SECTION 35 20 16.25
FABRICATED SLIDE GATES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American Water Works Association (AWWA): C561, Fabricated Stainless Steel Slide Gates.
   2. ASTM International (ASTM):
      a. A193/A193M, Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
      b. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications.
      c. A276, Standard Specification for Stainless Steel Bars and Shapes.
      d. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
   3. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).

1.02 DEFINITIONS

A. Self-Contained: The arrangement of gate operator, supported by gate frame, such that operating thrust loads are not applied external to the assembly.

B. Slenderness Ratio: The ratio of the maximum unsupported stem length to the stem cross-section radius of gyration.

1.03 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings:
      a. Make, model, weight, and horsepower of each equipment assembly.
      b. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction.
      c. Detailed structural, mechanical, and electrical drawings showing the equipment fabrications and interface with other items. Include dimensions, size, and locations of connections to other work, and weights of associated equipment associated therewith.
      d. Gate operator and stem calculations for each gate and service condition.
      e. Gate opening and closing thrust forces that will be transmitted to the support structure with operator at extreme positions and load.

f. Functional description of internal and external instrumentation and controls to be supplied including list of parameters monitored, controlled, or alarmed.

g. Power and control wiring diagrams, including terminals and numbers with indication of terminals with customer connections.

h. Submit anchorage and bracing drawings and cut sheets as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Submit anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Manufacturer's Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements.
3. Special shipping, storage and protection, and handling instructions.
4. Manufacturer's written/printed installation instructions.
5. Routine maintenance requirements prior to plant startup.
6. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
7. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.
~~7.~~8. Factory Test Results

1.04 SYSTEM DESCRIPTION

A. Coordinate such that electric motor operators are fully assembled and tested, including motor, at the factory.

1.05 EXTRA MATERIALS

A. Two sets of seals per gate size.

~~A.~~B. One lift nut per stem diameter

PART 2 PRODUCTS

2.01 SUPPLEMENTS

A. See supplements to this section for additional product information.

2.02 MATERIALS

A. Stainless Steel:

1. Plate, Sheet, and Strip: ASTM A240/A240M, Type 316 or Type 316L.
2. Bars and Shapes: ASTM A276, Type 316 or Type 316L.
3. All welded stainless steel components shall be Type 316L.

2.03 PERFORMANCE REQUIREMENTS

A. Leakage shall not exceed 0.05 gallon per minute per foot of gate periphery under either seating or unseating design operating head conditions as specified on the Slide Gate Schedule. Calculations shall be provided to show conformance

B. After installation, all slide gates shall be field tested at ~~maximum differential head~~design operating head conditions to ensure that all items of equipment are in compliance with this Section, including the leakage requirements.

In the event that any unit fails to meet the above requirements, the necessary changes shall be made and the unit retested. If the unit remains unable to meet the test requirements to the satisfaction of the Project Representative, it shall be removed and replaced with a satisfactory unit at no additional cost to the Owner.

~~A.~~C.

2.04 SLIDE GATES

A. Rising stem type, with assembly styles designated as follows:
   1. See the Slide Gate Schedule for designation of gate as self-contained versus non-self-contained.
   2. Style A: Upward acting type for wall surface mounting on the concrete structures, including a top of gate seal for use on submerged openings. Embedded bottom frame where indicated on Drawings.
   3. Style B: Upward acting type for mounting in channels with concrete embedded frame and invert. Where indicated on the Slide Gate Schedule, provide a top of gate seal for use on submerged openings.
   4. Style C: Downward acting weir gate type with invert seal for wall surface mounting on the concrete structures.
   5. Style D: Downward acting weir gate type with invert seal for embedded side frame mounting in concrete structures. “P” seals are not allowed.

B. Guide Frames:
   1. Stainless steel.
   2. Vertical Guides: Design for maximum rigidity, and extend in one continuous piece from the gate invert to form posts for support of gate operators of self-contained gates. When guides extended above the operating floor, they shall be sufficiently strong so that no further reinforcements are required.
      a. Weight: Not less than 13 pounds per linear foot for wall mounted frames, and not less than 6.5 pounds per linear foot for channel-mounted (embedded) guides. Unless indicated otherwise in the Slide Gate Schedule.
      b. Incorporate a replaceable, self-adjusting, UV stabilized UHMW polyethylene seal with nitrile compression cord. Seal shall be mechanically fastened in the guide slot on both the upstream and

downstream sides of the disc. No wedges, pressure pads or similar wedging devices are allowed.

c. Seal systems incorporating “J bulb”, “P seals”, “d seals”, or similar rubber seals are not acceptable.

3. Frame Invert: For flush bottom gate, furnish a neoprene insert to function as a seating surface for the gate disc.

a. Weight: Not less than 13 pounds per linear foot for wall mounted frames, and not less than 6.5 pounds per linear foot for channel-mounted (embedded) inverts.

4. Join vertical guide frames and invert with factory welded corners.

5. Size guided slot to provide a minimum disc engagement of 1 inch on each side.

C. Disc:

1. Disc Plate (Sliding Member): One-piece stainless steel plate. Reinforce as required so that the disc will not deflect more than 1/720 of the gate span, or 1/16-inch, whichever is less, when the upstream liquid depth (seating head side) is as shown on the schedule and the downstream liquid depth is less than 1/2 inch.

2. Reinforce gate disc with one-piece stainless steel angles or channels welded to the disc plate. Bolted reinforcements will not be permitted.

3. The portion of the slide that engages the frame shall have a minimum thickness of 1/2-inch.

D. Operator Support Yoke:

1. For self-contained gate operators, attached to the vertical extensions of the guide frames.

2. Constructed from at least two stainless steel channels, or two other suitable shapes, and weld or bolt in place to provide a rigid assembly. Angles are not acceptable for yoke members.

3. Maximum Deflection: Not to exceed 1/16 inch under full operator applied loading.

E. Stems:

1. 1-1/2 -inch minimum diameter, ASTM A276, Type 316 stainless steel. Unless indicated otherwise in the Slide Gate Schedule.

2. Threads: Acme type with RMS surface roughness of 16 microinches or less on the flanks.. Extend threaded portion of stem 2 inches above operator when gate is in CLOSED position.

3. Ratio of the unsupported stem length to the radius of gyration, both in inches, shall not exceed 200.

4. Stems to withstand in compression, without damage, the thrust equal to at least 2-1/2-times the rated output of the hoisting mechanism, with a 40-pound effort applied to the handwheel or crank.

5. Design electric motor-driven floor stands to withstand at least 1.25 times the output thrust of the motor in the stalled condition.
6. Equip operating stems with stainless steel, bushed stem guides, mounted on stainless steel brackets; adjustable in two directions and spaced so that the L/r ratio does not exceed 200.
7. Adjustable stop collar for the CLOSED position.
8. Connect the stems to the disc plate with a yoke, bolted to the stem and welded to the disc.
9. Slide gates having a width greater than twice the height or width greater than 84 inches shall have dual stems. For downward opening weir type gates, locate stems near outside edges of gate.

F. Stem Covers:
1. Transparent plastic, vented pipe stem cover and cap.
2. Provide with OPEN/CLOSED designators with 1-inch graduations on clear mylar pressure sensitive, adhesive tape, suitable for outdoor application.

G. Manufacturers:
1. RW Gate.
2. Whipps, Inc.

2.05 GATE OPERATORS

A. General:
1. Components: Withstand a minimum of 250 percent of design torque or thrust at extreme operator positions without damage.
2. Mount at walkway level, 36 inches above floor, unless otherwise indicated or required.
3. Gear train and gate stem sections shall produce a self-locking drive train.
4. Lift Nuts:
   a. Internally threaded with cut or cold-rolled Acme threads corresponding to stem threading.
   b. High tensile manganese bronze, or suitable material, accurately machined and mounted.
   c. Thread length shall not be less than 2.25 times the stem diameter
4.5. Roller Bearings: Ball-thrust or tapered above and below lift nut to support both opening and closing thrusts.
   a. Grease lubrication fittings for bearings.
   b. Input pinions with needle or ball bearings.
5.6. Lubrication: Furnish rising stem gates with an insert lubricator flange in lift, with grease fitting for greasing stem threads below stem nut.
6.7. Manual Operator Limit Switches:
   a. Mounted on an angle adjacent to stem and actuated through limit switch wands by stop collar.

b. Single-pole, double-throw type, with contacts rated 2 amps at 24V dc.

c. Provide two switches, one for gate full OPEN, and one for gate full CLOSED, where indicated.

~~Provide position indicators~~

~~An electrically isolated contact shall be provided with the mechanism to be open when the gate is in the extreme up position, and closed at all other times.~~

B. Type 1, Handwheel-Operated Bench Stands:

1. Direct drive.
2. Sealed, ball thrust, roller or needle bearing type and equipped with bronze lift nut, internally threaded with Acme threads.
3. Furnish mechanical seals at housing penetrations.
4. Handwheel and Baseplate: Cast iron or cast aluminum.
5. Manual Effort: Not to exceed 40 pounds.

C. Type 2, Crank-Operated Bench Stands:

1. Weatherproof housings, mounted on cast aluminum or cast iron base to the top horizontal member of the slide gate frame as described under paragraph Operator Support Yoke.
2. Solid Bronze Lift Nut: Integrally threaded with Acme threads.
3. Ball Thrust or Tapered Roller Bearings:
   a. Locate above and below operating nut flange to support opening and closing thrusts.
   b. Include grease lubrication fittings and input pinions.
4. Manual Crank Effort: Not to exceed 40 pounds.
5. Suitable for portable electric drill operation after removal of handcrank.

D. Type 3, Geared Floor Stands:

1. Crank-operated, with weatherproof housings with solid bronze lift nut.
2. Mount on fabricated stainless steel pedestal or base.
3. Maximum manual crank effort to operate gate shall not exceed 40 pounds.
4. Lift Nut: Internally threaded with Acme threads.
5. Furnish ball thrust or tapered roller bearings above and below the lift nut to support both opening and closing thrusts.
   a. Grease lubrication fittings for bearings.
   b. Input pinions with needle or ball bearings.
   c. Mechanical seals at housing penetrations.

E. Type 4, Electric Motor Operators: See Section 40 27 02, Process Valves and Operators, for 480-volt Electric Motor Operators.

2.06 APPURTENANCES

A. Lifting Lugs: Furnish suitably attached for equipment assemblies and components weighing over 100 pounds.

B. Anchor Bolts: For anchor bolt and post-installed concrete and masonry anchor requirements, refer to Specification Section 05 05 19, Anchor Bolts.

~~Stem Nuts~~

~~High tensile manganese bronze, or suitable material, accurately machined and mounted~~

~~1. Thread length shall not be less than 2.25 times the stem diameter~~

2.07 SHOP/FACTORY FINISHING

A. Mechanically descale and passivate all weld burn and weld slag in accordance with ASTM A380 to provide uniform finish.

2.08 SOURCE QUALITY CONTROL

A. Conduct factory functional tests per AWWA C561, Section 5.2 to verify slide gates operate from fully closed position to fully open position.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with the manufacturer's written instructions.

B. Disassemble factory assembled gate components before installation.

C. Field mount operators after installing gates.

D. Brace thimbles internally during concrete placement.

E. Accurately place anchor bolts using templates furnished by the manufacturer and as specified in Section 05 05 19, Anchor Bolts.

F. Lubricate stems before operating.

3.02 FIELD QUALITY CONTROL

A. ~~Factory Test: Conduct factory performance tests per AWWA C651, Section 5.2 as applicable to the gates provided. All factory testing shall comply with the testing requirements~~

B. Functional Tests:

1. Conduct on each slide gate.

1.2. Verify slide gates operate from fully closed position to fully open position without sticking or binding.

B.C. Performance Testings:

1. Conduct leakage tests on each slide gate. All field leakage tests shall comply with AWWA 653 or AWWA 561, as applicable to the gates provided.
2. Perform under actual or approved simulated operating conditions.
3. Test gate operation for a continuous one hour-period for modulating gates or for 3 open/close cycles for open-close gates, or as required, without malfunction. The gate shall be free of sticking and binding (i.e. gate should move freely using the operator provided).
4. Adjust, realign, or modify units and retest if necessary.

3.03 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:

1. Present at Site or classroom designated by Owner for minimum person-days listed below, travel time excluded:
   a. 3 person-days for installation assistance and inspection
   b. 3 person-days for functional testing and completion of Manufacturer's Certificate of Proper Installation.
   c. 2 person-days for prestartup classroom or Site training.
   d. 2 person-days for facility startup.

B. See Section 01 43 33, Manufacturer's Field Services and Section 01 91 14, Equipment Testing and Facility Startup.

Installation Inspection: Assist, supervise, and inspect the Contractor's activities during installation of gates. Provide a minimum of 8 hours of installation inspection during installation of the gates.

Test Phase Assistance: Assist, supervise, and inspect the Contractor's activities during the testing period. Provide a minimum of 12 hours for testing.

SPARE PARTS

Two sets of seals

One stem nut per stem diameter

3.033.04 SUPPLEMENT

A. The supplement listed below, following "End of Section," is a part of this Specification.

1. Slide Gate Schedule.

END OF SECTION

Slide Gate Schedule									
Gate Tag No.	P&ID No.	Assembly Style	Wall Opening (width/height inches)	Gate Slide Height (inches)	Flow Stream	Design Operating Head (feet) Seating/ Unseating Condition	Travel Time (inches/ minute)	Operator Type/ Control Style	Remarks
14GTE9550-00	N-001-09	A – Self-Contained	120 Diameter	120	RS	10 Seating	12	4/Open-Close	Gate travel is 120 inches
14GTE9501-01	N-005-09	B – Self-Contained	48/252	168	RS	10 Seating	12	4/Open-Close	Gate travel is 144 inches, Provide with local remote control station.
14GTE9501-02	N-005-09	B – Self-Contained	48/252	168	RS	10 Seating	12	4/Open-Close	Gate travel is 144 inches, Provide with local remote control station.
14GTE9501-03	N-005-09	B – Self-Contained	48/252	168	RS	10 Seating	12	4/Open-Close	Gate travel is 144 inches, Provide with local remote control station.
14GTE9505-01	N-007-09	B – Self-Contained	48/252	168	RS	10 Seating	12	4/Open-Close	Gate travel is 144 inches, Provide with local remote control station.

14GTE9505-02	N-007-09	B – Self-Contained	48/252	168	RS	10 Seating	12	4/Open-Close	Gate travel is 144 inches, Provide with local remote control station.
14GTE9505-03	N-007-09	B – Self-Contained	48/252	168	RS	10 Seating	12	4/Open-Close	Gate travel is 144 inches, Provide with local remote control station.
11-SLG-208	N-030-09	A – Self-Contained	96 Diameter	Unknown	RS	15 Seating/ Unseating	12	4/Open-Close	Retrofit existing gate with new electrical actuator
14GTE9530-01	N-019-09	B – Self-Contained	54/120	72	RS	6 Seating	12	4/Open-Close	
14GTE9530-02	N-019-09	B – Self-Contained	54/120	72	RS	6 Seating	12	4/Open-Close	
14GTE9530-03	N-020-09	B – Self-Contained	54/120	72	RS	6 Seating	12	4/Open-Close	
14GTE9530-04	N-020-09	B – Self-Contained	54/120	72	RS	6 Seating	12	4/Open-Close	
14GTE9530-05	N-021-09	B – Self-Contained	54/120	72	RS	6 Seating	12	4/Open-Close	
14GTE9530-06	N-021-09	B – Self-Contained	54/120	72	RS	6 Seating	12	4/Open-Close	
14GTE9650-01	N-012-09	B – Self-Contained	57.5/120	124	RS	22t Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9649-01	N-012-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide;

									2-1/2" stem (minimum)
14GTE9650-02	N-013-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9649-02	N-013-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9650-03	N-014-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9649-03	N-014-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9650-04	N-015-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9649-04	N-015-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9650-05	N-016-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide; 2-1/2" stem (minimum)
14GTE9649-05	N-016-09	B – Self-Contained	57.5/120	124	RS	22 Seating	24	4/Open-Close	15 pounds/ft vertical guide;

									2-1/2" stem (minimum)
12GTEXXXX – Backwash Junction Box Gate	N-003-09	A – Self-Contained	84 Diameter	84	RS	15 Seating	N/A	4/Manual	Field verify Gate width and gate slide height to cover existing pipe and anchor frame to new concrete structure
14GTE9533-01	N-019-09	A – Self-Contained	48/48	48	RS	13 Seating	12	4/Open-Close	

See Drawings for configuration and invert and operator elevations.

SECTION 41 22 23.20
HORIZONTAL WINCH HOISTS

EQUIPMENT AND COMPONENT NUMBER(S)

14MTR9525-01: Screenings Winch 1.
14MTR9525-02: Screenings Winch 2.

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Related sections include the following:
   1. Division 01, General Requirements.
   2. Section 05 05 19, Anchor Bolts.
   3. Section 26 05 26, Grounding and Bonding for Electrical Systems.
   4. Section 26 20 00, Low-Voltage AC Induction Motors.
   5. Section 40 99 90, Package Control Systems.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this Section:
   1. National Electrical Manufacturer's Association (NEMA):
      a. MG 1, Motors and Generators.
      b. 250, Enclosures for Electrical Equipment (1,000 volts maximum).
   2. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
   3. Occupational Safety and Health Act (OSHA).

1.03 DESIGN REQUIREMENTS

A. Stress and Safety Factors: ASME B30.7. Properly select materials of construction for stresses to which subjected.

B. Safety of Operation, Accessibility, Interchangeability, and Durability of Parts: ASME B30.7 and OSHA requirements.

C. Provide system, equipment, and components, including supports and anchorages, designed in accordance with Section 01 61 00, Common Product Requirements.

~~Performance Requirements~~

~~Bin Speed: 40 feet per minute~~

~~Winch system capacity: 30 yard dumpster bin 10 percent overloaded (approximately 15 tons) with wheels on back end and skids on front.~~

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Make, model, weight, and horsepower of each equipment assembly.
   b. Complete catalog information, descriptive literature, materials of construction, and specifications on all components part of assembly.
   c. Detail Shop Drawings of winch.
   d. Power and control wiring diagrams, including terminals and numbers for internal and customer connections.
   e. Motor nameplate data in accordance with NEMA MG 1, and include any motor modifications.
   f. Factory finish system.
   g. Submit anchorage and bracing drawings and cut sheets as required in Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Submit anchorage and bracing calculations as required in Section 01 88 15, Anchorage and Bracing.
2. Manufacturer's printed installation instructions.
3. Suggested spare parts list to maintain the equipment in service for a period of 2 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
4. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
5. Operation and Maintenance Data: As specified in Section 01 78 23, Operation, Maintenance, and Asset Data.
6. Field Functional Test and Performance Test report

1.05 ENVIRONMENTAL REQUIREMENTS

A. Design Temperature: Maximum 104 degrees F; minimum 34 degrees F.

B. Humidity: 90 percent maximum to 10 percent relative humidity.

C. Atmosphere: Mildly corrosive; located under open-sided canopy.

PART 2 PRODUCTS

2.01 SUPPLEMENTS

A. See supplements to this Section for additional requirements.

2.02 WINCH

A. Winch shall consist of rope drum driven through gear reductions, hook, Type 316 wire rope, sheaves, and automatic internal braking system. Provide minimum 50 feet of wire rope. Winch shall be rated for intermittent duty cycle.

B. Rope drum and surrounding members constructed to minimize abrasion, crushing or jamming of winch rope. Rope drum shall include a manual freespool lever.

C. Hook: Construct with sufficient ductility to open noticeably before hook failure, equipped with safety latch, free to rotate 360 degrees with rated load and positively held in place with locknuts, collars or other devices.

2.03 ELECTRICAL

A. Furnish electrical equipment including motors and pendant control.

B. Electrical: In accordance with NFPA 70, NEC Article 610 and Section 26 20 00, Low-Voltage AC Induction Motors.

C. Grounding: External in accordance with NFPA 70, NEC Article 250 and Section 26 05 26, Grounding and Bonding for Electrical Systems.

2.04 CONTROLS

A. In accordance with general control requirements specified in Section 40 99 90, Package Control Systems.

B. Winch: Two button pendant control having momentary contact pushbuttons with a device which will disconnect motors from line on failure of power.

C. Pushbuttons: Fully magnetic, plain reversing type, housed in NEMA 250, Type 4X enclosure, with contactors of sufficient size and quantity for starting, accelerating, reversing, and stopping duty for specified winch.

D. Packaged system wiring from controls from a single 480V ac, three-phase connection, including dc power supply for 24V dc controls.

2.05 ACCESSORIES

A. Equipment Identification Plate: Provide 16-gauge Type 316 stainless steel identification plate securely mounted in a readily visible location. Plate shall bear

3/8-inch high engraved block type black enamel filled equipment identification numbers and letters

B. Lifting Lugs: Provide suitably attached for equipment assemblies and components weighing over 100 pounds.

C. Anchor Bolts: For anchor bolt and post-installed concrete and masonry anchor requirements, refer to Section 05 05 19, Anchor Bolts.

2.06 FACTORY FINISHING

A. Provide manufacturer's standard industrial service factory finish system.

2.07 SOURCE QUALITY CONTROL

A. Factory Inspections: Inspect control panels and equipment for required construction, electrical connection, and intended function.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Provide lubrication and lubrication fittings.

3.02 FIELD FINISHING

A. Repair damaged factory finishes as recommended by the manufacturer.

3.03 FIELD QUALITY CONTROL

A. Functional Tests: Conduct on each hoist.

1. Alignment: Test complete assemblies for proper alignment and connection, and quiet operation.

~~1.~~2. Perform test with dumpster loaded to 15 tons distributed to simulate actual loading.

3.04 MANUFACTURER'S SERVICES

A. Manufacturer's Representative: Present at Site or classroom designated by Owner for minimum person-days listed below, travel time excluded:

1. 1/2 person-day for installation assistance and inspection.
2. 1/2 person-day for functional and completion of Manufacturer's Certificate of Proper Installation.

B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

3.05 SUPPLEMENT

A. The supplement listed below, following "End of Section," is a part of this Specification.

1. Screenings Dumpster Cable Winch Hoists Data Sheet.

END OF SECTION

SCREENINGS DUMPSTER
CABLE WINCH HOISTS DATA SHEET

Project: San José Headworks Project

Owner: San Jose-Santa Clara Regional Wastewater Facility

Service: Screenings Dumpster Cable Winch Hoists

Equip. Tag Number(s): 14MTR9525-01, 14MTR9525-02

Manufacturer: Columbia Winch; or equal

Model No.: ~~WN20000~~WR30000

Number of Units: 2

Rev/Date/By: ___/___/_____

GENERAL REQUIREMENTS

Equipment Capacity: ~~20~~30,000 lb

Method of Control: Pendant

Location of Control:

Equipment Location:

☐Indoors ☒Outdoors

Factory Testing:

☒Required ☐Not Required

Field Testing: ☐Not required

☒Required~~, functional and Performance~~

Power Supply:

Voltage: ~~480~~

Phase: ~~3~~

Frequency ~~60 Hz~~

WINCH

Type:

☒Electric, Wire Rope ☐Hand Operated, Chain

Service Class (ANSI):

☐H1 (standby) ☐H2 (light) ☒H3 (standard)

☐H4 (heavy) ☐H5 (severe)

Speed (fpm): ~~5~~ to ~~8~~

☒Constant Speed ☐Two Speed ☐Variable Speed

Motor hp: 7.5

Hook Travel: ~~40 feet~~

Hook Manufacturer: Per manufacturer's standard

Reeving: Single

SECTION 44 42 30
INFLUENT SCREENING SYSTEM

EQUIPMENT AND COMPONENT NUMBER(S)

14SCR9508-01: Influent Screen 1.
14SCR9508-02: Influent Screen 2.
14SCR9508-03: Influent Screen 3.
14SCP9521-01: Screenings Compactor 1.
14SCP9521-02: Screenings Compactor 2.
14SCP9521-03: Screenings Compactor 3.
14SCP9521-04: Screenings Compactor 4.

PART 1 GENERAL

1.01 WORK OF THIS SECTION

A. The Work of this Section requires that the influent screens, screenings sluice, and screenings compactors, complete with all accessories and appurtenances (including, but not limited to, electric motors, shafting, safety guards, speed reducers, specified controls be the end product of one responsible system manufacturer or system supplier. The supplier shall furnish and/or coordinate all components and accessories as necessary to place the equipment in operation in conformance with the specified performance, features, and functions indicated.

B. In general, the influent screening system consists of three multi-rake front-cleaned bar screens, each nominally rated for 105 mgd. The influent screens discharge to a screenings sluice which conveys the screened material to four washer/compactors. Each screenings compactor shall be capable of handling the total sluice water flow and 50 percent of screenings conveyed from three influent screens. The screenings compactors shall wash, dewater, compact, and discharge the screened material into dumpsters for offsite removal. See Drawings for general arrangement of equipment.

1.02 RELATED SECTIONS

A. Related sections include the following:
1. Division 01, General Requirements.
2. Section 05 05 23, Welding.
3. Section 05 50 00, Metal Fabrications.
4. Section 09 90 00, Painting and Coating.
5. Section 26 20 00, Low-Voltage AC Induction Motors.
6. Section 40 27 02, Process Valves and Operators

1.03 REFERENCES

A. The following is a list of standards which may be referenced in this Section:
   1. American Bearing Manufacturers' Association (ABMA): 11, Load Ratings and Fatigue Life for Roller Bearings.
   2. American Gear Manufacturers Association (AGMA):
      a. 2015-1-A01, Accuracy Classification System – Tangential Measurements for Cylindrical Gears.
      b. 6034-B92, Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors.
      c. 9005-E02, Industrial Gear Lubrication.
   3. American Welding Society (AWS):
      a. D1.1/D1.1M, Structural Welding Code – Steel.
      b. QC 1, Standard for AWS Certification of Welding Inspectors.
   4. ASTM International (ASTM):
      a. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
      b. C582, Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment.
      c. D3917, Standard Specification for Dimensional Tolerance of Thermosetting Glass-Reinforced Plastics Pultruded Shapes.
   5. National Electrical Code (NEC).
   6. National Electrical Manufacturers' Association (NEMA): MG 1, Motors and Generators.
   7. National Fire Protection Association (NFPA): 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
   8. UL: 674, Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.

1.04 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings:
      a. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials for construction.
      b. Detailed structural, mechanical, and electrical drawings showing equipment fabrications and interface with other items, including terminal block numbers and wire identification.
      c. Power and control wiring diagrams showing internal and customer connections. Include terminal block numbers.
      d. Dimensions, size, and locations of connections to other work.
      e. Details of attachment and support in channel.

f. Gear output torque and rake weight lifting capacity calculations.

g. See Section 26 20 00, Low-Voltage AC Induction Motors, for motor submittal requirements.

h. Shop painting systems, including manufacturer's descriptive technical catalog literature and specifications.

i. External utility requirements for air, water, power, drain for each component.

j. Drawings of equipment enclosures designed and stamped by professional structural engineer.

k. Submit anchorage and bracing drawings and catalog information, as required by Section 01 88 15, Anchorage and Bracing.

l. Recommended detailed Control Loop Descriptions of system components for incorporation in Plant Control System.

m. Test procedures.

n. Test results, reports, and certifications.

B. Informational Submittals:

1. Statements of Qualification: Professional structural engineer.
2. Submit anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
3. Manufacturer's Certificate of Compliance of factory-applied coating system.
4. Manufacturer's installation instructions.
5. Special shipping, storage and protection, and handling instructions.
6. Written factory test report of inspection.
7. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.
8. Operation and Maintenance Data: As specified in Section 01 78 23, Operation, Maintenance, and Asset Data, including routine maintenance requirements prior to plant startup.

PART 2 PRODUCTS

2.01 GENERAL

A. A single Supplier shall be responsible for supplying the influent screen system, complete with all accessories and appurtenances.

2.02 MANUFACTURERS

A. Manufacturers:

1. Huber Technologies.
2. Kusters Water.
3. Enviro-Care.
4. "Or-equal."

2.03 SERVICE CONDITIONS

A. Material Handled:
   1. Raw sewage from a municipal collection system containing large debris and fibrous material including but not limited to rocks, wood, hair, sand, silt, plastics, and fats, oils and grease. There is no upstream screening ahead of this influent screening system.
   2. Exposure: Variable concentrations of hydrogen sulfide.

B. Location:
   1. Influent Screens: Outdoors.
   2. Screenings Compactors: Outdoors, under canopy.
   3. See Drawing G-111-01, Material Selection Table, for area classification.

C. Temperature Range: 34 degrees F to 104 degrees F.

D. Raw Sewage Flow Rate:
   1. Startup Average Flow: 114 mgd (two screens in service).
   2. Design Year Average Flow: 142 mgd (two screens in service).
   3. Design Year Dry Weather Peak Hour Flow: 209 mgd (two screens in service).
   4. Design Year Extreme Wet Weather Peak Hour Flow: 260 mgd (three screens in service).

2.04 MULTIPLE RAKE BAR SCREENS (INFLUENT SCREENS, 14SCR9508-01, 14SCR9508-02, AND 14SCR9508-03)

A. The influent screens furnished shall positively clean and remove debris from the incoming wastewater by means of a bar rack installed in a concrete channel. The bar rack shall be cleaned by multiple rakes engaging the upstream side of the bar rack from the bottom of the channel and elevating the debris and discharging it to the downstream side into a screenings sluice trough. The influent screens shall be designed for variable speed operation such that under low flow and low loading (low differential) the screen cleaning system operates at approximately 50 percent of full speed, and as differential increases to a maximum headloss, the screening cleaning system operates at 100 percent of full speed.

B. Design and Service Conditions:
   1. Bar Spacing: 3/8-inch between individual bars at their widest point.
   2. Bar Screen Inclination Angle: 80 degrees from horizontal, maximum.
   3. Flow Rate Per Screen:
      a. Rated Capacity: 105 mgd with less than 12 inches head loss with flow passage area 35 percent blocked and downstream channel liquid depth of 10.5 feet.
      b. Minimum: 30 mgd and downstream liquid depth of 7 feet.

4. Raw Sewage Channels:
   a. See Drawings.
   b. Width: 72 inches.
   c. Invert Elevation (bottom of channel): EL -8.0.
   d. Operating Deck Elevation (top of channel): EL 13.0.
   e. Discharge Elevation: EL 20.0 (to be verified with sluice elevation).
5. Discharge to mate with screenings handling system components. Minimum angle of inclination for screenings discharge plates or chutes to screenings sluice shall be 60 degrees above horizontal.
6. Downstream Water: Varies between EL -1.0 at minimum flow, to EL 2.5 at maximum flow.
7. Maximum upstream head on fully blinded screens: 19 feet

This requirement is currently excluded from the GMP Cost Estimate. Huber Cost increase is approximately $150K for this item.

~~6.~~8. Minimum Screen Lift Capacity:
   a. Minimum: 300 cubic feet of wet screenings per hour, per screen.
   ~~b. Based on estimated loading per rake. To be verified by manufacturer.~~

~~7.~~9. Raking Mechanism (to be verified):
   a. Rake Engagement Frequency at Normal Speed~~Spacing~~: 30 seconds ~~4 feet to 6 feet.~~
   b. Rake Engagement Frequency at High Speed: 5 seconds ~~6 feet to 12 feet per minute.~~
   ~~b.~~c. Minimum number of rakes: 24

C. Each multiple rake bar screen assembly shall consist of the following components:
   1. Frame.
   2. Screen field.
   3. Dead plate.
   4. Rake mechanism having multiple rakes, and as an option, scrapers are allowed.
   5. Discharge chute.
   6. Chain sprockets and roller chain, and as an alternate, a link system may be used.
   7. Drive unit.
   8. Accessories.

D. Frame:
   1. Screen frame and support beams shall be constructed of Type 316L stainless steel formed to a channel having a minimum thickness of 0.16 inch.

2. The frame shall consist of four bolted sections and be sufficiently braced and stiffened to ensure a rigid assembly. Bolted connections shall utilize Type 316 stainless steel fasteners.
3. The frame shall form a rolled trough at its bottom. Bottom trough shall be Type 3164L stainless steel, having a minimum thickness of 0.16 inch.
4. The frame shall have support beams having a minimum thickness of 0.16 inch.
5. Provide and install 1/2-inch thick neoprene flaps to seal the screen to the channel walls. Neoprene flaps shall be bolted to the frame using Type 316 stainless steel fasteners on 6-inch centers.
6. Each frame section shall be provided with a total of four lifting lugs constructed of Type 316L stainless steel welded to the upper end of the frame sections. Each lifting lug shall be sized and anchored to handle 200 percent of the dead weight of the equipment.

E. Screen Field:

1. The screen field shall be structurally sound, robust and capable of withstanding all forces involved in the operation in a sewer system, including screen field blinding resulting in a differential head of 10 feet of water and a force equivalent to a 200-pound object traveling at rate of 3 feet per second.
2. The framework of the screen field shall be constructed of Type 316L stainless steel having a minimum thickness of 4 mm and be sufficiently braced and stiffened to form a rigid structure.
3. Bars shall be affixed to the screen field framework which is bolted to the frame of the screen using Type 316 stainless steel fasteners. Screen field, including individual bars shall have the capability to be field replaceable.
4. Bars shall be constructed of Type 316 stainless steel having either a trapezoidal cross-section or tear drop section. The orientation of the bars shall minimize the potential for screening materials wedging between the bars.
5. Bars shall be bolted to a dead plate that extends to the point of screenings discharge. Bars shall extend a minimum of 12 inches above maximum water level.
6. Bars shall be designed to be replaceable in groups that match the rake tine sections.
7. Bars shall be capable of being replaced with ¼-inch spacing arrangement

F. Dead Plate:

1. The dead plate shall be constructed of 0.12-inch minimum thickness Type 316L stainless steel.
2. The dead plate shall extend from the top of screen field to the point of screenings discharge.

3. The dead plate shall be flat and true such that a close clearance between the rake tines and the plate can be maintained during normal operation as the rakes proceed to the discharge chute.
4. The dead plate shall be supported and stiffened on the downstream side.

G. Rake Mechanism:

1. The rake mechanism shall consist of multiple rakes affixed to the roller chain whose spacing meets the specified cleaning interval.
2. Rakes (not tines) shall be interchangeable between 1/4-inch and 3/8-inch bar screens.

~~1.~~3. Rakes shall be designed to lift screenings collected on the bar screen and in the openings between the bars the entire length of the screen to the discharge point. To ensure screenings removal, the rakes must project a minimum of 1/2-inch into the bar spacing.

~~2.~~4. Each rake shall be designed such that screenings will not wrap around the rake tines and will not fall back into the sewage flow during the screening cycle.

~~3.~~5. Rakes shall include rake bars made of channel profile. Rake blades 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 a minimum of ~~several~~ six pieces with raking tines ~~teeth~~ such that only one portion of the rake blades ~~of the pieces~~ needs to be replaced in case that a tine ~~tooth~~ should be damaged.

~~4.~~6. The rake tines shall penetrate into the screen field sufficiently to ensure that screenings are completely removed during each cleaning cycle.

~~5.~~7. The rakes shall operate in guides on each side of screen frame to ensure engagement and to clean the bars from the upstream side of the screen.

~~6.~~8. Engagement of the rake tines into the bar spacings shall be by mechanical means. Engagement of the rake tines into the bar spacings by the dead weight of the rake or chain mechanism will not be acceptable.

~~7.~~9. During each cleaning cycle, the rake tines shall engage the bottom of the screen field at the channel invert.

H. Scraper:

1. Screenings transported to the top of the screen shall be discharged positively by means of a scraper to the discharge chute.
2. The scraper shall be constructed of Type 304L stainless steel and be designed to pivot to allow efficient cleaning of each rake on each cleaning cycle and cushioned during travel to the rest position.
3. The scraper blade shall be fabricated from high density polyethylene material and be replaceable in the field.

I. Discharge Chute:

1. Each discharge chute shall form a leak-free full enclosure that shall be constructed of 0.12-inch thick minimum Type 316L stainless steel bolted to the frame.
2. Each chute shall be oriented to deposit screenings directly into the sluice trough.
3. Each discharge chute shall attach to the screen frame by way of a flanged connection and gasket to prevent leakage.

J. Chain Sprockets and Guides:
1. The rake and chain assembly shall consist of multiple rakes attached to the roller links of the roller chain. The roller chain shall engage onto adjustable upper sprockets and fixed lower sprockets on each side of the screen.
2. The upper and lower sprockets shall be made of solid stainless steel with a minimum thickness of 27 mm. The sprockets shall be of the pitch and width to match the roller chain and shall have a stainless steel hub and sprocket teeth. The tooth width on the sprockets shall be a minimum of 27 mm.
3. The upper sprockets shall be key mounted onto a drive shaft.
    a. A chain guide shall be securely fixed to the screen side frames for the full height of travel, shall not protrude into the flow, and shall be of Type 316 stainless steel. The guides assure proper meshing between the rake tines and the bar rack, and proper clearance between the rake tines and the dead plate. Replaceable wear strips on chain guides located below the water level shall not be allowed. The chain guides shall be bolted to the side frame so they can be easily replaced.

K. Chains:
1. Each mechanically cleaned screen shall be provided with two continuous loops, one on each side of the screen.
2. Roller type chains shall be made of hardened 400 series stainless steel of high tensile strength and resistance to corrosion. Chain pins shall be constructed of stainless steel and hardened to Rockwell 26 HRC.
3. Each chain shall be provided with an L-profile, Type 316 stainless steel chain guide securely fixed to the side members of the screen frame for the full length of travel. Thickness of chain guide shall be 4 mm minimum.
4. Location of chain guide shall minimize obstruction to flow.

L. Shafting and Bearings:
1. The drive shaft shall be made of solid stainless steel, fitted with a shear pin device with bronze bushing, or auto reverse feature, to provide full protection of the drive unit. Keyways with fitted keys will be provided where necessary. The drive shaft shall be equipped with an adjustable screw type take-up providing for a 4 inch adjustment of the screen chains. The take up screw shall be made of 18-8 stainless steel. The lower sprockets shall

rotate on a stainless steel stub shaft attached to the frame. Lower sprockets and bearing shall be replaceable without removing the screen from the channel.

2. 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. Sealed self-lubricating upper bearings may be utilized. Self-lubricating bearings shall meet the same criteria as that for lower bearings, described below.
3. Lower bearings shall consist of a life sealed bushing system. The system shall consist of a stainless steel stub shaft supporting a ceramic collar. The ceramic collar will interface with a high lubricity, low friction composite bushing surface to ensure zero metal to metal contact. This composite bushing shall be designed for extreme wear life in highly abrasive, high impact environments. Lower bushings that require any maintenance, or have metal to metal wear shall not be accepted.

M. Drive Unit:

1. The drive assembly shall be complete with an adjustable mounting frame, motor, and gear reducer.
2. Each motor shall be sized based on the requirements of the driven loads with consideration given to all drive train components. Comply with Section 26 20 00, Low-Voltage AC Induction Motors.
3. Motor: See Supplement at End of Section.
4. The motor shall be capable of starting under full operational loading conditions (i.e., all rakes have a full design load of screenings in place at startup).
5. Motor shall be of a size and type to be compatible with the drive service required. Torque and heat dissipation shall be sufficient for continuous operation.

N. Equipment Enclosure:

1. Influent Screens shall be provided with covers above the operating deck of the channels to contain odors. Covers shall be removable for ease of maintenance, and individual sections shall not weigh more than 40 pounds.
2. Covers shall be constructed of minimum 20-gauge Type 316L stainless steel. Each panel shall be provided with two handles for panel removal/replacement. All handles and latches shall be Type 316 stainless steel.
3. Provide cover system with 6-inch nozzle to allow fresh air into the screen. Coordinate requirements with Odor Control engineer.

2.05 SCREENINGS FLUME

A. The screenings flume, or sluice, shall be designed to collect and convey debris received from the three bar screens to the washer compactors. The sluice shall

be designed to direct the conveyed screenings into two of four washer-compactors. A general configuration is shown on Drawings.

B. Design Summary:

1. Overall Length: Approximately 74 feet. See Contract Drawings.
2. Maximum Flume Slope: 1 percent.
3. Minimum Flume Slope: 0.5 percent.
4. Maximum Flume Flow: 200 gallons per minute (gpm), maximum.

C. Design and provide the screenings flume, which includes the sluice trough, covers, supports, diversion gates/valves, and flanged nozzles as described below.

D. Sluice Trough:

1. The sluice trough shall be smooth and provide no location for materials to collect while being conveyed. The trough shall be designed to carry the entire flume flow.
2. The sluice trough shall be U-shaped and constructed of 10-gauge thick Type 316L stainless steel with minimum 12-inch width and minimum 24-inch depth.
3. Trough shall be fabricated in a minimum of two sections for field assembly. Provide flanged and fully gasketed joints between sections. Trough system shall not leak.
4. At the upstream end of the sluice trough, provide bolted headplate with 2-inch NPT nozzle for connection of sluice water piping. The bolted head plate shall be removable with standard tools for the purpose of removing screenings from the upper end of the sluice. The smooth sluice interior shall extend to the headplate so that there are no obstructions to screenings in the reverse direction.
5. At the screenings compactors, provide four 12-inch diameter side-outlet flanged nozzles for connection of screenings compactor isolation gates and piping to screenings compactors. In addition, provide one isolation gate in the main sluiceway which isolates two upstream screenings compactors from two downstream screenings compactors. See Drawings for general configuration. Invert of nozzles shall be flush with invert of sluice trough to maintain a smooth flow line and not provide location for debris to collect.
6. Provide 6-inch diameter flanged overflow nozzle in location as shown on Drawings. Nozzle invert shall be approximately 16 inches above bottom of sluice trough. Other means of controlled single-point sluice overflow will be considered as recommended by system supplier.

E. Sluice Pipe: Provide 12-inch diameter Type 316 stainless steel piping between the sluice trough isolation gate valves and the screenings compactors.

F. Sluice Supports:

1. The sluice shall be furnished with supports suitable for mounting the sluice by the manufacturer's design. The supports shall be manufactured from 10-gauge (minimum) Type 316L stainless steel.
2. The sluice trough supports shall be designed to support the trough while completely full of water.

G. Sluice Covers:
1. The top of the sluice trough shall be furnished with removable cover panels. The cover panels shall have a minimum thickness of 20-gauge and be constructed of Type 316L stainless steel.
2. Removable covers shall be 4 feet in length (maximum) to facilitate ease of removal.
3. At upstream end of sluice system, provide cover with 3-inch diameter flanged connection for mounting of high level switch by others. See Drawings for location.
4. At location shown on Drawings, provide cover with a 6-inch diameter flanged connection for Foul Air duct.

H. Isolation Valves and Gate:
1. Screenings Compactor Isolation:
a. Provide four electrically actuated 12-inch diameter stainless steel knife gate valves to isolate the four washer compactors from the flume. Knife gate valves shall meet the requirements of Section 40 27 02, Process Valves and Operators, and generally be a flanged valve type for bolted connection to the sluice and screenings conveyance pipe.
b. Electric actuator shall be 480-volt, Open-Close (O/C) type and meet the requirements of Section 40 27 02, Process Valves and Operators.
2. Screenings Flume Isolation:
a. Provide one electrically actuated gate in flume to isolate upstream and downstream pairs of washer-compactors. Gate shall be the same width and depth of the flume, and meet the requirements of Section 40 27 02, Process Valves and Operators, and generally be a flanged type for bolted connection to the sluice and screenings conveyance pipe.
b. Electric actuator shall be 480-volt, Open-Close (O/C) type and meet the requirements of Section 40 27 02, Process Valves and Operators.

2.06 SCREENINGS COMPACTOR (14SCP9521-01, 14SCP9521-02, 14SCP9521-03, AND 14SCP9521-04)

A. General: The washer-compactor shall be a self-contained, hopper fed system used to wash and compact and dewater screenings that have been captured by a

bar screen system. Screenings shall be directly conveyed to the washer compactor unit and fed into the system via a sluice and sluice water.

B. Design Summary (per Unit):
   1. Receive screenings from the screenings flume.
   2. Screenings Volume: 80 to 300 cubic feet per hour.
   3. Wet Screenings Density: 60 pounds/cubic foot.
   4. Hydraulic Capacity: 200 gpm, minimum.
   5. Process Performance:
      a. Achieve a minimum of 50 percent reduction in volume.
      b. Achieve a minimum of 30 percent reduction in weight.
      c. Produce dewatered screenings capable of passing the EPA Paint Filter Test per Method 9095 of EPA Publication SW-486.
   6. Available Supplemental Water:
      a. Flow: 20 gpm ~~(to be verified)~~.
      b. Pressure: 50 psi.

C. Provide shafted screw-type screenings compactors in the arrangement shown on Drawings to wash, dewater, and compact screenings and discharge them to dumpster. Each screenings compactor shall consist of an inlet hopper, a screenings compactor with drive unit, spray system, discharge piping, and drain pans.

D. Screenings Compactor Inlet Hopper:
   1. Provide inlet hoppers mounted on top of screenings compactors designed to direct screenings material from the screenings flume to the screw housing.
   2. Hopper shall be 12-gauge (0.105-inch) thick, Type 316L stainless steel.
   3. Inlet hopper connections, and hinged, latchable hatch shall be as shown on Drawings. Dimensions of the inlet hopper are the responsibility of the manufacturer. Piping sizes, layout, and connection configuration for the sluice are shown on Drawings for general configuration, and are manufacturer provided.

E. Screenings Compactor:
   1. The barrel of the screenings compactor shall be fabricated of Type 316L stainless steel, and come equipped with an underdrain pan which runs the length of the barrel. The drive end of the compactor barrel shall be fitted with a flange to accept the flange of the thrust bearing through a bolted attachment. The discharge end shall be fitted with a flange for connection of the discharge pipe.
   2. The lower portion of the barrel shall contain a 1/2-inch thick wedge wire or perforated drain pan. The openings shall be 5~~3~~ mm ~~or smaller~~. Minimum 4-inch drainage piping shall allow for drainage of the discharged liquid.

3. The underdrain pan and cover over the dewatering zone and drainage pipe shall be removable to allow full access for cleaning and maintenance.
4. The shafted screw shall be 12 inches in diameter, minimum. A nylon brush shall be mounted on the screw to ensure the drain pan remains clear.

F. Discharge Piping:
1. The discharge piping shall convey washed and dewatered screenings from the compactor to the dumpster for offsite removal.
2. The discharge piping shall be constructed of 11-gauge, Type 316L stainless steel pipe. The discharge pipe shall include a flanged long-radius elbow connected to the washer-compactor, and a section of straight discharge pipe with a flared (increasing) diameter to convey material to dumpster.
3. Configure discharge piping according to the general arrangement shown on Drawings.

G. Washwater Distribution System:
1. Provide each screenings compactor with a washwater distribution system.
2. The washwater distribution system will be supplied with chlorinated treatment plant effluent through a single point of connection. The water source will have an Open-Closed motorized valve, supplied and controlled by others, to control the flow of washwater to the screenings compactor when compactor is operating.
3. The screenings compactor shall be provided with a washwater distribution manifold to distribute water to three zones. The water shall assist in cleaning the screenings of organic material, and prevent plugging of dewatering area and underdrain pan.
4. The flow of water to each of the three zones shall be controlled by a manually-throttled stainless steel ball valve to allow for balancing of water distribution. Provide valves in accordance with Section 40 27 02, Process Valves and Operators, Type V306.

H. Drive Unit:
1. The screenings compactors shall be driven by a shaft mounted, helical bevel gear reducer. The gear reducer shall meet the requirements of AGMA 6010-E88, rating Class II. All components of the motor and drive unit system shall be rated for continuous duty capable of 30 start-stop cycles per hour and continuous operation for a minimum of 24-hours.
2. Motor information specified herein must be coordinated with Section 26 20 00, Low-Voltage AC Induction Motors.
3. Motor: See Supplement at End of Section.

2.07 APPURTENANCES

A. Nuts, bolts, and other fasteners, as listed in the Area Classification Table on Drawings.

B. Furnish lifting lugs for equipment assemblies and components weighing over 100 pounds.

C. Equipment Identification Plates: 16-gauge, Type 304 stainless steel securely mounted to equipment in readily visible location. Plate shall bear 1/4-inch-high die-stamped block type black enamel filled equipment identification name and number.

D. Anchor Bolts: For anchor bolt and post-installed concrete and masonry anchor requirements, refer to Section 05 05 19, Anchor Bolts.

2.08 FABRICATION

A. Welded Construction: As specified in Section 05 05 23, Welding.

2.09 FINISHES

A. For nonstainless steel and nonaluminum metal surfaces, prepare, and prime, and finish coat in accordance with Section 09 90 00, Painting and Coating.

B. Stainless steel shall be cleaned and passivated following fabrication in accordance with ASTM A380.

2.10 INSTRUMENTATION AND CONTROLS

A. Local control stations will be provided by the Electrical Subcontractor. Operation of the equipment will be automatically controlled from the Plant Automation System provided by others, or manually through the local control stations. See P&ID drawings.

B. Provide a detailed description of the recommended manual and automatic controls and sequence of operations for the screens and screenings compactors, including equipment shutdowns.

2.11 SOURCE QUALITY CONTROL

A. Factory Tests and Adjustments:
   1. Test each screen assembly, in its operating position, to ensure meshing of rake and bar rack, and operation of protective devices and override controls.
   2. Run equipment and test for minimum of 6 hours. Testing shall be done in factory with unit oriented in its installed position.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with manufacturer's written instructions.

B. Anchor Bolts: Accurately place using templates furnished by equipment manufacturer and as specified in Section 05 05 19, Anchor Bolts.

3.02 FIELD FINISHING

A. Touchup damaged areas of painted ferrous metal in accordance with and as specified in Section 09 90 00, Painting and Coating, and as follows:
   1. All nonstainless steel and nonaluminum metal surfaces above the operating floor level should be painted in accordance with System No. 5, Exposed Metal.
   2. All nonstainless steel and nonaluminum metal surfaces below the operating floor level should be painted in accordance with System No. 2, Submerged Metal.

3.03 FIELD QUALITY CONTROL

A. ~~Component~~ Functional Test:
   1. Conduct on each influent screen assembly and each ~~washer/~~screenings compactor.
   2. Verification of equipment alignment.
   3. Verification that all internal protective functions are operational.
   4. Verification that connections between the influent screen discharge chute and sluice trough allow proper discharge into the sluice trough.
   5. The equipment shall be installed and tested under the direction of factory employed service technician.

B. Manufacturer's recommendations for prestart preparation and preoperational checkout procedures

~~B.~~C. Performance Test:
   1. Demonstrate that the influent screening systems, complete, can meet~~are capable of meeting~~ the performance requirements. All installed screens, screenings flume and ~~washer/~~screenings compactors shall be tested.
   2. Influent Screen:
      a. Demonstrate influent screens convey maximum Hydraulic Capacity at headloss specified.
      b. Demonstrate influent screen side seals function properly at maximum possible differential water level. This test will require 100 percent blockage of the bar screens to accumulate enough water on upstream side of screen, as shown on the design criteria.
      c. Demonstrate that a screen can carry the maximum volume of screenings either through a shop test or field test approved by the Contractor. The screenings shall be introduced to upstream of the screen.

3. Screenings Flume: Demonstrate that the flume meets the operational and performance requirements.
4. ~~Washer/~~Screenings Compactors: Demonstrate that the ~~washer/~~screenings compactors produce dewatered and compacted screenings meeting performance requirements.~~ with a test approved by the Contractor.~~ Suggested t~~T~~esting procedures are shown in Supplement 3 to this section. This testing procedure should be agreed upon by the Design Builder, ~~vendor/~~manufacturer and the City.

3.04 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:
   1. Present at Site or classroom designated by Jacobs, for minimum person-days listed below, travel time excluded:
      a. 5 person-days for installation assistance and inspection.
      b. 5 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
      c. 3 person-days for facility startup.
      d. 2 person-days for post-startup training of Owner's personnel. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Owner.

B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

3.05 SUPPLEMENTS

A. The supplements listed below, following "End of Section," are a part of this Specification.
   1. Influent Screen 1, 2 and 3 Induction Motor Data Sheet.
   2. Screenings Compactor 1 through 4 Induction Motor Data Sheet.
   ~~2.~~3. Screenings Compactor ~~Equipment~~ Performance Testing Procedures

END OF SECTION

INFLUENT SCREEN NO. 1, 2 AND 3
INDUCTION MOTOR DATA SHEET

Project: San José Headworks Project

Owner: San José-Santa Clara Regional Wastewater Facility

Equipment Name: Influent Screens Nos. 1 - 3

Equipment Tag Number(s): 14SCR9508-01, 14 SCR9508-02, 14 SCR9508-03

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 5 hp

Voltage: 480-V

Phase: 3-phase

Frequency: 60 Hz

Synchronous Speed: 1800 rpm

☐ Thermal Protection: _____

☐ Space Heater: ____ volts, single-phase

Guaranteed Minimum Efficiency at Full Load: ____ percent

Guaranteed Minimum Power Factor at Full Load: ____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

☐ Multispeed, Two-Speed: ____ / ____ rpm

Winding: ☐ One ☐ Two

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up ____ Down ____

☒ Adjustable Speed Drive: See Section 26 29 23, Low-Voltage Variable Frequency Drive System.

Operating Speed Range: 33 to 100 % of Rated Speed

☐ Variable Torque

☐ Constant Torque

Additional Motor Requirements: ☒ See Section 26 20 00, Low-Voltage AC Induction Motors.

Special Features:

SCREENINGS COMPACTOR NO. 1 THROUGH 4
INDUCTION MOTOR DATA SHEET

Project: San José Headworks Project

Owner: San José-Santa Clara Regional Wastewater Facility

Equipment Name: Screenings Compactor No. 1 - 4

Equipment Tag Number(s): 14SCP9521-01, 14 SCP9521-02, 14SCP9521-03, 14SCP9521-04

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 7.5 HP

Voltage: 480-V

Phase: 3-phase

Frequency: 60 Hz

Synchronous Speed: 1800 rpm

☐ Thermal Protection: _____

☐ Space Heater: ____ volts, single-phase

Guaranteed Minimum Efficiency at Full Load: ____ percent

Guaranteed Minimum Power Factor at Full Load: ____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

☐ Multispeed, Two-Speed: ____ / ____ rpm

Winding: ☐ One ☐ Two

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up ____ Down ____

☐ Adjustable Speed Drive: See Section 26 29 23, Low-Voltage Variable Frequency Drive System.

Operating Speed Range: ____ to ____% of Rated Speed

☐ Variable Torque

☐ Constant Torque

Additional Motor Requirements: ☒ See Section 26 20 00, Low-Voltage AC Induction Motors.

Special Features: _____

SECTION 44 42 30
SUPPLEMENT 3

SCREENINGS COMPACTOR ~~EQUIPMENT~~ PERFORMANCE TESTING PROCEDURES

3.01 METHODOLOGY

~~Turn off the screenings compactor to be used as the test unit, close the inlet gate and allow the inlet hopper and drainage area to empty.~~

~~Collect unwashed screenings in the sluice, or in a separate container or tote.~~

~~Determine the mass volume and mass discharge rate from the screens. Analyze samples of the raw feed screenings from the material accumulated in the tote for TSS and COD by the procedure shown below.~~

~~When the screenings compactor inlet hopper and drainage area is empty, switch on the screenings compactor and begin discharging screenings from the distribution sluice to the unit. Allow the raw screenings to be processed through the screenings compactor drain and inlet hopper.~~

~~Record the time for the screenings to be discharged into the unit, as well as the amount of water used to fill the hopper. Do not let the hopper overflow.~~

~~Allow the screenings compactor to run through its normal operating sequence.~~

~~When the screenings compactor is operating, and until there are no more raw feed screenings left in the unit, capture the dewatered, washed screenings discharged from the end of the sluice at the point they drop off into the container. It may take several on/off cycles in to get a representative amount of discharge from the end of the sluice.~~

~~Make a volume measurement of the inlet feed hopper and drainage area (represents volume of raw screenings processed) and measure the volume of screenings displaced from the screenings compactor discharge.~~

~~Take representative samples of raw feed screenings and dewatered washed screenings for COD and TSS testing as follows:~~

~~The samples are to be a minimum of 1 liter.~~

~~The solids should be removed and placed in a separate clean jar, to which 1 liter of clean water is added.~~

~~Stir the contents of the jar thoroughly for a minimum 2 minutes.~~

~~Screen the jar contents over a 16 mesh sieve and collect the liquid phase (material that goes thru the sieve) in a clean jar.~~

~~Perform the analysis for COD and TSS on the respective samples using Standard Methods.~~

1. ~~Volume reduction shall be calculated based on the rate of volume of raw screenings discharged from the screenings compactor multiplied by the time screenings were discharged in the unit and the volume of the dewatered, washed screenings discharged and captured off the end of the sluice.~~

A. Collect unwashed raw screenings in the sluice, or in a separate container or tote for a fixed period of time. Measure volume and mass of screenings collected. Calculate the volume and mass rate from the influent screens.

B. Resume normal operation. Allow the influent screens and screenings compactor to resume normal operating sequence.

C. With compactor discharge tube full, start test for duration to be determined (approximately 1 to 4 hours).

D. Collect washed and compacted screenings from compactor. Measure volume and mass of compacted screenings.

E. Reduction shall be calculated based on the rate of volume and mass of raw screenings produced from the influent screens multiplied by the duration of the test, compared to the volume and mass of the washed and compacted screenings discharged from the compactor.

F. In addition to performance testing described above, collect samples of raw screenings and screenings product for Owner's quality testing.

1. These samples and test results are for Owner's information, and not used for performance evaluation.
2. Owner will collect samples and test for COD and TSS as follows:
    a. Sample size: Minimum 1 liter.
    b. Remove solids from sample and place in separate clean jar and add 1 liter of clean water.
    c. Stir contents of jar with solids for minimum 2 minutes.
    d. Screen jar contents over a 16-mesh sieve and collect the liquid phase (material that passes through the sieve) in a clean jar.
    ~~a.~~e. Perform analysis for COD and TSS on the samples using Standard Methods.

SECTION 44 42 40
GRIT BASIN EQUIPMENT

EQUIPMENT AND COMPONENT NUMBER(S)

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. Hydraulic Institute Standards (HIS).

1.02 RELATED SECTIONS

A. Related sections include the following.
   1. Division 01, General Requirements.
   2. Section 05 05 19, Anchor Bolts.
   3. Section 09 90 00, Painting and Coating.

1.03 WORK INCLUDED

A. The manufacturer shall provide all materials, equipment and incidentals required to furnish, transport, and place into operation the grit basin equipment. The system must be complete and operational with base plates, supports, and accessories as shown on Drawings and specified in this section.

1.04 SYSTEM DESCRIPTION

A. The grit basin equipment shall include six Headcell™ Grit Concentrator units.

B. Each Headcell™ unit shall be placed in a concrete tank and receive the incoming screened flow. Each Headcell™ shall provide sufficient surface area to remove the specified grit particles from the specified peak flow and concentrating the grit in a sump at the bottom of the unit. Effluent from the Headcell™ unit shall be weir discharged as shown on Drawings.

1.05 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings:
      a. Make, model, and weight of each equipment assembly.

b. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction.

c. Detailed structural and mechanical drawings showing the equipment fabrications and interface with other items. Include dimensions, size, and locations of connections to other work, and weights of associated equipment.

d. Certified test data, certified summary table, or calculations indicating conformance with maximum hydraulic loss requirements.

e. Test data or calculations indicating conformance with grit removal performance requirements.

f. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Manufacturer's reference listing of previous installations of similar size.
2. Submit anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
3. Manufacturer's Certificate of Compliance.
4. Component and attachment seismic qualification certificate of compliance as required by Section 01 45 36, Equipment Seismic Certification.
5. Special shipping, storage and protection, and handling instructions.
6. Submit complete instruction for operation and maintenance of grit basin equipment components. Include the following data:
   a. Alignment, adjustment, and repair instructions.
   b. Manufacturer's installation instructions.
   c. Assembly diagrams.
   d. Troubleshooting guide.
   e. Recommended spare parts lists and predicted life of parts subject to wear.
7. Routine maintenance requirements prior to plant startup.
8. Performance test procedures and sample test log.
9. Manufacturer's Certificate of Proper Installation in accordance with Section 01 43 33, Manufacturers' Field Services.
10. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
11. Service records for maintenance performed during construction.

1.06 EXTRA MATERIALS

A. Furnish, tag, and box for shipment and storage the following spare parts and special tools:

Item	Quantity
Special tools required to maintain or dismantle unit	One complete set

1.07 DELIVERY

A. In accordance with Section 01 61 00, Common Product Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer:
   1. Hydro International.
   2. "Or-equal."

2.02 DESIGN AND EQUIPMENT PERFORMANCE

A. General:
   1. The grit basin equipment shall be designed to remove grit from screened wastewater at a municipal wastewater treatment plant.
   2. The grit basin equipment shall be installed in six grit concentrators (grit basins).
   3. The system shall be designed to handle a total peak flow of 260 mgd in six basins.

B. Grit Concentrators:
   1. Each grit concentrator unit shall be designed to hydraulically pass a peak flow of 46 mgd with a head loss of no more than 12 inches.
   2. Each grit concentrator unit shall remove minimum 95 percent of all grit equal to and larger than 212 micron (specific gravity 2.65) in size at flows equal to 46 mgd.
   3. At future average flow rate of 28 mgd per grit basin, each grit concentrator unit shall remove minimum 95 percent of all grit equal to and larger than 125 micron (specific gravity 2.65) in size.
   4. Each grit concentrator shall be all-hydraulic consisting of self-cleaning corrosion-resistant, nonmetallic trays with no moving parts within the unit.

2.03 MATERIALS AND CONSTRUCTION

A. Grit Concentrators:

1. Six grit concentrator units shall be supplied.
2. Each grit concentrator unit shall consist of a stack of twelve 12-foot diameter nested conical trays with no less than 1,356 square feet of total settling surface area.
3. Each grit concentrator tray shall be fabricated from UV-stabilized, corrosion resistant, nonmetallic materials. Material thickness shall be a minimum 1/4-inch thick.
4. All flow passages shall be self-cleaning and free of sharp projections or fittings that may snag stringy or fibrous materials.
5. The stack of trays shall securely fit into a Type 316L stainless steel support frame designed and supplied by the manufacturer. The support frame shall fit and be bolted to the bottom of the concrete tank and include all vertical supports and necessary hardware.
6. Each grit concentrator shall be provided with an underflow sump insert at bottom of the concentrator. The insert shall be Type 316 stainless steel. The underflow insert shall be provided with a 6-inch flanged connection for connection of grit removal piping. The underflow insert shall also have a 1-inch pipe stub for connection of fluidizing and flushing water.

2.04 ACCESSORIES

A. Lifting Lugs: Provide suitably attached for equipment assemblies and components weighing over 100 pounds.

B. Anchor Bolts: For anchor bolt and post-installed concrete and masonry anchor requirements, refer to Section 05 05 19, Anchor Bolts.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with manufacturer's written instructions.

3.02 FIELD QUALITY CONTROL

A. Functional Tests: Conduct on each unit.

1. Alignment: Prior to facility startup, test complete assemblies for correct rotation, proper alignment and connection.
2. Operate for a continuous 3-hour period without malfunction.

B. Performance Test: Conduct on ~~each~~ one unit.

1. Perform ~~during process commissioning and stabilization period~~ with ~~wastewater~~clean water and test sand as described below.

~~2. Test for a continuous 8-hour period without malfunction.~~

~~3.~~2. Manufacturer to lead performance test. ~~Perform with Jacobs' Engineer present.~~

~~4. Test Log: Upon completion of test, record information listed on sample test log.~~

3. ~~Adjust, realign, or modify units and retest if necessary.~~Test Procedure

a. General: Measure grit basin capture efficiency at Future Average flow conditions to demonstrate minimum 95% removal of all particles equal to and larger than 125 micron (specific gravity 2.65) in size at 28 mgd per grit basin using clean water and seed sand. To conform to standard sieve sizes, demonstrate removal based on 106 micron (specific gravity 2.65) and larger at 23 mgd per grit basin.

b. Manufacturer shall provide a detailed sampling and testing plan generally following this procedure, modified as required, and approved by Contractor.

c. Test equipment shall capture particles 50 microns (specific gravity 2.65) and larger.

d. Seed Sand: Granusil Mineral Fillers, Gradation 5010, or equal.

e. Test for minimum 4 hours. Add seed sand at rate of 250 lbs/MG (approximately 30 mg/L) to inlet duct of grit basin. At flow rate of 23 mgd this is a total of approximately 1000 pounds of seed sand.

f. Record flow rate and quantity of seed sand added throughout the test period.

g. Collect composite grit basin effluent sample in settling tank. Sampling of the grit basin effluent channel shall be done with sampler that will sample the full depth of flow to capture a representative distribution of the grit being carried by the effluent flow. At end of test interval, allow additional settling time before decanting the water from the tank to obtain the settled solids.

h. The settled solids sample from the grit basin effluent channel shall be tested and evaluated according to Standard Method procedures to determine the mass and gradation of the particles collected.

i. The percent removal of particles 106, 150, 212, and 300 micron shall be determined from the composite effluent sample.

~~a.~~

j. Final report shall include a mass balance calculation of the removal efficiency of the grit removal equipment based on the amounts and size distribution of the seed sand added to the influent and the amounts and size distribution of the particles collected by the effluent sampling system.

C. Functional and Performance Test shall comply with Section 01 91 14, Equipment Testing and Facility Startup.

3.03 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:

1. Present at Site or classroom designated by Jacobs, for minimum person-days listed below, travel time excluded:
   a. 5 person-days for installation assistance and inspection.
   b. 5 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
   c. 3 person-days for facility startup.
   d. 2 person-days for post-startup training of Owner's personnel. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Owner.

B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

END OF SECTION

SECTION 44 42 41
GRIT WASHER/CLASSIFIER SYSTEM

EQUIPMENT AND COMPONENT NUMBER(S)

14GCL9605-01: Grit Washer 1 Stirrer.
14GCL9605-02: Grit Washer 2 Stirrer.
14GCL9605-03: Grit Washer 3 Stirrer.
14GCL9605-04: Grit Washer 4 Stirrer.
14GCL9605-05: Grit Washer 5 Stirrer.
14GCL9605-06: Grit Washer 6 Stirrer.
14GSFR9601-01: Grit Classifier 1 Drive.
14GSFR9601-02: Grit Classifier 2 Drive.
14GSFR9601-03: Grit Classifier 3 Drive.
14GSFR9601-04: Grit Classifier 4 Drive.
14GSFR9601-05: Grit Classifier 5 Drive.
14GSFR9601-06: Grit Classifier 6 Drive.
Other components listed within Section.

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Related sections include the following.
   1. Division 01, General Requirements.
   2. Section 05 05 19, Anchor Bolts.
   3. Section 09 90 00, Painting and Coating.
   4. Section 26 20 00, Low-Voltage AC Induction Motors.
   5. Section 40 27 02, Process Valves and Operators.
   6. Section 40 91 00, Instrumentation Components.
   7. Section 40 99 90, Package Control Systems.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this Section:
   1. American National Standards Institute (ANSI).
   2. American Standards for Testing and Materials (ASTM): A967, Specification for Chemical Passivation Treatments for Stainless Steel Parts.
   3. National Electrical Manufacturers' Association (NEMA): MG 1, Motors and Generators.
   4. UL: 674, Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Grit Processing Capacity per Unit: 1.5 tons per hour.
2. At Design Flow, minimum Capture Rate of the Grit having a Specific Gravity of 2.65 or Greater and size of ~~110~~ 106 micron or Greater: 95 percent.
3. At Design Flow ~~of 400 gpm~~, Maximum Water Content in Washed Grit Product: 15 percent.
4. At Design Flow ~~of 400 gpm~~, Maximum Volatile Solids Content in Grit Product: 5 percent.

B. Service Conditions:

1. Installation:
   a. Location: Outdoors, uncovered.
   b. Temperature: 34 degrees F to 104 degrees F.
   c. See Drawing G-111-01, Material Selection Table, for Area Classification.
2. Design Flow: Grit Slurry Flow from the Underflow of the Grit Basins, ~~400~~ 300 gpm per unit.
~~2.~~3. Hydraulic Capacity: Grit Slurry Flow from the underflow of the Grit Basins, 400 gpm per unit.
~~3.~~4. Inlet Pressure: Less than 2 psig.
~~4.~~5. Feed Slurry Concentration Range: 0.5 percent to 1.5 percent.

1.04 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Make, model, weight, and horsepower of each equipment assembly.
   b. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction.
   c. Detailed structural, mechanical, and electrical drawings showing the equipment fabrications and interface with other items. Include dimensions, size, and locations of connections to other work, and weights of associated equipment.
   d. External utility requirements such as air, water, power, drain, etc., for each component including pressure and flow rate.
   e. Motor information as required in Section 26 20 00, Low-Voltage AC Induction Motors.
   f. Power and control wiring diagrams, including terminal labeling and numbers. Include indication of internal versus customer connections.

g. See Section 40 99 90, Package Control Systems, for additional submittal requirements.

h. Recommended detailed Control Loop Descriptions of system components for incorporation in Plant Control System.

i. Shop painting systems, including manufacturer's descriptive technical catalog literature and specifications.

j. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

2. Operation and Maintenance Data: As specified in Section 01 78 23, Operation, Maintenance, and Asset Data.

B. Informational Submittals:

1. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Special shipping, storage and protection, and handling instructions.
3. Manufacturer's written/printed installation instructions.
4. Manufacturer's Certificate of Compliance, in accordance with Section 01 43 33, Manufacturers' Field Services.
5. Certification that factory-applied coating system(s) is identical to requirements specified.
6. Routine maintenance requirements prior to plant startup.
7. Field Functional Test Report.
8. Manufacturer's Certificate of Proper Installation in accordance with Section 01 43 33, Manufacturers' Field Services.

1.05 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 01 61 00, Common Product Requirements.

1.06 EXTRA MATERIALS

A. Provide recommended list of spare parts in the Operations and Maintenance Manual, in accordance with Section 01 78 23, Operation, Maintenance, and Asset Data.

B. Furnish, tag, and box for shipment and storage one complete set of special tools if required for maintenance or dismantling.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Materials, equipment, and accessories specified in this Section shall be products of:

1. Huber Technology, Inc; Coanda Grit Washer.
2. Hydro International; Hydro GritCleanse.

2.02 SUPPLEMENTS

A. See supplements to this section for additional product information.

2.03 EQUIPMENT

A. General:
   1. Each complete unit shall include a grit washing mechanism and classification mechanism.
   2. The grit washing mechanism and fluidizing water shall provide grit washing and separation of organic and inorganic particles.
   3. The grit classification mechanism shall consist of a grit dewatering conveyor.
   4. Unit shall include structural frames, mounting brackets, and piping transitions for a complete operational unit.
   5. Number of Units: Six.

B. Materials: Type 316L stainless steel shapes, pipes, and sheets.
   1. After fabrication, equipment shall be passivated (pickled) in accordance with ASTM A967.

2.04 GRIT WASHER

A. General: Designed to maintain necessary velocities, to retain organic matter in suspension, and remove nonorganic, 110 micron particles and larger having a specific gravity of 2.65 or greater at design flow.

B. Washer Tank:
   1. Conical configuration.
   2. Construct tank of 1/4-inch (minimum) Type 316L stainless steel plate, reinforced and mounted on stainless steel supports.
   3. Nozzles:
      a. Connections shall be 125-pound, ANSI flanges.
      b. Grit Slurry Inlet: 8-inch diameter, minimum.
      c. Overflow Outlet: 10-inch diameter, minimum.
      d. Organics Outlet: 4-inch diameter, minimum.
   4. Organics Outlet:
      a. Provide the 4-inch organics outlet connection with an automatically operated electrically-actuated ball valve for removal of organic material out of the tank, controlled by Plant Control System.

b. Provide manufacturer's standard ball valve.

c. Provide valve operators in accordance with Section 40 27 02, Process Valves and Operators.

d. Valve Tag Numbers: 14VLV9604-01, -02, -03, -04, -05, -06.

5. Grit Level Monitoring:

a. Provide a pressure probe mounted in the bottom of the grit settling area to monitor the grit level within the tank.

b. Provide in accordance with Section 40 91 00, Instrumentation Components.

c. Instrument Tag Numbers: 14LIT9606-01. -02, -03, -04, -05, -06.

C. Fluidized Grit Bed:

1. A fluidized grit bed shall be maintained in the bottom portion of the grit washer tank to wash and remove organic material from the non-organic particles.

2. Grit Stirrer:

a. A grit stirrer of manufacturer's standard design shall be provided to maintain grit fluidization.

b. Equipment Tags: 14GCL9605-01, -02, -03, -04, -05, -06.

3. Grit Stirrer Drive Unit:

a. Stirrer Drive Unit shall be manufacturer's standard design.

b. Motor shall comply with Section 26 20 00, Low-Voltage AC Induction Motors.

c. See supplement at end of section.

4. Fluidizing water shall be introduced into the bottom of the grit bed zone to generate additional energy for grit bed suspension. This washwater shall also effectively flush the organic components out of the fluidized bed towards the overflow weir.

a. The washwater supply manifold shall be provided with a variable area flow meter (rotameter) with a transparent PVC casing to allow visual inspection of the internal float for manual flow rate confirmation.

b. Washwater ON-OFF control shall be provided via a 24V dc solenoid valve. Provide valves in accordance with Section 40 27 02, Process Valves and Operators.

c. Equipment Tags:

1) Rotameter: 14FI9608-01, -02, -03, -04, -05, -06.

2) Solenoid Valve: 14VLV9607-01, -02, -03, -04, -05, -06.

D. Classifier Screw and Trough:

1. Equipment Tags: 14GSFR9603-01, -02, -03, -04, -05, -06.

2. Trough: Type 316L stainless steel construction. Minimum 10/64-inch (4-mm) thick.
3. Screw:
   a. Heavy-walled, shafted screw, Type 316L stainless steel construction.
   b. Shaft shall be suspended between bearings at each end. Provide sufficient clearance between screw and trough so that a build-up of sand or grit will provide a bed for the screw, minimizing trough wear.
   c. Type 316L stainless steel flights shall be continuously seal welded to shaft.
   d. Support lower end of screw by bearing housed in watertight enclosure.
      1) Sealed bronze, sleeve type bearing, running completely submerged in oil, requiring only yearly inspection and oil change.
      2) Internal parts of bearing sealed from outside contamination using floating satellite seals.
   e. Drain: Provide a 3-inch diameter drain connection and ball valve at bottom of screw. Provide valves in accordance with Section 40 27 02, Process Valves and Operators, Type V307.
   f. Discharge: Screw shall discharge dewatered grit as shown on Drawings.
4. Grit Classifier Drive Unit:
   a. Provide Classifier Screw Drive assembly per manufacturer's standard design.
   b. Motor shall comply with Section 26 20 00, Low-Voltage AC Induction Motors.
   c. See supplement at end of section.

2.05 APPURTENANCES

A. Lifting Lugs: Provide suitably attached for equipment assemblies and components weighing over 100 pounds.

B. Equipment Identification Plates: Provide 16-gauge Type 316 stainless steel identification plate securely mounted on each separate equipment component and control panel in a readily visible location. Plate shall bear 3/8-inch high engraved block type black enamel filled equipment identification numbers and letters as shown.

C. Anchor Bolts: For anchor bolt and post-installed concrete and masonry anchor requirements, refer to Section 05 05 19, Anchor Bolts.

2.06 CONTROLS

A. Grit washer/classifier system will be controlled and monitored remotely by the plant control system, furnished by others.

B. Provide recommended detailed operation and sequencing of grit washing mechanism, grit classifying screw, organics discharge valve, and other accessories for inclusion in plant control system.

2.07 FACTORY FINISHING

A. For nonstainless steel and nonaluminum metal surfaces, provide factory surface preparation and factory prime coating in accordance with System No. 4 of Section 09 90 00, Painting and Coating.

B. Stainless steel shall be cleaned and passivated following fabrication in accordance with ASTM A380 and A967.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with manufacturer's written instructions.

B. Anchor Bolts: Accurately place using templates furnished by manufacturer and as specified in Section 05 05 19, Anchor Bolts.

3.02 FIELD QUALITY CONTROL

A. Perform in accordance with Section 01 91 14, Equipment Testing and Facility Startup.

B. Functional Test:
   1. Conduct on each unit with potable water (or other suitable water).
   2. Test shall include 6 hours of continuous operation of each piece of equipment specified herein.
   3. Verify continuous operation in proper direction of the Grit Stirrer and Grit Classifier auger.

C. Performance Test:
   1. Conduct ~~on each unit with~~ clean water test and ~~actual~~ wastewater tests as described below.
   2. Testing on wastewater, d~~D~~emonstrate that each unit produces a washed and dewatered grit product meeting the specified Dry Solids and Volatile Solids Content

3. Testing on clean water, d~~D~~emonstrate ~~that each~~on one unit that it achieves the minimum capture as specified.

D. ~~Testing and Startup~~Field Test:

~~This test is to substantiate conformance with the specified performance requirements.~~

1. ~~-~~Submit detailed test~~ing~~ procedures for the City's review and approval. The following methodologies are preliminary, and alternative methodologies may be proposed for review as progresses.
2. The performance test shall be conducted in the presence of the City. ~~by an independent testing laboratory or firm. All costs associated with performance testing, including that of the third-party testing firm shall be borne by the Design-Builder or Manufacturer.~~
3. Clean Water Grit Capture Testing Methodology:
   a. Perform and complete ~~field~~ performance testing of grit pumps prior to commencing grit washer performance testing. Calibrate flowmeters on the discharge of grit pumps prior to commencing grit washer performance testing.
   b. Perform the clean water grit capture test at ~~a grit withdrawal rate of 400 gpm~~design flow rate:
      1) Contractor shall isolate the associated grit basin for the testing and fill it to its normal operating level with utility water.
      2) Add minimum 50 gallons of seed sand (Granusil Mineral Fillers, Gradation 5010) directly into the grit basin ~~just ahead of the~~at grit pump inlet with pump operating.

      ~~Simultaneously, start the associated grit pump and pump settled material continuously to the grit washer.~~

      3) ~~At the same time, open (or partially open) the associated fluidizing valve for the duration of the test, in order to keep sufficient water volume in the grit basin while avoiding overflowing.~~ Throughout the test duration, monitor the water level in the grit basin and record ~~the~~ pump flow rate at a minimum interval of 10-minutes. ~~Maintain the level at higher than 10 feet throughout the testing to protect the pump.~~
   c. Starting at the 1-hour mark, add a minimum 10 gallons of seed sand every hour. Continue the addition of seed sand until the grit level in the associated grit washer reaches steady state and the grit washer is able to maintain that grit level/weight through its normal automatic operation. Alternatively, seed sand may be added directly to the grit washer to reduce the time to steady state.
   d. The attainment of steady state will mark the beginning of the actual performance testing.
      1) Record start time and grit level in the grit washer, and place an empty grit bin at this time.

2) Continue with the addition of seed sand (10 to 20 gallons per hour) ~~for 5 additional hours,~~ such that approximately 50 gallons of seed sand has been cumulatively added.

3) Continue running the pump and the grit washer until the grit level in the associated grit washer reaches the grit level at the beginning of the actual performance testing, which will mark the conclusion of the performance testing.

4) At this time, measure the volume of sand in the grit bin ~~and send samples to the testing laboratory for water content~~.

5) Comparing the volume of sand in the bin to the ~~50 gallons~~volume of sand added during the ~~actual performance~~ test~~ing~~ provides the capture rate. The tolerance of capture shall be within plus or minus 5 percent.

~~Perform analyses by a third party laboratory to determine capture rate at different sizes of seed sand.~~

4. Wastewater Grit Quality Testing Methodology.

a. After the grit basins and grit washers have been placed in normal operation and are treating wastewater ~~(and after the test sand in the grit washer has been displaced by the plant grit)~~, grit samples shall ~~continue to~~ be collected ~~for a specified period~~ to check for organic content and moisture.

b. The Design Builder shall take three 2-cup samples ~~taken~~ on any 3 days after the system is in normal operation. ~~It is preferred that the s~~Sample collection shall occur within a consecutive 2-week period~~, or sooner, per direction from the manufacturer~~.

c. Samples shall be collected at~~immediately upon~~ discharge from the ~~tested~~ grit washer, sealed in a vapor-tight container, and sent to the City's testing laboratory the same day. City shall pay for sample analysis.

d. The sample collection shall take place at grit pump design flow.~~on two separate occasions, one at a grit withdrawal rate of 250 gpm, and another at 300 gpm.~~

~~The Design Builder shall submit a final report summarizing all test data and results. In the event the equipment does not meet the performance testing requirements, the manufacturer shall make all necessary changes and retest at no additional cost to the City.~~

~~If the second test does not successfully demonstrate compliance with the specified performance requirements, the manufacturer shall take additional, concrete steps to rectify the situation until the specified performance is achieved.~~

3.03 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:
   1. Present at Site or classroom designated by Jacobs, for minimum person-days listed below, travel time excluded:
      a. One trip of 2 person-days for installation assistance and inspection.
      b. One trip of 2 person-days for functional testing, completion of Manufacturer's Certificate of Proper Installation, and training. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed and accepted by the Owner and Jacobs.
      c. One trip of 5 person-days for facility startup and performance testing.

B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

3.04 SUPPLEMENTS

A. The supplements listed below, following "End of Section," are a part of this Specification.
   1. Grit Washer 1-6 Stirrer Induction Motor Data Sheet.
   2. Grit Classifier 1-6 Drive Induction Motor Data Sheet.

END OF SECTION

GRIT WASHER 1-6 STIRRER
INDUCTION MOTOR DATA SHEET

Project: San José Headworks Project

Owner: San José-Santa Clara Regional Wastewater Facility

Equipment Name: Grit Washer 1-6 Stirrer

Equipment Tag Number(s): 14GCL9605-01, 14GCL9605-02, 14GCL9605-03, 14GCL9605-04, 14GCL9605-05, and 14GCL9605-06

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 0.75 hp

Voltage: 480-V

Phase: 3-phase

Frequency: 60 Hz

Synchronous Speed: 1800 rpm

☐ Thermal Protection: _____

☐ Space Heater: ____ volts, single-phase

Guaranteed Minimum Efficiency at Full Load: ____ percent

Guaranteed Minimum Power Factor at Full Load: ____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

☐ Multispeed, Two-Speed: ____ / ____ rpm

Winding: ☐ One ☐ Two

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up ____ Down ____

☐ Adjustable Speed Drive: See Section 26 29 23, Low-Voltage Variable Frequency Drive System.

Operating Speed Range: ____ to ____% of Rated Speed

☐ Variable Torque

☐ Constant Torque

Additional Motor Requirements: ☒ See Section 26 20 00, Low-Voltage AC Induction Motors.

Special Features:

GRIT CLASSIFIER 1-6 DRIVE
INDUCTION MOTOR DATA SHEET

Project: San José Headworks Project

Owner: San José-Santa Clara Regional Wastewater Facility

Equipment Name: Grit Classifier 1-6 Drive

Equipment Tag Number(s): 14GSFR9601-01, 14GSFR9601-02, 14GSFR9601-03, 14GSFR9601-04, 14GSFR9601-05, and 14GSFR9601-06

Type: Squirrel-cage induction meeting requirements of NEMA MG 1

Manufacturer: For multiple units of the same type of equipment, furnish motors and accessories of a single manufacturer.

Hazardous Location: ☒ Furnish motors for hazardous (classified) locations that conform to UL 674 and have an applied UL listing mark.

Motor Horsepower: 1.5 HP

Voltage: 480-V

Phase: 3-phase

Frequency: 60 Hz

Synchronous Speed: 1800 rpm

☐ Thermal Protection: _____

☐ Space Heater: ____ volts, single-phase

Guaranteed Minimum Efficiency at Full Load: ____ percent

Guaranteed Minimum Power Factor at Full Load: ____ percent

Service Factor (@ rated max. amb. temp.): ☐ 1.0 ☒ 1.15

Enclosure Type: TEFC

☐ Multispeed, Two-Speed: ____ / ____ rpm

Winding: ☐ One ☐ Two

Mounting Type: ☐ Horizontal ☐ Vertical

☐ Vertical Shaft: ☐ Solid ☐ Hollow

☐ Vertical Thrust Capacity (lb): Up ____ Down ____

☐ Adjustable Speed Drive: See Section 26 29 23, Low-Voltage Variable Frequency Drive System.

Operating Speed Range: ____ to ____% of Rated Speed

☐ Variable Torque

☐ Constant Torque

Additional Motor Requirements: ☒ See Section 26 20 00, Low-Voltage AC Induction Motors.

Special Features: _____

SECTION 44 42 56.03
VERTICAL TURBINE PUMPS

EQUIPMENT AND COMPONENT NUMBER(S)

Raw Sewage Pump 1: 14PMP9655-01.
Raw Sewage Pump 2: 14PMP9655-02.
Raw Sewage Pump 3: 14PMP9655-03.
Raw Sewage Pump 4: 14PMP9655-04.
Raw Sewage Pump 5: 14PMP9655-05.

Additional motors, sensors, and control equipment to be provided by pump manufacturer are specified herein.

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Related sections include the following.
   1. Division 01, General Requirements.
   2. Section 03 62 00, Grouting.
   3. Section 05 05 19, Anchor Bolts.
   4. Section 09 90 00, Painting and Coating.
   5. Section 26 19 00, Medium-Voltage Induction Motors.
   6. Section 40 80 02, Physical Hydraulic Modeling Standards and Requirements.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American Bearing Manufacturers Association (ABMA):
      a. 9, Load Ratings and Fatigue Life for Ball Bearings.
      b. 11, Load Ratings and Fatigue Life for Roller Bearings.
   2. American Petroleum Institute (API):
      a. 610, Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries.
      b. 670, Machinery Protection Systems.
   3. ASTM International (ASTM):
      a. A36/A36M, Standard Specification for Carbon Structural Steel.
      b. A532 Standard Specification for Abrasion Resistant Cast Irons.
      c. A536, Standard Specification for Ductile Iron Castings.

d. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.

e. A743 Standard Specification for Castings, Iron-Chromium, Iron Chromium-Nickel, corrosion Resistant for General Application.

4. Hydraulic Institute Standards (ANSI/HI):
   a. 9.6.4, Rotodynamic Pumps for Vibration Measurements and Allowable Values.
   b. 9.8, Rotodynamic Pumps for Pump Intake Design.
   c. 14.6, Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.
5. National Electrical Manufacturer's Association (NEMA): MG 1, Motors and Generators.
6. NSF International (NSF):
   a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
   b. NSF/ANSI 372, Drinking Water System Components - Lead Content.

1.03 DEFINITIONS

A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

1.04 SUBMITTALS

A. Action Submittals:
   1. Make, model, weight, and horsepower of each equipment assembly.
   2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
   3. Performance data curves showing head, capacity, horsepower demand, NPSH required, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the design flow conditions.
   4. Calculations:
      a. Structural dynamic analysis of the combined pump and motor systems, as defined herein.
      b. Torsional analysis for complete rotating assembly. Analysis report shall include the specific items for a level 2 analysis specified in ANSI/HI 9.6.8 for VS pumps.
      c. Lateral vibration analysis for discharge head motor assembly for column pipe bowl assembly, and for structural response. Analysis shall include all applicable items for a level 2 analysis in ANSI/HI 9.6.8 for VS pumps.
      d. Reverse Rachet sizing calculations.
      e. Physical Modeling calculations, study, and report.

~~e.~~f. Column loss calculations and empirical rational and evidence for graphs, submitted prior to factory testing.

5. Pump maximum downthrust or upthrust in pounds.
6. Detailed structural, mechanical, and electrical drawings showing equipment dimensions, size, and locations of connections and weights of components.
7. Assembly and installation drawings including shaft size, seal, coupling, bearings, anchor bolt plan, parts nomenclature, and materials of construction lists.
8. Baseplate drawings with leveling jackscrew details, anchor bolt and sleeve details, and minimum foundation installation and leveling requirements.
9. Shaft enclosing tube seal water flow, pressure, and purity requirements.
10. Power and control wiring diagrams, including terminals and numbers.
11. Motor information as specified in Section 26 19 00, Medium-Voltage Induction Motors.
12. Factory finish system.
13. Vibration and temperature monitoring system information including technical product bulletins and descriptions, specification data sheets, wiring diagrams including terminal block labels for internal and external connections, communications hardware and software, enclosure product data, documentation sufficient for configuration of functions specified herein and shown on Drawings.
14. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.
15. Installation list of all similarly sized installations of the same design as proposed herein, including installation contact, date of initial operation, size of pumps, horsepower, flow capacity, and number of pumps. A similar installation shall be defined as pumps which convey raw sewage, upstream of primary clarifiers, and for which a means of contacting the operations staff still exists.
16. Vibration analysis information, including Campbell diagrams, mode shape diagram of rotating elements, critical speed map, damped lateral rotordynamic analysis, calculated radial and axial hydraulic loads, eigenvalue calculation and unbalanced force response, impeller-casing interaction coefficients, and static and dynamic sleeve bearing coefficients, nonlinear iteration analysis for sleeve bearings, linear structural analysis of pump.
17. Third party vibration analyst qualifications.
18. Physical modeling submittals as part of Section 40 80 02, Physical Hydraulic Modeling Standards and Requirements.

B. Informational Submittals:

1. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Special shipping, storage and protection, and handling instructions.

3. Manufacturer's printed installation instructions.
4. Factory Functional and Performance Test Reports and Log. Factory test data for each pump shall be submitted, reviewed, and approved by Jacob's Engineer prior to shipment of equipment. Include calibration calculations and certifications for all instruments used on the test stand or in calculating data found in the test report. Include methodology of test procedure and test stand, and all data collected including time and date of measurement.
5. Suggested spare parts list to maintain equipment in service for a period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
6. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
7. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
8. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.
9. Pump manufacturer statement certifying that all pumps will operate over the entire design range within HI hydraulic and vibration standards based on physical modeling and vibration analysis performed by subcontractors to the pump manufacturer.

1.05 EXTRA MATERIALS

A. Furnish the following
1. One complete set bearings.
2. Five complete set gaskets and O-ring seals.
3. One complete set of shaft sleeves.
4. Five complete set keys, dowels, pins, etc.
5. Five complete mechanical seals.
6. One complete wear ring.
7. One complete set of special tools required to dismantle pump.

1.06 QUALITY

A. Prior to manufacture, the pump manufacturer shall submit the vibration analysis described herein. For the dynamic vibration analysis described, minimum and maximum operating speeds will be as required to meet performance requirements specified herein. The dynamic vibration analysis shall be performed by a qualified third party (not by the pump manufacturer).
1. Analyst Qualifications: Experienced in performing analysis of pump and motor units of comparable size and complexity.
2. Prepare a written report for each completed analysis and calculations procedures.

3. Submit results of each analysis for review and acceptance prior to pump and motor manufacturer.

B. Structural Response Frequency Analysis: Structural dynamic analysis of the combined pump/motor system including the connected and interconnected concrete deck, walls, and foundation; the piping out to the first pipe restraint or expansion joint. Analysis shall not simply assume the foundation is rigid rather it shall incorporate foundation design shown on Drawings. The structural dynamic analysis shall predict that no first or second bending mode frequencies will exist within a pump speed range from 20 percent below minimum operating speed to 20 percent above maximum operating speed, with all supplied pumps operating simultaneously at the same speed. The analysis shall conform to ANSI/HI 9.6.8 level 2 analysis, when possible.

C. Lateral Analysis: A lateral rotor dynamic analysis of the pump rotating system (i.e., motor rotor, line shafting, couplings, bowl shafting and impellers, etc.) shall identify and predict that the first lateral critical speed shall have a separation margin of at least 20 percent above the maximum pump speed or 20 percent below the minimum pump speed. The analysis shall conform to ANSI/HI 9.6.8 level 2 analysis, when possible.

D. Torsional Analysis: A torsional rotordynamic analysis of the complete rotating system (pump, motor, intermediate shafting, and coupling) shall identify and predict that no torsional natural frequencies occur within a separation margin extending from 20 percent below to 20 percent above the specified pump operating speed range. Additionally, no natural frequencies shall be plus or minus 10 percent of 2x times running speed, line frequency, 2x line frequency, vane pass frequency, and VFD control frequencies (if applicable). If a design modification (i.e., such as a shaft diameter change or different coupling arrangement) cannot resolve a separation margin deficiency or is not practical, a forced damped response analysis shall be performed to show that infinite life will be achieved with a safety factor of at least two.

E. Campbell diagrams shall be submitted, documenting the structural lateral, rotating component lateral, and torsional analysis results, graphically demonstrating the separation margins specified above.

F. Maximum vibration velocity in inches per second RMS, measured in the field, shall conform to the requirements of ANSI/HI 9.6.4. In addition, for operating motor speeds less than or equal to 600 rpm, field vibration displacement in mils peak-to-peak shall conform to the requirements of ANSI/HI 9.6.4.

G. Pump manufacturer shall conduct physical modeling prior to manufacture of pumps. Physical modeling shall be in accordance with HI standards and shall be based off of the Design Drawings provided by Jacobs' Engineer, and pump dimensional drawings provided by the pump manufacturer. Physical modeling shall include the channels downstream of screens (with flow equalized from each channel), the entire 120-inch RS pipe that conveys flow into the pump station wetwell, the wetwell forebay, including gates, spray piping, or other minor

features, the individual pump bays, and the pump bowl, bell, and column. Chamfers and concrete forming and sloping shall be included in the model. Physical modeling shall demonstrate passing requirements stipulated in the HI Standards. Additionally, it shall demonstrate passing requirements at max pump station flow, and at flushing flow. These conditions will be stipulated by the Jacobs' Engineer.

PART 2 PRODUCTS

2.01 GENERAL

A. The pump manufacturer shall furnish a pump and motor as a complete system. The pump manufacturer shall furnish thermal and vibration sensory equipment and panels as specified herein and in the medium voltage motor specification. The pump shall be specifically designed for handling raw sewage and solids and shall specific design elements to prevent accumulation of rags, wipes, fibers; to resist abrasion from grit within the pumped fluid, and to resist corrosion from corrosive gasses found in sewage. The pumps discharge to a high point, where flow transitions to gravity into a channel. The pumps do not come equipped with isolation or check valve, as the high point has a siphon break. Pumps shall have an external seal water system provided by Contractor to flush the bearings of the enclosing tube.

B. Pumps' dimensions shall conform to dimensions and elevations listed on Drawings, unless specifically indicated otherwise in the specification or if the listed dimensions or elevations are incompatible with successful design and construction of the pump.

C. The five pumps shall be installed as indicated on Drawings. The pumps will pump municipal sewage and are located downstream of 3/8-inch multirake bar screens, but upstream of grit removal. The pumps will be outdoors, with no cover, and will be exposed to the weather of San José, California.

D. The manufacturer shall guarantee that the equipment furnished is suitable for the installation characteristics. All equipment provided shall be in compliance will all local, state, and federal rules and regulations. All equipment furnished shall operate as a complete system and shall not rely on additional equipment, unless explicitly indicated in the specification. The furnished pump system shall be designed and or modified by pump manufacturer to be within HI vibration acceptance limits in both the factory testing and installed condition.

E. All components of the shaft, impeller, and motor coupling, shall be designed to not loosen or unscrew during reverse flow through the pump.

F. The pump manufacturer shall locate interconnections connections, flanges, access doors, and mounting locations as shown on drawings unless changes are coordinated with and accepted by Jacobs' Engineer.

G. Adjustable Speed Drives:

1. Where required, furnish coordinated operating system complete with pump, driver, and speed controller.
2. Coordinate pump and motor requirements with adjustable speed drive manufacturer and be responsible for the following:
   a. Torsional vibration of rotating assembly and related stresses.
   b. Motor thermal rating.
   c. Structural design of pump and motor assembly.
   d. Drive capacity for actual motor's nameplate current rating being supplied.
   e. Minimum motor speed rating for required corresponding torque.

H. Lateral and Torsional Vibrations:
1. Pump and motor assembly shall have no natural frequencies within 20 percent of operating speed range.
2. Fundamental critical speed of rotating assembly shall be no less than 50 percent above the rated speed.
3. Pump manufacturer shall conduct an analysis of the lateral and torsional vibration of pump and motor assembly.
   a. Excitation frequency range of the analysis shall include, but not be limited to, number of motor poles and number of impeller vanes.
   b. Perform detailed stress analysis for pump, coupling, motor system at each critical speed, and steady-state operating condition.
   c. Stress analysis shall demonstrate that in no case shall maximum stress on pump, coupling and motor component exceed endurance limits of pump, coupling and motor assembly components materials of construction.

2.02 SUPPLEMENTS

A. Some specific requirements are attached to this section as supplements.

2.03 SHAFT SEALS

A. Sealing system for vertical turbine pump shafts shall be mechanical seal or packed stuffing box as indicated in pump data sheet.

B. Mechanical Seal Requirements:
1. Nonfretting type requiring no wearing sleeve for shaft.
2. Shafts for pumps specified with mechanical seals shall be furnished with no reduction in size through seal area.
3. Arrangement shall allow removal of seal without disturbing pump or driver.
4. Hard/hard faces shall be used.
5. Design such that dynamic O-ring moves towards a clean surface as face wears and springs are not in pumped fluid.

6. Stationary seal face shall be spring loaded to provide self-aligning despite stuffing box misalignment.
7. Cartridge Type Mechanical Seals:
   a. Single, balanced, flexible stator design.
   b. Capable of 600 psig service.
   c. O-ring secondary seals and setscrew drive with three-point centering to ensure 0.003-inch maximum perpendicularity of rotary face to shaft.
   d. Gland shall have flush port and be affixed to equipment with adjustable tabs to fit irregular bolt patterns.
   e. Manufacturers and Products:
      1) A.W. Chesterton Company; 155.
      2) Crane; 1B.
8. Seal Materials:
   a. Metals:
      1) Loaded Parts Over 0.060-inch Cross Section: Type 316 stainless steel minimum.
      2) Thinner Parts (springs): Hastelloy-C, Alloy 20, AMS5876 Elgiloy, or other alloy that is not vulnerable to chloride stress corrosion.
   b. Elastomers: Fluorocarbon Viton preferred, unless seal manufacturer recommends ethylene propylene for service conditions.
   c. Faces: Homogeneous construction. Surface treatments and plated faces are unacceptable.
      1) Acceptable hard faces include nickel bound tungsten carbide, self-sintered silicon carbide, reaction bonded silicon carbide, or graphitized silicon carbide. Silicon carbide is preferred because of its higher pressure-velocity capability.
      2) Acceptable soft face is carbon-graphite, either Union Carbide 658RC or Purecarbon P8412.
9. Seal Environmental Controls:
   a. Pipe seal flush port drain to wetwell or hub drain as shown on Drawings. Provide venting of seal chamber.
   b. Material of Construction: Type 316 stainless steel.
   c. Connect mechanical seal to water purge supply where indicated on Drawings.
10. Provide Seal with drainage box and NPT connection at elevation 13.95.

2.04 VIBRATION AND TEMPERATURE TRANSDUCERS AND MONITORING SYSTEM

~~0.~~

A. General:

1. Meet requirements specified herein and with motor temperature and vibration sensors specified in Section 26 19 00, Medium-Voltage Induction Motors.
2. Provide temperature and vibration monitoring system, one per pump, in a NEMA 4X cabinet per Area Classification and Material Selection Table on Drawings. Monitoring system may include multiple transceivers/monitors within a single enclosure. Program, test, calibrate, fully configure and place into operation the monitoring system. Each vibration monitoring system shall be labeled, as follows:
    a. Raw Sewage Pump 1: 14MMS9660-01.
    b. Raw Sewage Pump 2: 14MMS9660-02.
    c. Raw Sewage Pump 3: 14MMS9660-03.
    d. Raw Sewage Pump 4: 14MMS9660-04.
    e. Raw Sewage Pump 5: 14MMS9660-05.

B. Features:
1. Locally mounted enclosure, one per pump Machine Monitoring System (MMS).
2. Modbus TCP/IP communication interface selections to plant control system with data from each individual vibration and temperature element.
3. Individual alarm set points per channel.
4. Programmable operating ranges.
5. 24V dc input power.
6. Connect to VFD control via a discrete output, rated 24V dc.
7. Alarm Contacts: Configured to be normally closed, open in alarm condition, and open on loss of power.
8. Cables requiring special calibration for optimum performance shall be calibrated by vibration system supplier.
9. Manufacturer and Product: Bentley; Nevada Series 2300.
10. Panel(s) shall be as specified in Section 40 99 90, Package Control Systems.

C. Pump Vibration Velocity Transducers:
1. Two radial velocity transducers shall be provided on the motor mounting flange measuring the directions perpendicular to the axis of the pump drive shaft.
2. Two radial velocity transducers shall be provided with one measuring the outboard thrust bearing and one at 90 degrees to the thrust bearing direction. See Section 26 19 00, Medium-Voltage Induction Motors.
3. Elements:
    a. Accelerometers, providing inches per second RMS (root mean squared) velocity output.

b. Minimum Rated Operating Frequency: Less than minimum pump operating speed.

c. Vibration element shall include shielded signal cable and be enclosed in NEMA 4X housing.

d. Sensors shall be as specified in Section 26 19 00, Medium-Voltage Induction Motors.

D. Motor Temperature Transducers:

1. Two temperature sensors on each winding of the motor.
2. Two temperature sensors on motor inboard and motor outboard thrust bearings.
3. On motor winding or motor bearing high temperature, provide hardwired contact to motor drive for
4. Sensors shall be as specified in Section 26 19 00, Medium-Voltage Induction Motors.

E. Vibration and temperature transducers shall be installed in accordance with guidelines provided by API 670.

2.05 MOTOR

A. See Section 26 19 00, Medium-Voltage Induction Motors, for more requirements.

B. Suitable for outdoors, uncovered installation.

C. The motor shall be designed for mounting to the pump column, or coupling stand provided by the pump manufacturer.

D. The motor rated bhp shall not be exceeded at any point within the pump duty points, nor during pump testing. The motor's rated bhp at reduced speeds shall not be exceeded at the respective speed required by the pump to meet any duty points. Note that deadheading the pump is not possible in the installed condition due to no downstream valves.

E. Provide motor with anti-reverse rotation rachet. The rachet shall be designed to indefinitely resist reverse rotation of the pump while the entire flow passes backwards through the pump, at the pumps highest rated flow and highest duty point TDH. ~~The rachet shall be designed with a safety factor of 150 percent.~~

F. The motor and pump shall be designed to have a maximum noise emission as follows:

1. 85 dBA sound pressure at 3 feet from the motor, per pump, with one pump operating, in the installed conditions.

2.06 ACCESSORIES

A. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.

B. Lifting Lugs or Tabs: Equipment weighing over 100 pounds.

C. Anchor Bolts: Galvanized, sized by equipment manufacturer, 1/2-inch minimum diameter, and as specified in Section 05 05 19, Anchor Bolts. Coat in accordance with Section 09 90 00, Painting and Coating.

D. Hydrocone with Baffles: Furnish five Type 316 stainless steel hydrocones, each with two anti-rotation baffles as detailed on Drawings. Baffles shall be 1-inch minimum thickness, and peripherally welded to the cone. Hydrocone anchorage shall be determined by the manufacturer. Provide angled end piece to one baffle to not interfere with grout fill.

2.07 FACTORY FINISHING

A. Prepare and prime and finish coat in accordance with Section 09 90 00, Painting and Coating

B. Line the interior of the pump column, pump, and discharge head (up to discharge flange connection) and the exterior of the shaft enclosing tube with Manufacturer's premium ceramic epoxy suitable for wastewater immersion service in accordance with Section 09 90 00, Painting and Coating. Two coats 20 MDFT to 30 MDFT per coat. Surface prep SSPC SP-10. Lining is not required on stainless steels. Lining is not required where lining will interfere with precision dimensions required for the function or performance of the pump.

C. Line all other interior surfaces of the pump with manufacturer's standard lining for raw sewage service.

2.08 SOURCE QUALITY CONTROL

A. Inspect equipment for required construction, electrical connection, and intended function.

~~A.~~B. Ensure motor BHP is not exceeded during testing.

~~B.~~C. Factory Tests and Adjustments: Test all pumps furnished using a motor and VFD purchased as part of Section 26 19 23, Medium-Voltage Variable Frequency Drive System, and Section 26 19 00, Medium-Voltage Induction Motors. The VFDs will not be furnished by the pump manufacturer. The motors shall be furnished by the pump manufacturers. The pump manufacturer shall assist the VFD manufacturer in installing the VFD in the factory test setting. Additional motors and VFDs may be shipped directly to the project site after approval of factory testing of the pumps and approval of required submittals and testing for motors and VFDs. The Factory Test may be witnessed at the Owner and Jacobs'

discretion. Notify Jacobs of testing schedule at least 60 calendar days before testing.

1. Testing with motor shall include system efficiency test reports as part of Section 26 19 00, Medium-Voltage Induction Motors.

~~C.~~D. Factory Test Report: Include test data sheets, curve test results, performance test logs, certified correct by a registered professional engineer.

~~D.~~E. Factory Functional Test:

1. Perform manufacturer's standard, test on equipment. Factory Performance Test:
   a. Conduct on each pump at rated speed.
   b. Perform under simulated operating conditions.
   c. Test for a continuous 3-hour period without malfunction.
   d. Test Log:
      1) Record the following:
         a) Total head, subtracting hydraulic friction losses internal to the pump column and discharge bend.
         b) Capacity.
         c) Horsepower requirements.
         d) Flow measured by factory instrumentation and storage volumes.
         e) Average distance from suction well water surface to pump discharge centerline for duration of test.
         f) Pump discharge pressure converted to feet of liquid pumped and corrected to pump discharge centerline.
         g) Calculated velocity head at the discharge flange.
         h) Bowl head.
         i) Driving motor voltage and amperage measured for each phase.
   e. Adjust, realign, or modify units and retest in accordance with Hydraulic Institute Standards if necessary.

~~E.~~F. Factory Performance Test:

1. Conduct performance test in accordance with ANSI/HI 14.6 with acceptance grade 1U. Ensure motor nameplate rating is not exceeded when throttling the pump to pressures above the primary duty point.
2. Run pumps for a minimum of 1 hour uninterrupted prior to taking any readings for any test points. For the four performance guarantee points only: run pump for 15 minutes without modification to test stand prior to first reading of each performance guarantee point, with 5 minute spacing between each data reading taken (4 data readings at each guarantee point), for a total of approximately 30 minutes testing at each guarantee point. Testing at each data point shall be within -0%/+10% of guarantee point flow, and -0%/+6% of guarantee point total developed head to be considered representative of that guarantee point. ~~Run pump for a~~

~~minimum of 1 hour after warmup for taking performance readings. All readings measured shall be reported in testing submittals.~~For measurements at all test points not associated with one of the four guaranteed points, pause before data point collection to allow system stabilization and follow HI 14.6 grade 1U guidance. Generate flow, TDH, efficiency, and power curves using at least 6 data points per curve, at speeds between 50 and 100% of rated speed in increments not to exceed 10% speed.

~~.~~a. Performance guarantee point required flow, head, and efficiency shall be as listed in the purchase order for the pumps.

3. ~~Additionally, t~~Test each pump at reduced speed to demonstrate efficiency stipulated in purchase order. ~~Test tolerances for flow, head, and power shall be in accordance with HI grade 1U, with total capacity (flow) buydown as directed by the purchase order performance guarantee.~~ Efficiency penalties and tolerances shall be in accordance with language stipulated in the purchase order performance guarantee.

   a. To calculate bhp a torque gauge shall be used and placed on either the pump shaft or motor shaft near the pump/motor coupling. The torque gauge shall be calibrated from the BHP and speed measurements made during across the line testing of the pump/motor on sine wave power (60 hz). To calibrate the torque gauge, the input power to the motor will be measured along with the motor manufacturer's efficiency testing and the torque gauge readings will be compared to the output power of the motor. Once the torque gauge is calibrated at full speed, it will be used for measuring the pump power at the pump/motor coupling during reduced speed tests.

   b. TDH (total developed head): the TDH shall be ~~determined by measuring the gauge stagnation pressure with a calibrated digital pressure transmitter at the centerline of the pump discharge nozzle or flange with measurement units of feet of water at standard conditions, plus adding the elevation difference between the centerline of the discharge nozzle and the water level in the test stand wetwell. The measured gauge stagnation pressure shall be adjusted to account for any elevation differences between the pressure sensor and the pump discharge centerline, and the density of the fluid filling the tubing or piping between the pressure sensor and discharge centerline. This adjustment may be made during the calibration of the pressure sensor, if the method is agreed to by both Buyer and Seller. The TDH shall be measured while the pump is assembled to its designed pump column length, with all parts internal to the pump column and bowl installed. The TDH shall exclude taking credit for head lost to friction inside the pump column or pump assembly, these friction which shall not be credited as part of the TDH developed by the pump.~~the same as "total head" as defined per HI 14.6, Table 14.6.1.3a, Row 3.1.31. The total head shall be empirically measured using the pump in the design column

length, or if a reduced column length is used, shall include calculations for projected losses to be incurred by additional column and fittings. The calculations for projected column losses shall be submitted 30 days prior to testing, and must be satisfactory in the sole opinion of Jacob's Engineer prior to proceeding with testing.

c. Actual TDH measured on the test stand shall be ~~+4.0%/-0% of values listed.~~within HI 14.6 Grade 1U Tolerance, when corrected for any changes in column length.

d. Efficiency shall be the flow measured in gpm by a calibrated ~~magnetic~~venturi flowmeter on the test stand, multiplied by the TDH as defined above, divided by 3960 and divided by the brake horse power (bhp) measured at the input shaft to the pump by strain gauges and multiplied by 100. The strain gauges shall use 2 point calibration within 10 degrees F of the actual test conditions and shall be accurate to within +/- 1.0% of the relative measured strain. The gauges shall be calibrated on the same shaft to be used in the test. Efficiency shall be as represented in this formula:

$$\text{Actual Efficiency} = \frac{flow*TDH}{3960*bhp}*100$$

~~a.~~e. Actual flow measured on the test stand shall be within HI 14.6 Grade 1U Tolerance~~Actual flow shall be +4%/-0%~~ of values listed.

4. Test tolerances for flow, head, and power shall be in accordance with HI grade 1U, with ~~total capacity (flow) buydown~~ penalties for underperformance as directed by the purchase order performance guarantee.

a. The deficit for each of the four guarantee point test conditions will be calculated on a per pump basis, using the average of all efficiency data points collected for each guarantee point, based on the following equation and rounded up to the nearest 0.5%:

$$\text{Deficit} = Actual\ Pump\ Efficiency\ - Required\ Efficiency$$

b. The average deficit of the four test conditions will then be calculated and utilized to determine the performance guarantee damages listed in the purchase order.

~~F.~~G. Motor Test: See Section 26 19 00, Medium-Voltage Induction Motors. Test will not be witnessed excluding testing related to performance testing of pump in pump manufacturer's facility.

~~G.~~H. Hydrostatic Tests: Pump casing(s) tested at 150 percent of shutoff head. Test pressure maintained for not less than 5 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Level soleplate by means of leveling screws to manufacturer's required levelness (expected to be 0.005 inch/foot of level). Measure levelness at mounting flange with device capable of detecting 0.001-inch deviations.

C. Adjust pump assemblies such that driving units are properly aligned, plumb, and level with driven units and interconnecting shafts and couplings. Do not compensate for misalignment by use of flexible couplings.

D. After pump and driver have been set in position, aligned, and shimmed to proper elevation, grout space between bottom of baseplate and concrete foundation with a poured, nonshrinking grout of the proper category, as specified in Section 03 62 00, Grouting. Remove wedges after grout is set and pack void with grout.

E. Vibration and Temperature Transducers:
   1. Install in accordance with API 670.
   2. Provide cable from motor bearing temperature transducers to remote monitoring enclosure, located near motor. Provide cable from motor vibration transducers to remote monitoring enclosure, located near motor.

F. Connect suction and discharge piping without imposing strain to pump flanges.

G. Anchor Bolts: Accurately place using equipment templates and as specified in Section 05 05 19, Anchor Bolts.

3.02 FIELD FINISHING

A. As specified in Section 09 90 00, Painting and Coating.

3.03 FIELD QUALITY CONTROL

A. Functional Tests: Conduct on each pump.
   1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
   2. Noise Test: A noise test shall be conducted by Jacobs' Engineer to confirm conformance with noise requirements specified herein.
   3. Vibration Test:
      a. Test with unit installed and in normal operation, and discharging to connected piping systems at rates between low discharge head and high discharge head conditions specified, and with actual building structures and foundations provided shall not develop vibration exceeding 80 percent of limits specified in ANSI/HI 9.6.4. Conduct Vibration test with two or three pumps running simultaneously at the same speed, if possible.
      b. If unit exhibits vibration in excess of limits specified, Pump Manufacturer shall adjust or modify pump as necessary.
   4. Flow Output: Measured by plant instrumentation and storage volumes.

5. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.
6. Test for continuous 3-hour period.
7. Test Report Requirements: In accordance with ANSI/HI 14.6 for flow test. Report all vibration data collected with associated pump speeds for all running pumps.

3.04 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:
   1. Present at Site or classroom designated by Owner for minimum person-days listed below, travel time excluded:
      a. 3 person-days for installation assistance and inspection.
      b. 5 person-days for functional testing and completion of Manufacturer's Certificate of Proper Installation.
      c. 1 person-day for prestartup classroom or Site training.
      d. 1 person-day for facility startup.
      e. 1 person-day for temperature/vibration monitoring system training.

B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

3.05 SUPPLEMENT

A. The supplement listed below, following "End of Section," is a part of this Specification.
   1. Raw Sewage Pump 1, 2, 3, 4, and 5 Pump Data Sheet.

END OF SECTION

RAW SEWAGE PUMPS 1, 2, 3, 4, AND 5 PUMP DATA SHEET

Tag Numbers: 14PMP9655-01, 14PMP9655-02, 14PMP9655-03, 14PMP9655-04, 14PMP9655-05

Pump Name: Raw Sewage Pump 1, Raw Sewage Pump 2, Raw Sewage Pump 3, Raw Sewage Pump 4, Raw Sewage Pump 5

Manufacturers and Product: (1) Fairbanks Nijhuis, VTSH

(2) Flowserve MVX

(3) "Or-equal"

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): Screened Raw Sewage with Grit

Pumping Temperature (Fahrenheit): Normal _____ Max _____ Min _____

Specific Gravity at 60 Degrees F: 1.0 Viscosity Range: 1.0 cP

Vapor Pressure at 60 Degrees F: _____. pH: _____

Abrasive (Y/N): Yes Caused by: Grit

Possible Scale Buildup (Y/N): _____ Caused by: _____

Corrosive (Y/N): Yes Caused by: H2S attack

Largest diameter solid pump can pass (inches) 5 inch minimum

Min. NPSH Available (Ft. Absolute): _____

Suction Pressure (Ft): Max _____ At Rated Capacity _____.

Altitude (Feet above Mean Sea Level): 0

Area Classification: Class 1 Div 1 below mounting plate, Class 1 Div 2 within 36" envelope of mounting plate

Ambient Temperature (degrees F.): 34-104

Location: Indoor (Y/N): N Outdoor (Y/N): Yes

PERFORMANCE REQUIREMENTS

Capacity (US gpm): Primary Duty Point: 36,500 Secondary Duty Point: 17,350
Total Dynamic Head (Ft): Primary Duty point : 38, excluding pump column friction losses
Secondary Duty Point: 33, excluding pump column friction losses

The pump shall be able to operate continuously at any flow between primary and secondary flows while at any dynamic head between primary and secondary pressures. Refer to purchase order for definition of Total Dynamic Head.

BHP at Rated Point: Not to exceed 500

Min. Pump Hydraulic Efficiency at Certain Flows and TDH (%): See purchase order performance guarantee table for penalties

Max. NPSH Required at Rated Secondary Capacity (Ft. Absolute):

Max. Pump Speed at Rated Capacity (rpm): 600

Constant (Y/N): N

Adjustable (Y/N): Yes

DESIGN AND MATERIALS

Pump Type Enclosed Line Shaft (Y/N) Yes

Bowl: ASTM A48 CL30 Bowl Wear Rings: Required, ASTM A743, CA6NM or ASTM 532 CR28, minimum 250 Brinell hardness
Bowl Lining: Manufacturer's standard for corrosive service
Bowl and Suction Bell Maximum Diameter (inches): 60" Diameter Suction Bell, bowl per HI recommended requirements

Bowl Bearings: Manufacturer's standard for corrosive abrasive service

Column: Manufacturer's Standard with anti-rotation vane, ~~42~~36" nominal diameter.

Column Lining: Ceramic Epoxy

Line Shafting: Type 416 Stainless steel Max. Bearing Span (Feet): 10 feet max. Adjust spacing as required for vibration resistance.

Line Shaft Bearings: Manufacturer's standard for enclosed shaft

Discharge Head:

Type: Flanged, designed to prevent accumulation of stringy material (in the opinion of Jacobs' Engineer)

Material: Fabricated Steel, ASTM A36/A36M

Discharge Nozzle Size (inches): ~~42~~36 Flange Standard/Class: ANSI 150 lb

Impeller:

Type: 4 vane, mixed flow, designed to prevent rag, wipe, or fiber accumulation

Material: ASTM A743, CA6NM or ASTM 532 CR28, minimum 250 Brinell hardness

Impeller and bowl Wear Rings: ASTM A743, CA6NM or ASTM 532 CR28, minimum 250 Brinell hardness

Head Shaft Material: Type 416 stainless steel Shaft Sleeve Material:

Shaft Sealing: Mechanical (Y/N) Y Type: Cartridge Y

Seal Lubrication: Plant Water

Coupling: Manufacturer Standard (Y/N) Y, provide coupling access

Baseplate Material: ASTM A36

Sole plate: Provide ASTM A36 sole plate with coated bottom to match exterior coating of pump column for section of sole plate above opening hole. Provide leveling screws for installation.

Motor Base Material: Standard

DRIVE MOTOR (See Section 26 19 00, Medium-Voltage Induction Motors)

Horsepower: ~~600~~500 Voltage: 4,000 Phase: 3

Synchronous Speed (rpm): 600, max

Service Factor: 1.0

Motor nameplate horsepower shall not be exceeded at any head-capacity point on pump curve within the allowable operating range.

Enclosure: DIP _____ EXP _____ ODP _____ TEFC _____ CISD-TEFC _____
TEWAC _____ WPI _____ WPII ____X__

Mounting Type: Vertical Hollow Shaft _____ Nonreverse Ratchet (Y/N) _____Y

Vertical Solid Shaft Yes

ABMA 9 and ABMA 11, B-10 Motor Bearing Life (hrs): 100,000, see motor specification

REMARKS

SECTION 44 42 56.12
INDUCED FLOW (RECESSED IMPELLER) CENTRIFUGAL PUMPS

EQUIPMENT AND COMPONENT NUMBERS(S)

14PMP9601-01: Grit Pump 1.
14PMP9601-02: Grit Pump 2.
14PMP9601-03: Grit Pump 3.
14PMP9601-04: Grit Pump 4.
14PMP9601-05: Grit Pump 5.
14PMP9601-06: Grit Pump 6.

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Related sections include the following:
   1. Division 01, General Requirements.
   2. Section 03 62 00, Grouting.
   3. Section 05 05 19, Anchor Bolts.
   4. Section 09 90 00, Paints and Coatings.
   5. Section 26 20 00, Low-Voltage AC Induction Motors.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American Bearing Manufacturers Association (ABMA).
   2. Hydraulic Standards Institute (HIS).
   3. National Electrical Manufacturer's Association (NEMA): MG 1, Motors and Generators.

1.03 DEFINITIONS

A. Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

1.04 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings:
      a. Make, model, weight, and horsepower of each equipment assembly.
      b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
      c. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the

pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.

d. Detailed structural, mechanical, and electrical drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.

e. Power and control wiring diagrams, including terminals with labels and numbers. Include indication of internal and customer wiring.

f. Motor information as specified in Section 26 20 00, Low-Voltage AC Induction Motors.

g. Factory finish system.

h. Submit anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Submit anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Manufacturer's Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements, that factory finish system is identical to the requirements specified herein
3. Component and attachment seismic qualification certificate of compliance as required by Section 01 45 36, Equipment Seismic Certification.
4. Special shipping, storage and protection, and handling instructions.
5. Manufacturer's printed installation instructions.
6. Factory Functional and Performance Test Reports.
7. Suggested spare parts list to maintain the equipment in service for a period of 1 year. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
8. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
9. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
10. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

1.05 EXTRA MATERIALS

A. Furnish for this set of pumps One complete set of special tools required to dismantle pump.

PART 2 PRODUCTS

2.01 GENERAL

A. Coordinate pump requirements with drive manufacturer and be responsible for pump and drive requirements.

2.02 SUPPLEMENTS

A. Specific requirements are attached to this section as supplements.

2.03 ACCESSORIES

A. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.

B. Lifting Lugs: Equipment weighing over 100 pounds.

C. Anchor Bolts: For anchor bolt and post-installed concrete and masonry anchor requirements, refer to Section 05 05 19, Anchor Bolts.

2.04 FACTORY FINISHING

A. Prepare, prime, and finish coat in accordance with Section 09 90 00, Painting and Coating.

B. Manufacturer's standard enamel finish.

2.05 SOURCE QUALITY CONTROL

A. Factory Test Report: Include test data sheets, curve test results, certified correct by a registered professional engineer.

B. Functional Test: Perform manufacturer's standard test on equipment.

C. Performance Test:
   1. Conduct on each pump.
   2. Perform under simulated operating conditions.
   3. Conduct in accordance with Hydraulic Institute Standards 11.6, Acceptance Grade 1U.
   4. Test for a continuous 3-hour period without malfunction.
   5. Test Log:
      a. Record the following:
         1) Total head.
         2) Capacity.

3) Horsepower requirements.
4) Flow measured by factory instrumentation and storage volumes.
5) Average distance from suction well water surface to pump discharge centerline for duration of test.
6) Pump discharge pressure converted to feet of liquid pumped and corrected to pump discharge centerline.
7) Calculated velocity head at the discharge flange.
8) Field head.
9) Driving motor voltage and amperage measured for each phase.

6. Adjust, realign, or modify units and retest in accordance with Hydraulic Institute Standards if necessary.

D. Motor Test: See Section 26 20 00, Low-Voltage AC Induction Motors.

E. Hydrostatic Tests: Pump casing(s) tested at 150 percent of shutoff head. Test pressure maintained for not less than 5 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Level base by means of steel wedges (steel plates and steel shims). Wedge taper not greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for the pump and driver base. Accomplish wedging so that there is no change of level or springing of the baseplate when the anchor bolts are tightened.

C. Adjust pump assemblies such that the driving units are properly aligned, plumb, and level with the driven units and all interconnecting shafts and couplings. Do not compensate for misalignment by use of flexible couplings.

D. After the pump and driver have been set in position, aligned, and shimmed to the proper elevation, grout the space between the bottom of the baseplate and the concrete foundation with a poured, nonshrinking grout of the proper category, as specified in Section 03 62 00, Grouting. Remove wedges after grout is set and pack void with grout.

E. Connect suction and discharge piping without imposing strain to pump flanges.

F. Anchor Bolts: Accurately place using equipment templates and as specified in Section 05 05 19, Anchor Bolts.

G. Pipe pump drain(s) to hub drain or scupper.

3.02 FIELD FINISHING

A. Touchup damaged coating on equipment as recommended by equipment manufacturer.

3.03 FIELD QUALITY CONTROL

A. Functional Tests: Conduct on each pump.
   1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
   2. Vibration Test:
      a. Test with unit installed and in normal operation, and discharging to the connected piping systems at rates between low discharge head and high discharge head conditions specified, and with actual building structures and foundations provided shall not develop vibration exceeding the 80 percent of the limits specified in HIS 9.6.4.
      b. If units exhibit vibration in excess of the limits specified adjust or modify as necessary. Units that cannot be adjusted or modified to conform as specified shall be replaced.
   3. Flow Output~~, Discharge Head and Horsepower~~: Measured by plant instrumentation and storage volumes.

B. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.

C. Performance Test: In accordance with Hydraulic Institute Standards and per the Performance Requirements in the attached data sheet~~.~~

3.04 MANUFACTURER'S SERVICES

A. Manufacturer's Representative: Present at Site or classroom designated by Jacobs, for minimum person-days listed below, travel time excluded:
   1. 2 person-days for installation assistance and inspection.
   2. 3 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
   3. 2 person-days for prestartup classroom or Site training.
   4. 2 person-days for facility startup.
   5. 2 person-days for post-startup training Owner's personnel. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Jacob's Engineer.

B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

3.05 SUPPLEMENT

A. The supplement listed below, following "End of Section," is a part of this Specification.

1. Grit Pump 1-6 Data Sheet.

END OF SECTION

GRIT PUMP 1-6 DATA SHEET

Tag Numbers: 14PMP9601-01, 14PMP9601-02, 14PMP9601-03, 14PMP9601-04, 14PMP9601-05, 14PMP9601-06
Pump Name: Grit Pump 1 - 6

Manufacturer and Model Number: (1) Wemco, Model C
(2) Morris Model 6100
(3)

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): Grit Slurry

Pumping Temperature (Fahrenheit): Normal: 70 Max 80 Min 55

Specific Gravity at 60 Degrees F: 1.0 Viscosity Range: 1 cp

pH: 6 -9

Corrosive (Y/N) Y Nature of Corrosive Conditions: Hydrogen Sulfide

Abrasive (Y/N) Y Nature of Abrasive Conditions: Grit

Possible Scale Buildup (Y/N): N

Total suspended solids (mg/L): 5,000 to ~~10,500~~15,000

Largest diameter solid pump can pass (inches): 3

Min. NPSH Available (Ft. Absolute):
Altitude (Feet above Mean Sea Level): Sea Level

Area Classification: Unclassified

Ambient Temperature (degrees F.): 40 to 90

Location: Indoor (Y/N): Y Outdoor (Y/N): N

PERFORMANCE REQUIREMENTS

Capacity (US gpm) and Total Dynamic Head (ft):

Rated: 400 gpm at 15 ft (normal operation)

Tank Draining~~Secondary~~: 400 gpm at 25 ft (basin ½ empty); 200 gpm at 28 ft (basin empty)

~~Total Dynamic Head (Ft): Rated: 15 Tank Draining~~~~Secondary: 20~~

BHP at Rated Point: 7.5 BHP

~~Pump RPM at Rated Point~~

Min. Pump Hydraulic Efficiency at Rated Capacity (%):

Max. NPSH Required at Rated Secondary Capacity (Ft. Absolute):

Max. Pump Speed at Rated Capacity (rpm): ~~1,800~~
Constant (Y/N): N~~Y~~
Adjustable (Y/N): Y~~N~~; Rated = 500; Tank Draining = 900

DESIGN AND MATERIALS

Pump Type: Horizontal (Y/N) Y Frame-Mounted (Y/N) ~~N~~Y

Vertical (Y/N) N Other ~~Belt Driven; See Drawing for Orientation~~

Fully-Recessed Impeller Type: Y

Impeller Material: Ni-Hard, ASTM A532, BHN 650

Removable Suction Flange/Wear Plate (Y/N): Y

Wear Plate Material: Ni-Hard, ASTM A532, BHN 650

Removable Radial Wear Plate (Y/N): Material:

Removable Wear Plate w/Pump-out Vanes behind Impeller (Y/N):

Material:

Primary Wear Surface Minimum Brinnell Hardness: 650

Primary Wear Surface Minimum Thickness (in.): 1-1/4

Casing Type: Two-Piece Radial Split Min Thickness (in.) 3/4

Casing Material: Ni-Hard Cast-on Feet (Y/N):

Shaft Material: Steel, ASTM A276 Type 410

Shaft Sleeve Material: 450 BHN

Shaft Seal: Packing (Y/N) N Mechanical (Y/N) Y

Seal Type: Single, Mechanical, Tungsten Carbon Seal Faces

Seal Lubrication: External flushing water

ABMA B-10 Bearing Life (hrs): 100,000 Lubrication: Oil bath

DRIVE MOTOR (See Section 26 20 00, Low-Voltage AC Induction Motors.)

Horsepower: 25 Voltage: 480 Phase: 3 Synchronous Speed (rpm) ~~1800~~1200

Service Factor: 1.15 Inverter Duty: ~~No~~Yes

Motor nameplate horsepower shall not be exceeded at any head-capacity point on pump curve.

Enclosure: DIP _____ EXP _____ ODP _____ TEFC _X_____ CISD-TEFC _____ TENV _____ WPI _____ WPII _____ SUBM _____

Adjustable Speed Drive, See Section 26 29 23, Lo-Voltage Adjustable Frequency Drive System.

REMARKS