

EQUIPMENT DETAILS

DESIGN LIFE: Environment One Corporation grinder pumps have a design life of 25 years however. EOne's 35 years of experience and 350,000 units in operation, allows us to provide credible information with respect to whole of life costs, life expectancy of equipment and actual operating costs. We are the only organization to have had the equipment we are supplying installed in Pressure Sewer Systems for the expected life of the unit. Typically we get 10 years between service calls. Independent operating data from various water authorities is attached.

PUMP: The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier. All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

GRINDER: The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder will be a one-piece, forged 4140 cutter wheel of the rotating type with inductively hardened cutter teeth (Rockwell 55-58c) for abrasion resistance. A stationary quench hardened and ground shredding ring shall be provided. The shredding ring will have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque.

This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

- The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
- The maximum velocity through the cutting mechanism must not exceed 1.15 L/s second. This is a critical design element to prevent jamming and as such must be adhered to.
- The inlet shroud shall have a diameter of no less than 127mm.
- The impeller mechanism must rotate at a nominal speed of no greater than 1450 rpm. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

ELECTRIC MOTOR: As a maximum, the motor shall be a 0.75kW, 1425 RPM, 240 Volt 50 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 11.4 Nm. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. The wet portion of the motor armature must be 300 Series stainless.



MECHANICAL SEAL: The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

TANK: High Density Polyethylene Construction. The tank shall be a wetwell design made of high density polyethylene of a grade selected for environmental stress cracking resistance. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to maximum external soil and hydrostatic pressure.

DISCHARGE HOSE AND DISCONNECT/VALVE: All discharge fittings and piping shall be constructed of 304 Series stainless steel, polypropylene, EPDM or PVC. The discharge hose assembly shall include a shut-off valve rated for 200 psi WOG and a quick disconnect feature to simplify installation and pump removal. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

ELECTRICAL QUICK DISCONNECT: The grinder pump core shall include a factory installed NEMA 6P electrical quick disconnect (EQD) for all power and control functions. The EQD will be supplied with a minimum of 15m of useable electrical supply cable to connect to the alarm panel. The EQD requires no tools for assembly, seals against water before the electrical connection is made, and includes radial seals to assure watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts.

CHECK VALVE: The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 152mm of water at maximum rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A non-metallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection moulded part made of an engineered thermoplastic resin. The working pressure of the valve shall be at least 235 psi.

ANTI-SIPHON VALVE: The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A non-metallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-moulded from an engineered thermoplastic resin. Anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

CORE UNIT: The grinder pump station shall have an easily removable core assembly containing pump, motor, grinder, all motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. The watertight integrity of the core unit shall be established by a 100% factory test at a minimum of 5 PSIG.

CONTROLS: All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. Wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. Level sensor housing must be sealed via a radial type seal. Level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. Level sensing housing must be a high-impact thermoplastic copolymer over-moulded with a thermo plastic elastomer. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in



an integral air column connected to a pressure switch. The air column shall be integrally moulded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be an integral to the pump core assembly in a single readily exchange unit.

Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump. All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into the tank mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY INSTALLED NEMA 6P EQD half attached to it.

ALARM PANEL: Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The alarm panel shall contain one (1) 15-amp, double-pole circuit breaker for the pump core's power circuit and one (1) 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

Protection Package, consisting of:

- Brownout Protection w/ Trouble Indication
- Run Dry Protection w/ Trouble Indication
- High System Pressure Protection w/ Trouble Indication

SERVICEABILITY: The grinder pump core, including level sensor assembly, shall have two lifting hooks complete with lift-out harness connected to its top housing to facilitate easy core removal when necessary. The level sensor assembly must be easily removed from the pump assembly for service or replacement. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. Each EQD half must include a water-tight cover to protect the internal electrical pins while the EQD is unplugged. A pump push-to-run feature will be provided for field trouble shooting. The push to run feature must operate the pump even if the level sensor assembly has been removed from the pump assembly. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

BOUNDARY KIT: 316 Stainless steel swing check no return valve (1 ½"), 316 stainless steel ball isolating valve (1 ½") and a 316 stainless steel flushing tee with polyethylene plug. Two 316 stainless steel 1 ¼" male nipples to connect components, 577 Loctite on all threaded joints apart from PE plug which has thread-tape as sealant. All housed in an underground "Toby Box" enclosure as per drawings attached. Valve assembly pressure tested to 16Bar prior to delivery. **FLUSHING PIT:** Flushing Point boxes shall be manufactured from Polyethylene. Flushing Point Kits shall comprise 2" BSP (50mm) isolating valve (stainless steel) and polyethylene cam lock fitting. Isolating valve shall be rated and tested to 16 bar (232 PSI).

