

SECTION 11308

PACKAGED GRINDER PUMPING STATIONS

PART 1 GENERAL

1.01 COMMENTARY

- A. This Authority recognizes the fact that there are many types of grinder pumps and manufacturers. The Authority is also aware that costs of grinder pumping stations operation and maintenance are significant.
- B. Therefore, the Developer/Homeowner shall do or cause the following elements to be done:
 - 1. Whenever possible, a pressure sewer system with grinder pumping station shall not be used.
 - 2. Prior to design of a pressure sewer system, the Developer shall discuss the proposed system in detail with the Authority.
 - 3. Any pressure sewer system and grinder pumping station design shall be of a type satisfactory to the Authority and shall meet all applicable requirements of PADEP.
 - 4. The intent of the Authority is to standardize components, as much as possible, that are used in pressure sewer systems and/or grinder pumping station applications to facilitate inventory control, equipment familiarization, and safety.

1.02 SECTION INCLUDES

- A. Furnish all labor, materials and equipment to install grinder pumping station(s) and appurtenances as shown on the Drawings and as specified herein. Work shall include but not be limited to:
 - 1. Excavation
 - 2. Enclosure and Component Placement
 - 3. Control Panel and Wiring
 - 4. Internal and external piping with required supports and concrete encasement
 - 5. Backfill

1.03 REFERENCES

- A. Pennsylvania Department of Transportation Publication 408, Latest Edition
- B. National Electric Code - N.E.C.
- C. National Electric Safety Code
- D. HTWSA Sewer Collection System Design Guidelines
- E. HTWSA Section 02732 - Building Sewers
- D. HTWSA Standard Drawing No. 8

1.04 JOB CONDITIONS

- A. Job Conditions shall generally meet those of the related Sections.
- B. Specific conditions will be included with each project as may be required.

1.05 SUBMITTALS

- A. Developer's Engineer or Homeowners Contractor shall provide a construction plan showing the location or property, tax parcel number, connection details, plan view of force main, grinder pump station, house and pertinent topographic features, and location of controller. Drawing shall be presented to the Authority for review and approval at least 45 days prior to start of construction.
- A. Submit shop drawings/product data from manufacturers' descriptive literature and specifications for all materials used in this Section. Submit in accordance with Section 01300.
- B. Specific submittals will be included with each project as may be required for testing, warranties, project manuals, etc.

1.06 QUALITY ASSURANCE

- A. Qualifications of Workmen: Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the design and application of work described for this Section, and who shall be present at all times during progress of the work of this Section and shall direct all work performed under this Section.

PART 2 PRODUCTS

2.01 General

- A. Grinder pump stations shall normally be designed using components as specified herein or with only approved equals. This is done to improve inventory control (standardization), equipment familiarization, and safety.
- B. Unit shall include tank, sewage grinder pump(s), mercury switch level controls, discharge piping, with hydraulically sealed discharge flange(s), pump mounting plate(s), with bottom rail supports, upper rail supports, pump guide rails, rail supports, lifting chain, or cable, control panel, control panel enclosure, electrical wiring, alarm devices, piping, and other necessary accessories as specified herein.

2.02 PUMPS

A. General

- 1. Sewage grinder pumping stations shall be factory-built automatic stations as approved by the Engineer.
- 2. The pumping equipment must be supplied as a complete unit, and all items furnished by the manufacturer. The principal items of equipment in each pump station shall consist of a cast iron simplex or duplex grinder pump, stainless steel discharge piping, stainless steel pump mounting plates with stainless steel guide rails and hoisting chain or cable, hydraulically sealed stainless steel discharge flange, ball check valve, gate valve or ball valve, steel pump plate cover, fiberglass containment basin, mercury switch level controls, NEMA 4 junction box, NEMA 3R control panel. In addition all fasteners, clips, washers, bolts, etc. within the basin shall also be stainless steel.
- 3. The sewage grinder pump station shall be as manufactured by Peabody Barnes, Inc. or approved equal.

Pump units constructed of nonmetallic materials will not be acceptable.

B. Operating Conditions

- 1. Grinder pumps shall be capable of operating against fluctuating total dynamic head.
- 3. Pumps - Each pump shall be capable of delivering a minimum of 8 gpm against a normal rated total dynamic head of 90 feet with a shut-off of 104 feet. Pump motor shall be a minimum of 2 hp, single phase, 230 volt, 60 hertz, 3,450 rpm

(maximum). The pumps shall not overload at any point on the performance curve and shall be free from the harmful effects of cavitation at either high or low head.

C. Pumps and Motors

1. Grinder pumps and motors shall be specifically designed and manufactured to operate in a completely submerged environment in the liquid being pumped. Electrical power cord shall be sealed by use of a cord grip, with individual conductors sealed into the cord cap assembly with epoxy sealant. The cord grip shall have a male taper pipe thread threaded into a final taper pipe thread in a cord cap. The cord cap shall be sealed into the motor housing with a Buna N O-ring, providing an electrical connection that is completely watertight, yet may be easily removed from service.
2. Grinder pumps shall be of the centrifugal type with a combination impeller-grinder assembly. Pump and motor housings shall be cast iron or gray iron. The pump impeller shall be bronze or stainless steel. All fasteners shall be stainless steel.
3. The grinder assembly shall consist of a rotating cutter and a stationary cutting ring on the suction side of the impeller so the cutting assembly discharges directing into the impeller inlet. All cutters, both stationary and rotating, shall be made of hardened and ground stainless steel and shall be adjustable externally to maintain proper clearance. The upper cutter and the stationary cutting ring shall be reversible for longer service life. In the absence of reversible cutters, a spare upper cutter and cutting ring shall be furnished with each grinder pump.
4. The pump-motor shafts shall be supported by permanently oiled upper and lower bearings. Bearings and motors shall be protected from the liquid being pumped by dual mechanical seals consisting of a stationary ceramic seal and two carbon rotating sealing surfaces.

2.03 TANK

A. Tank construction of fiberglass reinforced polyester or precast concrete.

1. Fiberglass Reinforced Polyester (FRP): Tank construction shall conform to ASTM C 582 and C 581 Standards with a minimum wall thickness of 1/4-inch.
 - a. Manufactured according to ASTM D 3299 Standards for filament wound tanks or NBS PS 15-69 Standards for contact molded tanks.

- b. Polyester Resin: Atlac 382.
- c. Flush, slip resistant bolt down cover with padlock.
- d. Connections: watertight and suitable for attaching PVC pipe; 4-inch diameter inlet and 1 1/4-inch diameter discharge with plugs or caps.
- e. Anti-Flotation Anchor: Provide precast, or field cast concrete anchor in accordance with tank manufacturer's recommendations. The tank manufacturer shall provide the design and size of the anchor.

2. Precast Concrete Manhole: Conforming to the requirements of Section 03455.

2.04 ANCILLARY EQUIPMENT

A. Discharge Piping and Fittings:

- 1. Size: 1 1/4-inch diameter.
- 2. Material: ASTM D 1785 Schedule 80 manufactured from Class 12454-B Rigid PVC Compounds with a hydrostatic design stress of 13.8 MPa (2000 psi designated as PVC 1120), NPT couplings, pipe and fittings.
- 3. Material Option: ASTM D 2241, SDR 21.
 - a. Pressure Class 200 psi.
 - b. Pipe Joints: Push-on or compression type, joint performance ASTM D 3139, rubber gasket suitable for domestic sewage service ASTM F 477.

B. Valves: Include a check valve, ball valve and hydraulically sealed discharge flange in pump discharge piping.

- 1. Provide valves of the same type by the same manufacturer; suitable for the intended service.
- 2. Markings factory cast on the bonnet or body of each valve indicating manufacturer's name or mark, year of valve casting, size of valve, directional flow arrow and designation of working water pressure.
- 3. Valve pressure-temperature ratings of not less than the design criteria applicable to system components.
- 4. Provide extension stems with bronze bushed stem guides where required. Provide a top support and one intermediate support unless the unsupported

stem length exceeds four feet, in which case provide an additional support every two feet of valve stem length.

5. Check Valve: Ball check valve designed for a minimum water working pressure of 150 pounds per square inch and factory tested to double that pressure before shipment. Check valve bodies to provide excess area through the valves to assure full delivery of line capacity.
6. Hydraulically Sealed Discharge Flange: The hydraulically sealed discharge flange shall allow the pump to be removed periodically and shall result in a watertight seal when the pump is replaced. Fittings of threaded style, 150 lb. galvanized malleable iron conforming to ANSI B 16.3.
7. Lifting Accessories
 - a. Provide stainless steel guide rails, supports, chains and shackles for raising and lowering the pumping equipment.

2.04 VALVE PIT ENCLOSURES

- A. Valve pit enclosures shall be constructed of high-density polypropylene located in non-traffic areas. Pits shall be installed to prevent freezing of the pressure force main running through it.
- B. The vault shall be shall a "E-Z Vault" be as manufactured by Mueller Company or approved equal.

2.05 CONTROL PANEL AND CONTROLS

- A. Control Panel
 1. NEMA 4X Fiberglass enclosure, fully enclosed and all panel hardware mounted on a separate inside plate organized to facilitate maintenance and repair. Panel factory equipped with an oxidation inhibitor and wall mounting brackets.
 - a. Provide a circuit breaker for total panel and individual breakers for pumps and alarms so that alarms remain energized when pump breaker is tripped.
 2. Hardware includes start and run capacitors, start relay, circuit breaker (quick-make/quick-break action on manual operation) with bi-metallic ambient compensated overload relay with heaters to protect both start and run windings, a manual on switch and alarm light. Provide individual circuit breaker for control system.

3. Provide terminal strip for float control wires and
- 4 120 volt AC control circuit.
5. Panel so designed to be wall mounted.
6. Enclosure to be lockable, with padlock. Unnecessary punch outs not permitted. Enclosure to contain the following:
 - a. Visible red lights indicating high water level conditions.
7. Provide electrical surge protection device as part of the unit package.

B. Floats

1. The electric power cord to the pump shall be SO type construction suitable for submersion in sewage. The cord is to be sealed by use of a cord grip, with individual conductors additionally sealed into the cord cap assembly with epoxy sealing compound. Seal the cord cap into the motor housing with a Buna-N a-ring, providing a completely watertight electrical connection.
2. Sealed float-type mercury switches shall control sump level and high-level alarm signal. For corrosion and shock resistance the mercury tube switches are factory sealed in a solid polypropylene float, with internal weight. The float power and support wire shall have a heavy Neoprene jacket; provide an intrinsically safe UL approved relay to be wired to each float type mercury switch.
3. Support the float switches by the cord that is connected to the junction box. Provide a junction box to be drilled and tapped for the four - 3/4-inch diameter conduits for wiring to Pump control Panel.
4. Provide three mercury switches one for pump start, one for pump stop, and one to signal high-level sump alarm. On sump level rise, lower mercury switch shall first be energized, then upper level switch shall next energize and start pump. With pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. If level continues to rise when pump is operating, alarm switch shall energize. Level switches adjustable for level setting, from the surface.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine units for defects that will adversely affect installation or cause latent defects in completed work. Inform Inspector of defects. Do not proceed with installation until defects have been corrected.

- B. Refer to manufacturer's instruction and installation manual before proceeding with installation of units. Verify other construction work is complete to the extent that substrate on which electrical apparatus is to be installed is ready to receive same.
- C. Verify direction of motor rotation in equipment before making final connections to electrically operated equipment.

3.02 PREPARATION

- A. Field Measurement:
 - 1. The Drawings are generally indicative of the Work, but are not an exact representation of all conditions involved; therefore, set units, piping, etc. to suit actual field measurements.
 - 2. Submit details of proposed departures necessitated by field conditions or other causes to the Authority for approval. Keep pipe and unit interiors cleared of debris as construction progresses.
- B. Keep pipe and unit interiors cleared of debris as construction progresses.
- C. Earthwork
 - 1. Make excavations for units to a nearly vertical plane and not to exceed the nominal dimensions of the concrete anchor outside diameter.
 - 2. If rock excavation is required, take rock out to limits specified previously.
 - 3. If surface pavement of any type is encountered, vehicle or pedestrian ways, cut such pavement to a rectangular shape as opposed to circular shape of unit. Make limits of cut not to exceed one-foot beyond excavation limit as specified previously.

3.03 INSTALLATION

- A. Install units in strict accordance with manufacturer's instruction and installation manual, and at locations and in accordance with Details indicated on the Drawings.
 - 1. Install valve vault between the unit and the main sewer piping in accordance with the Standard Drawings.
- B. Install units on a six inch deep compacted layer of aggregate meeting requirements of ASSHTO No 57 Stone. Install material as backfill up to highest pipe connection.

- C. Anti-Flotation Anchor Installation, Fiberglass Tank: Form and pour concrete anchors in accordance with requirements of Division 3 Concrete. Prefabricated anchors, as qualified previously in this section, are acceptable.
- D. Underground Systems: Install underground electric cable in accordance with Article 300-5 of the NEC, in accordance with previous requirements of this Section, and the following requirements exceeding NEC:
 - 1. Earthwork: Perform earthwork for buried electric cable as specified for piping under Section 02732.
 - 2. Provide two feet minimum cover over cable unless indicated otherwise on the Drawings.
 - 3. Make electrical cable penetrations through the tank absolutely watertight.
- E. Grounding: Perform grounding of electrical systems and metal enclosures in accordance with Article 250 of the NEC.
- F. Control Panel Installation: Fasten control panel and cable to exterior of the building or post (for post mounted) using fasteners suitable for anchoring into the particular type of surface, and fasten in accordance with current accepted trade practices. Only screw-type corrosion-resistant fasteners are acceptable.
 - 1. Install control panel four feet above existing grade, measured to the bottom of the panel.
 - 2. If post mounts installation, provide post of sufficient length to permit three feet of embedment in ground and the four foot clearance requirement stated above.

3.05 FIELD QUALITY CONTROL

- A. General: Upon completion of installation of the grinder pump units, including but not limited to control panel mounting, electrical work installation and connections, pressure service lateral installation, and unit backfilling, each being performed in a manner satisfactory to the Authority, advise the unit manufacturer that the units have been installed and are ready to be inspected and tested.
 - 1. In cooperation with the unit manufacturer, determine a mutually acceptable schedule for inspection and testing of installed units.
 - 2. Conduct the Performance Test specified herein prior to the property owner's electrical wiring and plumbing connections to the grinder pump units.

3. Conduct tests as specified herein so that each unit installed in the Project is tested to the unit manufacturer's and Authority's satisfaction. Provide the Owner with documentation of such manufacturer's acceptance test in the form of a letter to the Owner attesting to this test requirement.
 4. Provide tools, materials, water, temporary power, apparatus, and instruments necessary for unit testing. Conduct the specified tests in the presence of and to the satisfaction of the unit manufacturer and the Authority.
- B. Performance Test: Demonstrate (with the Personnel of the Owner observing), to the satisfaction of the Authority and manufacturer, the mechanical performance of each unit when operated in accordance with the design intent indicated by the Drawings and described in this Section of the Specifications.
1. Connect 120V temporary power source to the alarm circuit at the control panel.
 2. Fill the tank with sufficient water to test the high level audible and visual alarms at the control panel.
 3. Connect 240V temporary power source to the power circuit at the control panel and run the unit through a minimum of three operation cycles to check pump operation and shut-off.
 4. If the demonstrations are satisfactory to the Authority, the test will be considered concluded. If deficiencies are found, they shall be corrected as follows and the test repeated until the Authority determines that the unit has performed satisfactorily.
 - a. Unit manufacturer to correct pump, internal piping and control panel deficiencies.
 - b. Installer shall correct installation deficiencies.
- C. Watertightness Test, Fiberglass Tank:
1. Fill the completely installed units above the highest tank wall penetration (including electrical) with clear water. Allow a one hour stabilization period and then commence a one hour exfiltration test.
 2. Measure and record the water level, with the Authority observing, both at the beginning and end of the test period.
 3. An acceptable exfiltration test will be when no water leakage in the closed unit is detectable by the measurements.

- E. Electrical Systems Test: Unless waived in writing by the Authority, perform tests and trials in the presence of a duly authorized representative of the Authority. When the presence of such representative is so waived, furnish to the Authority sworn statements, in duplicate, of the tests made and the results thereof.
1. Inspection: Have the work inspected by an authorized inspection agency, and such other agencies having jurisdiction, for compliance with National Electrical Code and obtain certificates of approval, acceptance, and compliance with code regulations. Work shall not be deemed complete until such certifications have been delivered to the Owner.
 2. Testing; Test materials, supplies and parts and assemblies thereof, entering into the Work, in conformity with the best currently approved method for the particular type and class of work.
 - a. Render the entire installation free from short circuits and improper grounds. Test feeders cable disconnected from the power source. Then test the entire power circuit and the panel with the pumping equipment operating. In no case, shall the insulation resistance be less than one hundred thousand ohms.
 - b. Perform initial electrical system tests using meggers, ammeters, voltmeters, insulation resistance testers, and high-pot testers prior to placing electrical systems into complete operation.
 - 1) Use meggers with an adjustable 2.5/5.0 KV range which will permit reading of 0.05 to 100,000 Megohms. The minimum testing voltage obtained by adding 1000 volts to twice the rated voltage of the cable, device, apparatus or equipment. In no case shall the insulation resistance be less than one Megohm. However, the recommended insulation resistance measurements of each test shall conform to IEEE and ANSI Standards.
 - c. Correct failures in a manner satisfactory to the Authority or his authorized representative.

END OF SECTION