escalator unit housing shall be [ ] inches wide x [ ] inches long, center to center of head roll to tail roll, and be inclined at 30 degrees. Belt speed shall be adjustable between 1 and 5 ft/min.
- D. **Belt:** Each belt shall have [ ]-inch wide hinged type cleats vulcanized on [ ]-inch wide 1/8-inch x 1/32-inch two-ply polyester reinforced continuous conductor belting. The belt cleats (3-3/16-inch x 4-9/16-inch) shall be of molded 60 Durometer neoprene construction, aluminum reinforced with minimum 5/32-inch thick neoprene hinge.
- E. Head and Tail Rolls, Retainer Plate and Scraper
1. Head and tail rolls shall be 304 stainless steel. The 9/16-inch lagged head roll shall be designed for adjustable take-up without affecting the head roll retainer plate, scraper, or driver unit adjustments. The 9/16-inch lagged tail roll shall mount internally to each belt housing with external sealed bearings.
  2. Each grit dewatering escalator unit shall be provided with a head roll scraper having 1/4-inch thick high density polyethylene (HDPE) contact surfaces with a 1/8-inch thick HDPE retainer plate. Both retainer plate and scraper shall be loaded to keep belt cleats closed tightly around head roll during operation.
- F. **Self-Cleaning Tail Roll Mechanism:** The belt cleats shall be neoprene hinged with fulcrums to provide at least 1-inch cleat opening when rotated about the tail roll. Two-inch openings shall be provided in the grit dewatering escalator unit belt to allow transfer of fine solids internal to the belt to the underside of each cleat. The tail roll shall be fitted with a scraper which shall also function as an internal belt scraper.
- G. Belt Housing and Clarifier
1. The belt housing shall be fabricated from 0.135-inch thick 304 stainless steel conforming to the material specifications below. Welding shall conform to the most current standards of the American Welding Society. Surfaces shall be bead or pumice blasted to a uniform finish.
  2. The housing shall be provided with cleanout plates and a flanged 3-inch NPT drain in the tail roll end. The CONTRACTOR shall connect a 3-inch plug valve directly to the 3-inch NPT drain. The plug valve shall be followed by a 3-inch tee with the tee arm of the tee directed towards an open drain and the straight arm of the tee used as a cleanout.
  3. The housing shall be fitted with a clarifier providing at least [ ] square feet of free water surface and walls sloping at least 45 degrees from the horizontal. The clarifier shall provide at least 3 inches of freeboard. The clarifier shall have one 4-inch NPT inlet. The clarifier shall be fitted with an overflow weir at least 62 inches long with a 6-inch NPT overflow discharge connection.

4. A utility water (high pressure) source providing minimum [ ] gpm, at [ ] psig shall be provided by the CONTRACTOR to meet system water needs. During normal operations only 25-30% of the maximum flow shall be used. The maximum water flow shall be used infrequently and only when the clarifier of the grit dewatering escalator units needs refreshing.

#### H. Support Structure

1. Each grit dewatering escalator unit support structure shall be designed as indicated in Section 11000.

#### I. Explosion-Proof Drive Unit

1. The drive unit shall be a helical gear reducer with hardened alloy steel gears accurately cut to shape. The housing shall be steel or cast iron and shall be oil tight. Bearings shall be ball type or roller type, anti-friction throughout, heavy duty on the output shaft. Complete drive unit shall be treated for severe outdoor duty. Drive pulleys on the adjustable speed drive shall be nitrided.
2. The motor shall be [ ]-HP, [ ] phase, [ ] VAC, 60 Hz, NEMA Design B, explosion-proof (Class 1, Group D environment) with a 1.0 service factor and be mounted to the drive unit with an adjustable speed belt type drive which in turn is mounted integrally with the helical reducer. The motor shall have windings covered with a non-hygroscopic polyester varnish rated for Class B insulation (temperature) rating.
3. Mechanical torque limiting clutch shall be mounted on the head roll gear assembly to prevent an accidental overload of the drive unit and belt.

### 2.3 MATERIALS

#### A. Type 304 stainless steel shall comply with the following:

Plate and Sheet	ASTM A 167 ASTM A 240
Bar	ASTM A 276 ASTM A 479
Tube	ASTM A 312

### 2.4 NAMEPLATE, TOOLS, AND SPARE PARTS

#### A. Spare Part

1. The WORK includes the following spare parts for each separator/classifier:

- a. [2] sets of all gaskets
2. The WORK includes the following spare parts for each dewatering unit:
- a. [One] set of drive bearings
  - b. [One] set of oil seals and gaskets
  - c. [One] set of screw bearing assemblies
  - d. [One] upper gasket
  - e. [One] drive belt
- B. Spare parts shall be stored in boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

## 2.5 MANUFACTURERS

- A. Grit classifier/separator and dewatering units shall be manufactured by the following (or equal):

Eutek Systems

## **PART 3 -- EXECUTION**

### 3.1 GENERAL

- A. Installation of the grit separation/classification equipment shall be in strict accordance with the manufacturer's installation instructions and shop drawings.

### 3.2 FIELD TESTING

- A. After installation, equipment and systems shall be tested with grit from the grit pump discharge and adjusted for proper operation at the manufacturer's recommended inlet pressure and flow without excessive noise, vibration, or overheating. Equipment shall be adjusted and checked for misalignment, clearance, and supports. Adjustment shall be accomplished in increasing or decreasing the speed of the horizontal recessed impeller grit pumps feeding each grit cyclone separator. The equipment manufacturer shall certify proper installation of grit separators prior to startup.
- B. The unit shall be tested for compliance with the performance criteria indicated above. The CONSTRUCTION MANAGER may withdraw material samples for independent laboratory analysis at no cost to the CONTRACTOR.

\* END OF SECTION \*