

**D-Series
Wetwell/Drywell
Grinder Pump Station
with
Wired Level Sensor**

Typical Specifications

**Semi-Positive
Displacement Type
Grinder Pump
Stations**

1.0 GENERAL

- 1.01 GENERAL DESCRIPTION:** The **MANUFACTURER** shall furnish complete factory-built and tested Wetwell/Drywell Grinder Pump Station(s), each consisting of grinder pump(s) suitably mounted in a basin constructed of high density polyethylene (HDPE) for simplex stations and HDPE or Fiberglass Reinforced Polyester Resin for duplex stations with dimensions and capacities as show on the Contract Drawings, NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon valve/check valve, each assembled in the basin, electrical alarm panel and all necessary internal wiring and controls. Component type grinder pump systems that require field assembly will not be acceptable due to the potential problems that can occur during field assembly. All components and materials shall be in accordance with section 2.0 of this Product Specification. For ease of serviceability, all pump, motor/grinder units shall be of like type and horsepower throughout the system.
- 1.02 SUBMITTALS:** After receipt of notice to proceed, the **MANUFACTURER** shall furnish a minimum of six sets of shop drawings detailing the equipment to be furnished including dimensional data and materials of construction. The **ENGINEER** shall promptly review this data, and return two copies as accepted, or with requested modifications. Upon receipt of accepted shop drawings, the **MANUFACTURER** shall proceed immediately with fabrication of the equipment.
- 1.03 MANUFACTURER:** Grinder pump stations, complete with all appurtenances, form an integral system, and as such, shall be supplied by one grinder pump station manufacturer. The **CONTRACTOR** shall be responsible for the satisfactory operation of the entire system. The equipment specified shall be a product of a company experienced in the design and manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts. The **MANUFACTURER** shall provide, upon request, a reference and contact list from ten of its largest contiguous grinder pump installations of the type of grinder pumps described within this specification.

The **MANUFACTURER** of the grinder pump station shall be Environment One Corporation (or Proposed Alternate).

Attention is directed to the fact that the drawings and overall system design are based on a particular piece of equipment from a particular manufacturer. These specifications are intended to provide guidelines for standard equipment of a recognized manufacturer who already meets all the requirements of this specification.

- 1.03a ALTERNATE EQUIPMENT:** In the event that the **CONTRACTOR** or another supplier proposes an Alternate to the specified **MANUFACTURER**, the **ENGINEER** recognizes that it will be difficult to conform to certain details of this Specification due to different manufacturing techniques or grinder pump station designs. If proposing an Alternate, the **CONTRACTOR** (supplier) must submit, no less than 15 business days in advance of the bid date, a complete description of any changes that will be necessary to the system design, a complete submittal package as outlined in Section 1.02 SUBMITTALS, a system hydraulic analysis based on the proposed pump (including pipe sizes, flows, velocities, retention times and number and location of recommended valves and cleanouts, if any), a list of exceptions to this specification, and demonstration of compliance to Section 1.04 EXPERIENCE CLAUSE of this specification. The **CONTRACTOR** (supplier) must also complete the Manufacturer Disclosure Statement found at the end of this specification. This information must be submitted to the **ENGINEER** for pre-approval of the alternate equipment being proposed and determination of compliance with these Contract Documents. If the equipment differs materially or differs from the dimensions given on the Drawings, the **CONTRACTOR** (supplier) shall submit complete drawings showing elevations, dimensions, or any necessary changes to the Contract Documents for the proposed equipment and its installation. Pre-approval, if granted, will be provided in writing by the **ENGINEER** to the **CONTRACTOR** (supplier) at least five business days in advance of the bid date. If the **ENGINEER'S** approval is obtained for Alternate Equipment, the **CONTRACTOR** (supplier) must make any needed changes in the structures, system design, piping or electrical systems necessary to accommodate the proposed equipment at the expense of the **CONTRACTOR** (supplier).

1.04 EXPERIENCE CLAUSE: The equipment furnished hereunder shall be the product of a company experienced in the design and manufacture of grinder pumps specifically designed for use in low pressure systems. All manufacturers proposing equipment for this project shall have at least 10 years of experience in the design and manufacture of units of identical size(s) and performance to the specified units. All manufacturers proposing equipment for this project must also have not less than 500 successful installations of low pressure sewer systems utilizing grinder pumps of like type to the grinder pumps specified herein. An installation is defined as a minimum of 25 pumps discharging into a common force main which forms a low pressure sewer system. The **CONTRACTOR** (supplier) proposing alternate equipment shall also submit, as part of the bid schedule, an installation list with contact person(s), phone number(s) and date(s) of at least 10 installations of the type of pump specified herein that have been in operation for at least 10 years.

In lieu of this experience clause, the **CONTRACTOR** (supplier) of alternate equipment will be required to submit a 5-year performance bond for 100 percent of the stipulated cost of the equipment as bid and as shown in the Bid Schedule. This performance bond will be used to guarantee the replacement of the equipment in the event that it fails within the bond period.

1.05 OPERATING CONDITIONS: The pumps shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 PSIG), 11 GPM against a rated total dynamic head of 92 feet (40 PSIG), and 7.8 GPM against a rated total dynamic head of 185 feet (80 PSIG). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

1.06 WARRANTY: The grinder pump **MANUFACTURER** shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 24 months after notice of **OWNER'S** acceptance, but no greater than 27 months after receipt of shipment. Any manufacturing defects found during the warranty period will be reported to the **MANUFACTURER** by the **OWNER** and will be corrected by the **MANUFACTURER** at no cost to the **OWNER**.

(OPTIONAL) Certified Installation Program – In lieu of the above warranty, at no charge, the Certified Installation Program with the same coverage as E/One's standard warranty will be granted for residential applications of the DH071 and DH151 grinder pump stations when the installation uses an E/One Uni-Lateral Stainless Steel Curb Stop Assembly (Section 2.12); E/One Sentry Protect Plus alarm panel (Section 2.13); and the E/One Certified Installation and Start-Up forms located at apps.eone.com have been successfully completed and submitted.

Only after the installation and start-up data have been successfully completed and submitted via apps.eone.com will the **OWNER** be issued a 5-Year Certified Installation Program certificate for each applicable DH071 or DH151 grinder pump station. This certificate is the proof of the program coverage. If submissions are not received, no additional coverage has been applied.

1.07 WARRANTY PERFORMANCE CERTIFICATION: As a bid certification requirement, each bidder shall provide with their bid schedule a Warranty Performance Certification statement executed by the most senior executive officer of the grinder pump **MANUFACTURER**, which certifies a minimum of a 24-month warranty. They must further detail any exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition, including all associated labor and shipping fees, and certify that the **MANUFACTURER** will bear **all** costs to correct any original equipment deficiency for the effective period of the warranty. All preventive maintenance type requirements shall be included in this form as exclusions. These requirements include, but are not limited to, unjamming of grinder mechanism, periodic motor maintenance, and periodic cleaning of liquid level controls. Should the **CONTRACTOR** (supplier) elect to submit a performance bond in lieu of the experience clause outlined above, this Warranty Performance Certification shall also be used as a criterion to evaluate the **CONTRACTOR'S** (supplier's) performance over the warranty period. A Warranty Performance Certification form is included with the bid schedule and must be completed and submitted as part of the bid package. Bids with incomplete forms or missing forms will be considered nonresponsive.

2.0 PRODUCT

2.01 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. This 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.

2.02 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 (cutter wheel) 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 impeller shall be a one-piece, 4140 cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque. These materials have been chosen for their capacity to perform in the intended environment as they are materials with wear and corrosive resistant properties.

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 minimize 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:

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
2. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second. This is a critical design element to minimize jamming and as such must be adhered to.
3. The inlet shroud shall have a diameter of no less than 5 inches. Inlet shrouds that are less than 5 inches in diameter will not be accepted due to their inability to maintain the specified 4 feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism and minimizes blinding of the pump by large objects that block the inlet shroud.
4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 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, wipes, 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.

2.03 ELECTRIC MOTOR: As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 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 8.4 foot pounds. 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. Non-capacitor start motors or permanent split capacitor motors will not be accepted

because of their reduced starting torque and consequent diminished grinding capability. The wet portion of the motor armature must be 300 Series stainless. To reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted.

2.04 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.

2.05 TANK AND INTEGRAL ACCESSWAY: (Model DH071) High Density Polyethylene Construction. The tank shall be a Wetwell/Drywell design made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The 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 150 percent of the maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the contract drawings.

The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.

All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32', 25' of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a 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. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

2.06 TANK & INTEGRAL ACCESSWAY: (Models DH151 150 Gallon Simplex & DH152 150 Gallon Duplex) High Density Polyethylene Construction. The tank shall be a Wetwell/Drywell design made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction

are to be thermally welded and factory tested for leak tightness. The 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 150 percent of the maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the contract drawings.

The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The cover shall be high density polyethylene, green in color, with a load rating of 150 lbs per square foot. The accessway design and construction shall enable field adjustment of the station height in increments of 3" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.

All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32', 25' of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a 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. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

2.07 TANK & INTEGRAL ACCESSWAY: (DH272, 275-Gallon Duplex & DH502, 500-Gallon Duplex) Fiberglass reinforced polyester resin. The tank shall be a wetwell/drywell design constructed of fiberglass reinforced polyester resin with a high density polyethylene accessway. Accessway corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All polyethylene seams created during tank construction are to be thermally welded and factory tested for leak tightness. The 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 150 percent of the maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the contract drawings.

The drywell accessway shall be an integral extension of the wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The cover shall be high density polyethylene, green in color, with a load rating of 150 lbs per square foot. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak-free installation, no field penetrations will be acceptable.

All discharge piping shall be constructed of 304 Series stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32', 25' of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a 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. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

- 2.08 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 6 inches 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 nonmetallic 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 molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.
- 2.09 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 nonmetallic 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-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.
- 2.10 CORE UNIT:** The grinder pump station shall have a cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level controls, electrical quick disconnect and wiring. The core unit shall be installed in the basin by the manufacturer. Field assembly of the pump and controls into the basin is not acceptable because of potential workmanship issues and increased installation time. In some cases, stations taller than 96" may be shipped on their side without the cores assembled in the basin for freight purposes but this is the only exception. The core unit shall seal to the tank deck with a stainless steel latch assembly. The latch assembly must be actuated utilizing a single quick release mechanism requiring no more than a half turn of a wrench. The watertight integrity of each core unit shall be established by a 100 percent factory test at a minimum of 5 PSIG.
- 2.11 CONTROLS:** All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. Locating the motor starting controls in a plastic enclosure is not acceptable. The wastewater level sensing controls shall be housed in a separate enclosure from

motor starting controls. The level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. The 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. The level sensing housing must be a high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer. The use of PVC for the level sensing housing is not acceptable.

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 molded 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 integral to the pump core assembly in a single, readily-exchanged 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. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. 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 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.

2.12 STAINLESS STEEL CURB STOP/CHECK VALVE ASSEMBLY (UNI-LATERAL): The curb stop shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.

The stainless steel check valve shall be integral with the curb stop valve. The check valve will provide a full-ported 1-1/4" passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure.

Engineered Thermoplastic Fittings – All plastic fitting components are to be in compliance with applicable ASTM standards.

All pipe connections shall be made using compression fitting connections including a Buna-N O-ring for sealing to the outside diameter of the pipe. A split-collet locking device shall be integrated into all pipe connection fittings to securely restrain the pipe from hydraulic pressure and external loading caused by shifting and settling.

Curb Boxes – Curb boxes shall be constructed of ABS, conforming to ASTM-D 1788. Lid top casting shall be cast iron, conforming to ASTM A-48 Class 25, providing magnetic detectability, and be painted black. All components shall be inherently corrosion-resistant to ensure durability in the ground. Curb boxes shall provide height adjustment downward (shorter) from their nominal height.

High Density Polyethylene Pipe (Supplied by others) – Pipe shall be have a working pressure of 160 psi minimum and shall be classified SDR per ASTM D 3035.

Pipe Dimensions – The SDR (Standard Dimension Ratio) of the pipe supplied shall be as specified by the **SPECIFYING ENGINEER**. SDR 7, 9 and 11 fittings are available from the **MANUFACTURER**.

Factory Test – The stainless steel, combination curb stop/check valve component shall be 100 percent hydrostatically tested to 150 psi in the factory.

Construction Practices – Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking should be in accordance with the pipe manufacturer's recommendations. The pipe should be handled in such a manner that it is not damaged by being dragged over sharp objects or cut by chokers or lifting equipment.

Segments of pipe having cuts or gouges in excess of 10 percent of the wall thickness of the pipe shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fusion joining method. Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the butt-fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt-fusion equipment used in the joining procedure shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure.

Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable-type chokers should be avoided. Nylon slings are preferred. Spreader bars should be used when lifting long, fused sections. Care should be exercised to avoid cutting or gouging the pipe.

Installation – Assemble the compression fittings according to the fitting manufacturer's recommendations.

The trench and trench bottom should be constructed in accordance with ASTM D 2321. Embedment materials should be Class I, Class II or Class III materials as defined in ASTM D 2321. The use of Class IV and/or Class V materials for embedment is not recommended and should be allowed only with the approval of the **SPECIFYING ENGINEER**. Bedding of the pipe should be performed in accordance with ASTM D 2321. Compaction should be as specified in ASTM D 2321. Deviations from the specified compaction shall be approved by the **SPECIFYING ENGINEER**.

Haunching and initial backfill should be as specified in ASTM D 2321 using Class I, Class II or Class III materials. Materials used and compaction shall be as specified by the **SPECIFYING ENGINEER**. In cases where a compaction of 85 percent Standard Proctor Density is not attainable, the **SPECIFYING ENGINEER** may wish to increase the SDR of the pipe to provide adequate stiffness. ASTM D 2321 sections titled "Minimum Cover for Load Application," "Use of Compaction Equipment" and "Removal of Trench Protection" should apply unless directed otherwise by the **SPECIFYING ENGINEER**.

2.13 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 enclosure shall not exceed 10.5" W x 14" H x 7" D, or 12.5" W x 16" H x 7.5" D if certain options are included.

The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 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.

The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:

1. When liquid level in the sewage wet-well rises above the alarm level, the contacts on the alarm

pressure switch activate, audible and visual alarms are activated, and the redundant pump starting system is energized.

2. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.
3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.

The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.

(OPTIONAL) Alarm Contacts Package

- **Alarm Activated Dry Contacts** – Normally open relay contact closes upon alarm activation.
- **Alarm Activated Contacts for Remote Sentry Indoor Alarm Module** – Will work with or without power to the alarm panel and is designed to work with E/One's Remote Sentry.

(OPTIONAL) Generator Receptacle and Auto Transfer – The alarm panel shall include a 20 amp, 250 VAC generator receptacle with a spring-loaded, gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a NEMA 4X rating. An automatic transfer switch shall be provided, which automatically switches from AC power to generator power. Power shall be provided to that alarm panel through the generator receptacle whenever power is present at the receptacle, allowing the audible and visual alarms to function normally in generator mode. When power is no longer applied to the generator receptacle, the panel is automatically switched back to the AC Mains power. (No manual switching within the panel enclosure is necessary to switch from generator power back to AC Mains, so the mode cannot be inadvertently left in the generator position after pumping down the station in generator mode as is the case with a manual transfer switch).

(OPTIONAL) Service Equipment/Main Service Disconnect Breaker – A separate, internal breaker rated and approved for use as "service equipment" and acts as a main service disconnect of the grinder pump station shall be provided.

(OPTIONAL) Remote Sentry Indoor Alarm Module – A separate, remote indoor alarm module shall be provided to indicate a high level alarm with or without AC power to the grinder pump station. The Remote Sentry indoor alarm module shall have an internal power source enabling its continued operation without AC power. The Remote Sentry shall have an audible alarm and a visual alarm, both of which shall automatically reset if the high level alarm condition is eliminated. The Remote Sentry indoor alarm module shall include a Silence button for the audible alarm and a Test button.

(OPTIONAL) Run-time/Hour Meter – A run-time or hour meter to display the total run-time or operation time for the pump core shall be provided.

(OPTIONAL) Event/Cycle Counter – An event or cycle counter to display the number of operations of the pump core shall be provided.

(OPTIONAL) SENTRY SIMPLEX PROTECT

Provides protection from the following operating conditions:

- **Low Voltage (Brownout) Protection** – A lockout cycle will prevent the motor from operating

and will illuminate an LED if:

- the incoming AC Mains voltage drops below a predetermined minimum, typically 12% of nameplate (211 volts for a 240 volt system) for 2 to 3 seconds, regardless of whether the motor is running
- the lockout cycle will end if the incoming AC Mains voltage returns to a predetermined value, typically 10% of nameplate (216 volts for a 240 volt system)

The system continues to retest the voltage every second indefinitely. If the lockout cycle has been initiated and the voltage comes back above the predetermined starting voltage, the system will function normally. The LED remains illuminated during a Brownout condition and remains latched until the pump breaker is turned off and then on again (reset). The audible and visual alarm will not be activated unless there is a high wastewater level in the tank.

- **Run Dry Protection** – A 20-minute lockout cycle will prevent the motor from operating and will illuminate an LED when the wastewater level in the tank is below the pump inlet level. The condition is rechecked every 20 minutes. If the lockout cycle has been initiated and the condition is satisfied, the pump is not allowed to cycle normally but the LED remains latched. The LED will remain latched until the pump breaker is turned off and then on again (reset). If the condition is not satisfied after 3 consecutive attempts, the visual alarm will be activated until the pump breaker is turned off and on (reset) or until there is one cycle of normal operation. If a high level condition is presented at any time, a pump run cycle will be activated.
- **High System Pressure Protection** – A 20-minute lockout cycle will prevent the motor from operating and will illuminate an LED when the pressure in the discharge line is atypically high (closed valve or abnormal line plug). The condition is rechecked every 20 minutes. If the condition is satisfied, the pump is allowed to cycle normally but the LED remains latched. If the condition is not satisfied after 3 consecutive attempts, the pump is locked out indefinitely until the condition is removed and power is reset. The LED will remain latched until the pump breaker is turned off and then on again (reset). The audible and visual alarm will be activated.

In all of the above cases, if more than one error condition is presented, the LED depicting the most recent error condition will be displayed.

Other included features:

- Alarm Activated Dry Contacts – Normally open relay contact closes upon alarm activation.
- Alarm Activated Contacts for Remote Indoor Alarm Module – Will work with or without power to the alarm panel and is designed to work with E/One's Remote Sentry.
- Includes Inner Door Dead Front
- Separate LED's for each condition

(OPTIONAL) SENTRY SIMPLEX PROTECT PLUS:

- All Sentry Protect features (as detailed above)
- High/Low Voltage monitoring with Trouble indication
- High/Low Wattage (wattage is used instead of current because it is a better indicator of pump performance) monitoring with Trouble indication
- Extended Run Time monitoring with Trouble indication
- Cycle/Event Counter
- Run Time Counter (Hour Meter)
- Run Time Limit — time adjustable, user-selected options: 10 minutes (default) to 120 minutes in 1-minute intervals
- Power-up Delay — time adjustable, user-selected options: None (default), to 300 minutes in 1-minute intervals
- Alarm Delay — time adjustable, user-selected options: None (default) or adjustable in 1-minute intervals
- System self-test diagnostic
- User-selectable Alarm latch
- User-selectable Protect Mode disable
- User-selectable buzzer timer

Specific Protect PLUS indicators and programming features shall include:

- Ready LED to indicate AC power to the station is satisfactory
- Pump Run LED to indicate pump is operating
- Trouble LED indicator and predictive Visual Alarm notification (“blinking” alarm lamp; clears on Normal cycle)
- High Level Alarm LED indicator
- Manual Run switch to manually activate pump
- Menu-driven programmable controller with navigation overlay-type buttons (Enter, Scroll, Up, Down)
- Normal Operation LED and Mode button for Mode status
- Pump Performance menu LED with LCD Display of the following pump performance statistics:
 - Real-time Voltage
 - Real-time Amperage
 - Real-time Wattage
 - Minimum/Maximum/Average Voltage
 - Minimum/Maximum/Average Amperage
 - Minimum/Maximum/Average Wattage
 - Minimum/Maximum Run-time
 - Average Run-time
 - Last Run-time
 - Cycle/Event Counter
 - Run Time Counter (Hour Meter)
- Diagnostics Menu LED
- Initialize System Menu LED
- Run Limit Menu LED
- Alarm Delay Menu LED
- Power Delay Menu LED

DUPLEX STATIONS

MOD T260 DUPLEX:

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 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 standard enclosure shall not exceed 12.5" W x 16" H x 7.5" D.

The panel shall contain one 15-amp single pole circuit breaker for the alarm circuit and one 15-amp double pole circuit breaker per core for the power 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.

The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

The high-level alarm system shall operate as follows:

1. The panel will go into alarm mode if either pump's alarm switch closes. During the initial alarm mode both pumps will run and the alarm light and buzzer will be delayed for a period of time based on user settings (default is 3-1/2 minutes). If the station is still in high-level alarm after the delay, the light and buzzer will be activated.
2. The audible alarm may be silenced by means of the externally mounted push-to-silence button.

3. The visual alarm remains illuminated until the sewage level in the wet well drops below the “off” setting of the alarm switch for both pumps.

The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.

(OPTIONAL) Generator Receptacle and Auto Transfer – The alarm panel shall include a 20 amp, 250 VAC generator receptacle with a spring-loaded, gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a NEMA 4X rating. An automatic transfer switch shall be provided, which automatically switches from AC power to generator power. Power shall be provided to the alarm panel through the generator receptacle whenever power is present at the receptacle, allowing the audible and visual alarms to function normally in generator mode. When power is no longer applied to the generator receptacle, the panel is automatically switched back to the AC Mains power. (No manual switching within the panel enclosure is necessary to switch from generator power back to AC Mains, so the mode cannot be inadvertently left in the generator position after pumping down the station in generator mode as is the case with a manual transfer switch).

(OPTIONAL) Service Equipment/Main Service Disconnect Breaker – A separate, internal breaker rated and approved for use as “service equipment” and acts as a main service disconnect of the grinder pump station shall be provided.

(OPTIONAL) Remote Sentry Indoor Alarm Module – A separate, remote indoor alarm module shall be provided to indicate a high level alarm with or without AC power to the grinder pump station. The Remote Sentry indoor alarm module shall have an internal power source enabling its continued operation without AC power. The Remote Sentry shall have an audible alarm and a visual alarm, both of which shall automatically reset if the high level alarm condition is eliminated. The Remote Sentry indoor alarm module shall include a Silence button for the audible alarm and a Test button.

(OPTIONAL) Run-time/Hour Meter – A run-time or hour meter to display the total run-time or operation time for the pump core shall be provided.

(OPTIONAL) Event/Cycle Counter – An event or cycle counter to display the number of operations of the pump core shall be provided.

(OPTIONAL) External Autodialer –

- Four separate voice message alarm zones
- Calls up to 8 telephones, cell phones or pagers
- Built-in line seizure
- Remote Turn Off feature allows termination of activated channel
- EEPROM Memory retains program despite power loss
- Listen-in verification and communication
- Universal dial tone
- Built-in auxiliary output to drive external siren, strobe or relay
- Five optional settings for notifications of a power loss occurrence — instantaneous, 15 minutes, 2 hours, 12 hours or 24 hours
- One channel for power-loss sensing, three hardwired channels for additional input
- Dialer senses loss of power and based on setting; will notify parties of loss condition only when specified time has elapsed
- If power restores before set time has elapsed, no call will be made
- Package includes battery backup and transformer

DUPLEX PROTECT PLUS:

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 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 standard enclosure shall not exceed 12.5" W x 16" H x 7.5" D.

The panel shall contain one 15-amp single pole circuit breaker for the alarm circuit and one 15-amp double pole circuit breaker per core for the power 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.

The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

The high-level alarm system shall operate as follows:

1. The panel will go into alarm mode if either pump's alarm switch closes. During the initial alarm mode both pumps will run and the alarm light and buzzer will be delayed for a period of time based on user settings (default is 3-1/2 minutes). If the station is still in high-level alarm after the delay, the light and buzzer will be activated.
2. The audible alarm may be silenced by means of the externally mounted push-to-silence button.
3. The visual alarm remains illuminated until the sewage level in the wet well drops below the "off" setting of the alarm switch for both pumps.

The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.

Contains the following features:

- **Alarm Activated Dry Contacts** – Normally open relay contact closes upon alarm activation.
- **Alarm Activated Contacts for Remote Indoor Alarm Module** – Will work with or without power to the alarm panel and is designed to work with E/One's Remote Sentry.
- **Includes Inner Door Dead Front**
- **Separate LED's for each condition**

Provides protection from the following operating conditions:

- **Low Voltage (Brownout) Protection** – A lockout cycle will prevent the motor from operating and will illuminate the Trouble LED if:
 - the incoming AC Mains voltage drops below a predetermined minimum, typically 12% of nameplate (211 volts for a 240 volt system) for 2 to 3 seconds, regardless of whether the motor is running
 - the lockout cycle will end if the incoming AC Mains voltage returns to a predetermined value, typically 10% of nameplate (216 volts for a 240 volt system).

The system continues to retest the voltage every second indefinitely. If the lockout cycle has been initiated and the voltage comes back above the predetermined starting voltage, the system will function normally. The Trouble LED remains illuminated during a Brownout condition and a corresponding Brownout message will be displayed on the LCD screen. The LED will turn off when the Brownout condition ends and the LCD message remains latched until the panel is reset. The audible and visual alarm will not be activated unless there is a high wastewater level in the tank.

- **Run Dry Protection** – A 20-minute lockout cycle will prevent the motor from operating and will

illuminate the Trouble LED when the wastewater level in the tank is below the pump inlet shroud. A corresponding Run Dry message will be displayed on the LCD screen. The condition is rechecked every 20 minutes and the LCD message remains latched. If the condition is satisfied, the pump is allowed to cycle normally and the Trouble LED will go out, but the LCD message remains latched. The LCD message will remain latched until the panel is reset. If the condition is not satisfied after 3 consecutive attempts, the visual alarm will be activated until the panel is reset or until there is one cycle of normal operation. If a high level condition is presented at any time, a pump run cycle will be activated.

- **High System Pressure Protection** – A 20-minute lockout cycle will prevent the motor from operating and will illuminate the Trouble LED when the pressure in the discharge line is atypically high (closed valve or abnormal line plug). A corresponding Overpressure message will be displayed on the LCD screen. The condition is rechecked every 20 minutes. If the condition is satisfied, the pump is allowed to cycle normally and the Trouble LED will turn off, but the LCD message remains latched. The LCD message will remain latched until the panel is reset. If the condition is not satisfied after 3 consecutive attempts, the pump is locked out indefinitely and the audible and visual alarm will be activated. The LCD message and alarms will remain latched until the condition is removed and the panel is reset.

In all of the above cases, if more than one error condition is presented, the LCD message depicting the most recent error condition will be displayed.

PROTECT PLUS FEATURES:

- High/Low Voltage monitoring with Trouble indication
- High/Low Wattage (wattage is used instead of current because it is a better indicator of pump performance) monitoring with Trouble indication
- Extended Run Time monitoring with Trouble indication
- Cycle/Event Counter
- Run Time Counter (Hour Meter)
- Run Time Limit — time adjustable, user-selected options: 10 minutes (default) to 120 minutes in 1-minute intervals
- Power-up Delay — time adjustable, user-selected options: None (default), to 300 minutes in 1-minute intervals
- Alarm Delay — time adjustable, user-selected options: zero to 10 minutes in 30-second increments; 4 minutes is default
- System self-test diagnostic
- User-selectable Alarm latch
- User-selectable Protect Mode disable
- User-selectable buzzer timer

Specific Duplex Protect PLUS indicators and programming features shall include:

- Ready LED to indicate AC power to the station is satisfactory
- Pump Run LED to indicate pump is operating (LCD indicates which pump is running)
- Trouble LED indicator and predictive Visual Alarm notification (“blinking” alarm lamp; clears on Normal cycle)
- High Level Alarm LED indicator (LCD indicates which pump is in alarm)
- Manual Run switch to manually activate pumps
- Lead/Lag indication (LCD indicates which pump is lead)
- Menu-driven programmable controller with navigation overlay-type buttons (Enter, Scroll, Up, Down)
- Normal Operation LED and Mode button for Mode status
- Pump Performance menu LED with LCD display of the following pump performance statistics:
 - Real-time Voltage
 - Real-time Amperage
 - Real-time Wattage
 - Minimum/Maximum/Average Voltage
 - Minimum/Maximum/Average Amperage
 - Minimum/Maximum/Average Wattage

- Minimum/Maximum Run-time
- Average Run-time
- Last Run-time
- Cycle/Event Counter
- Run Time Counter (Hour Meter)
- Diagnostics Menu LED
- Initialize System Menu LED
- Run Limit Menu LED
- Alarm Delay Menu LED
- Power Delay Menu LED
- Pump alternating options (no alternation, adjustable time based and test)
- Pump alternating time options — 24 hours to 72 hours in 12-hour increments

(OPTIONAL) Generator Receptacle and Auto Transfer – The alarm panel shall include a 20 amp, 250 VAC generator receptacle with a spring-loaded, gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a NEMA 4X rating. An automatic transfer switch shall be provided, which automatically switches from AC power to generator power. Power shall be provided to the alarm panel through the generator receptacle whenever power is present at the receptacle, allowing the audible and visual alarms to function normally in generator mode. When power is no longer applied to the generator receptacle, the panel is automatically switched back to the AC Mains power. (No manual switching within the panel enclosure is necessary to switch from generator power back to AC Mains, so the mode cannot be inadvertently left in the generator position after pumping down the station in generator mode as is the case with a manual transfer switch).

(OPTIONAL) Service Equipment/Main Service Disconnect Breaker – A separate, internal breaker that is rated and approved for use as “service equipment” and acts as a main service disconnect of the grinder pump station shall be provided.

(OPTIONAL) Remote Sentry Indoor Alarm Module – A separate, remote indoor alarm module shall be provided to indicate a high level alarm with or without AC power to the grinder pump station. The Remote Sentry indoor alarm module shall have an internal power source enabling its continued operation without AC power. The Remote Sentry shall have an audible alarm and a visual alarm, both of which shall automatically reset if the high level alarm condition is eliminated. The Remote Sentry indoor alarm module shall include a Silence button for the audible alarm and a Test button.

(OPTIONAL) External Autodialer –

- Four separate voice message alarm zones
- Calls up to 8 telephones, cell phones or pagers
- Built-in line seizure
- Remote Turn Off feature allows termination of activated channel
- EEPROM Memory retains program despite power loss
- Listen-in verification and communication
- Universal dial tone
- Built-in auxiliary output to drive external siren, strobe or relay
- Five optional settings for notifications of a power loss occurrence — instantaneous, 15 minutes, 2 hours, 12 hours or 24 hours
- One channel for power-loss sensing, three hardwired channels for additional input
- Dialer senses loss of power and based on setting; will notify parties of loss condition only when specified time has elapsed
- If power restores before set time has elapsed, no call will be made
- Package includes battery backup and transformer

2.14 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.

- 2.15 OSHA CONFINED SPACE:** All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per **OSHA 1910.146**, permit-required confined spaces). *“Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant’s body breaks the plane of an opening into the space.”*
- 2.16 SAFETY:** The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump station shall be listed by Underwriters Laboratories, Inc. to be safe and appropriate for the intended use. UL listing of components of the station, or third-party testing to UL standard are not acceptable.

The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard is not acceptable.

3.0 EXECUTION

- 3.01 FACTORY TEST:** Each grinder pump shall be submerged and operated for 1.5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit’s dedicated level controls and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps is not acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two different points on its curve. Additional validation tests include: integral level control performance, continuity to ground and acoustic tests of the rotating components.

The **ENGINEER** reserves the right to inspect such testing procedures with representatives of the **OWNER**, at the **GRINDER PUMP MANUFACTURER’S** facility.

- 3.02 CERTIFIED SERVICE PROGRAM:** The grinder pump **MANUFACTURER** shall provide a program implemented by the **MANUFACTURER’S** personnel as described in this specification to certify the service company as an authorized serviced center. As evidence of this, the **MANUFACTURER** shall provide, when requested, sufficient evidence that they have maintained their own service department for a minimum of 30 years and currently employ a minimum of five employees specifically in the service department.

As part of this program, the **MANUFACTURER** shall evaluate the service technicians as well as the service organization annually. The service company will be authorized by the **MANUFACTURER** to make independent warranty judgments. The areas covered by the program shall include, as a minimum:

1. Pump Population Information — The service company will maintain a detailed database for the grinder pumps in the territory that tracks serial numbers by address.
2. Inventory Management — The service company must maintain an appropriate level of inventory (pumps, tanks, panels, service parts, etc.) including regular inventory review and proper inventory

labeling. Service technicians will also maintain appropriate parts inventory and spare core(s) on service vehicles.

3. Service Personnel Certification — Service technicians will maintain their level-specific certification annually. The certifications are given in field troubleshooting, repair, and training.
4. Service Documentation and Records — Start up sheets, service call records, and customer feedback will be recorded and available by the service company.
5. Shop Organization — The service company will keep its service shop organized and pumps will be tagged with site information at all times. The shop will have all required equipment, a test tank, and cleaning tools necessary to service pumps properly.

3.03 DELIVERY: All grinder pump units will be delivered to the job site 100 percent completely assembled, including testing, ready for installation. Field installation of the pump in tanks under 96 inches is not allowed. Field installation of the level sensor into the tank is not allowed. Grinder pump stations will be individually mounted on wooden pallets.

3.04 INSTALLATION: Earth excavation and backfill are specified under **SITE WORK**, but are also to be done as a part of the work under this section, including any necessary sheeting and bracing.

The **CONTRACTOR** shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.

The grinder pump stations shall not be set into the excavation until the installation procedures and excavation have been approved by the **ENGINEER**.

Remove packing material. User instructions **MUST** be given to the **OWNER**. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 4" inlet grommet (4.50" OD) for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason.

Installation shall be accomplished so that 1 inch to 4 inches of accessway, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anchor.

A 6" inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8" or more than 3/4" shall be used as bedding material under each unit.

A concrete anti-flotation collar, as detailed on the drawings, and sized according to the manufacturer's instructions, shall be required and shall be pre-cast to the grinder pump or poured in place. Each grinder pump station with its pre-cast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes.

If the concrete is poured in place, the unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8" sleeve is required over the inlet prior to the concrete being poured.

The **CONTRACTOR** will provide and install a 4-foot piece of 4-inch SCH 40 PVC pipe with water tight cap, to stub-out the inlet for the property owners' installation contractor, as depicted on the contract drawings.

E/One requires that an E/One Uni-Lateral assembly (E/One part number NB0184PXX or NC0193GXX) or E/One Redundant Check Valve (E/One part number PC0051GXX) be installed in the pipe lateral outside the home between the pump discharge and the street main on all installations.

The electrical enclosure shall be furnished, installed and wired to the grinder pump station by the **CONTRACTOR**. An alarm device is required on every installation, there shall be **NO EXCEPTIONS**. It will be the responsibility of the **CONTRACTOR** and the **ENGINEER** to coordinate with the individual property owner(s) to determine the optimum location for the Alarm Panel.

The **CONTRACTOR** shall mount the alarm device in a conspicuous location, as per national and local codes. The alarm panel will be connected to the grinder pump station by a length of 6-conductor type TC cable as shown on the contract drawings. The power and alarm circuits must be on separate power circuits. The grinder pump stations will be provided with 32 feet, 25 feet of useable, electrical supply cable to connect the station to the alarm panel. This cable shall be supplied with a **FACTORY INSTALLED** EQD half to connect to the mating EQD half on the core.

3.05 BACKFILL REQUIREMENTS: Proper backfill is essential to the long-term reliability of any underground structure. Several methods of backfill are available to produce favorable results with different native soil conditions. The most highly recommended method of backfilling is to surround the unit to grade using Class I or Class II backfill material as defined in ASTM 2321. Class 1A and Class 1B are recommended where frost heave is a concern, Class 1B is a better choice when the native soil is sand or if a high, fluctuating water table is expected. Class 1, angular crushed stone offers an added benefit in that it doesn't need to be compacted.

Class II, naturally rounded stone, may require more compactive effort, or tamping, to achieve the proper density. If the native soil condition consists of clean compactible soil, with less than 12 percent fines, free of ice, rocks, roots and organic material, it may be an acceptable backfill. Soil must be compacted in lifts not to exceed one foot to reach a final Proctor Density of between 85 percent and 90 percent. Heavy, non-compactible clays and silts are *not* suitable backfill for this or any underground structure such as inlet or discharge lines.

If you are unsure of the consistency of the native soil, it is recommended that a geotechnical evaluation of the material is obtained before specifying backfill.

Another option is the use of a flowable fill (i.e., low slump concrete). This is particularly attractive when installing grinder pump stations in augured holes where tight clearances make it difficult to assure proper backfilling and compaction with dry materials. Flowable fills should not be dropped more than 4 feet from the discharge to the bottom of the hole to avoid separation of the constituent materials.

Backfill of clean native earth, free of rocks, roots, and foreign objects shall be thoroughly compacted in lifts not exceeding 12" to a final Proctor Density of not less than 85 percent. Improper backfilling may result in damaged accessways. The grinder pump station shall be installed at a minimum depth from grade to the top of the 1 1/4" discharge line, to assure maximum frost protection. The finish grade line shall be 1" to 4" below the bottom of the lid, and final grade shall slope away from the grinder pump station.

All restoration will be the responsibility of the **CONTRACTOR**. Per unit costs for this item shall be included in the **CONTRACTOR'S** bid price for the individual grinder pump stations. The properties shall be restored to their original condition in all respects, including, but not limited to, curb and sidewalk replacement, landscaping, loaming and seeding, and restoration of the traveled ways, as directed by the **ENGINEER**.

3.06 START-UP AND FIELD TESTING: The **MANUFACTURER** shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the **OWNER'S** personnel in the operation and maintenance of the equipment before the stations are accepted by the **OWNER**.

All equipment and materials necessary to perform testing shall be the responsibility of the **INSTALLING CONTRACTOR**. This includes, as a minimum, a portable generator and power cable (if temporary power is required), water in each basin (filled to a depth sufficient to verify the high level alarm is

operating), and opening of all valves in the system. These steps shall be completed prior to the qualified factory trained technician(s) arrival on site.

The services of a trained factory-authorized technician shall be provided at a rate of 40 hours for every 100 grinder pump stations supplied.

Upon completion of the installation, the authorized factory technician(s) will perform the following test on each station:

1. Make certain the discharge shut-off valve in the station is fully open.
2. Turn ON the alarm power circuit and verify the alarm is functioning properly.
3. Turn ON the pump power circuit. Initiate the pump operation to verify automatic "on/off" controls are operative. The pump should immediately turn ON.
4. Consult the Manufacturer's Service Manual for detailed start-up procedures.

Upon completion of the start-up and testing, the **MANUFACTURER** shall submit to the **ENGINEER** the start-up authorization form describing the results of the tests performed for each grinder pump station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

4.0 OPERATION AND MAINTENANCE

- 4.01 SPARE CORE:** The **MANUFACTURER** will supply one spare grinder pump core for every 50 grinder pump stations installed, complete with all operational controls, level sensors, check valve, anti-siphon valve, pump/motor unit, and grinder.
- 4.02 MANUALS:** The **MANUFACTURER** shall supply four copies of Operation and Maintenance Manuals to the **OWNER**, and one copy of the same to the **ENGINEER**.

END OF SECTION



Environment One Corporation
2773 Balltown Road
Niskayuna, New York 12309
www.eone.com
A PCC Company

LM000354 Rev M
9/18



**ENGINEERED
TO DO ONE JOB
PERFECTLY**

E/ONE
EXTREME
S E R I E S

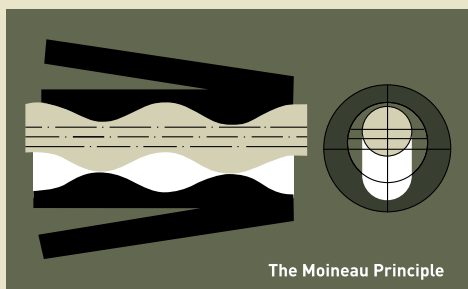
**PRESSURE
SEWER
SYSTEMS**

ENGINEERED TO DO ONE JOB PERFECTLY

At the heart of the E/One Sewer System is the toughest, hardest working pump in the industry. The new standard in excellence, durability, and longevity, the E/One Extreme Series Grinder Pump. Its evolution reflects everything we've learned in 40 years as the originator and leader in the category of low pressure sewer systems.

The pump stations incorporate the grinder pump, motor controls and level sensing device integrated into a compact unit, easily removable for servicing when necessary.

And, the geometry of the pump not only produces a near-vertical pump curve, but allows passage of ground solids without clogging. Because of the low rpm and highest quality components, we experience the lowest service call rate in the industry. An average mean time of 10 years between service calls is typical.



The progressing cavity pump itself is based on the Moineau principle. A rotor turns within a stator, creating a sequence of sealed chambers. The precision-cast and polished stainless steel rotor moves wastewater through these chambers at a nearly constant flow, over a wide range of conditions – from negative to abnormally high heads. Turning at just 1,725 rpm, the one-horsepower motor can pump fluid through more than two miles of small-diameter piping or elevation changes of over 185 feet.

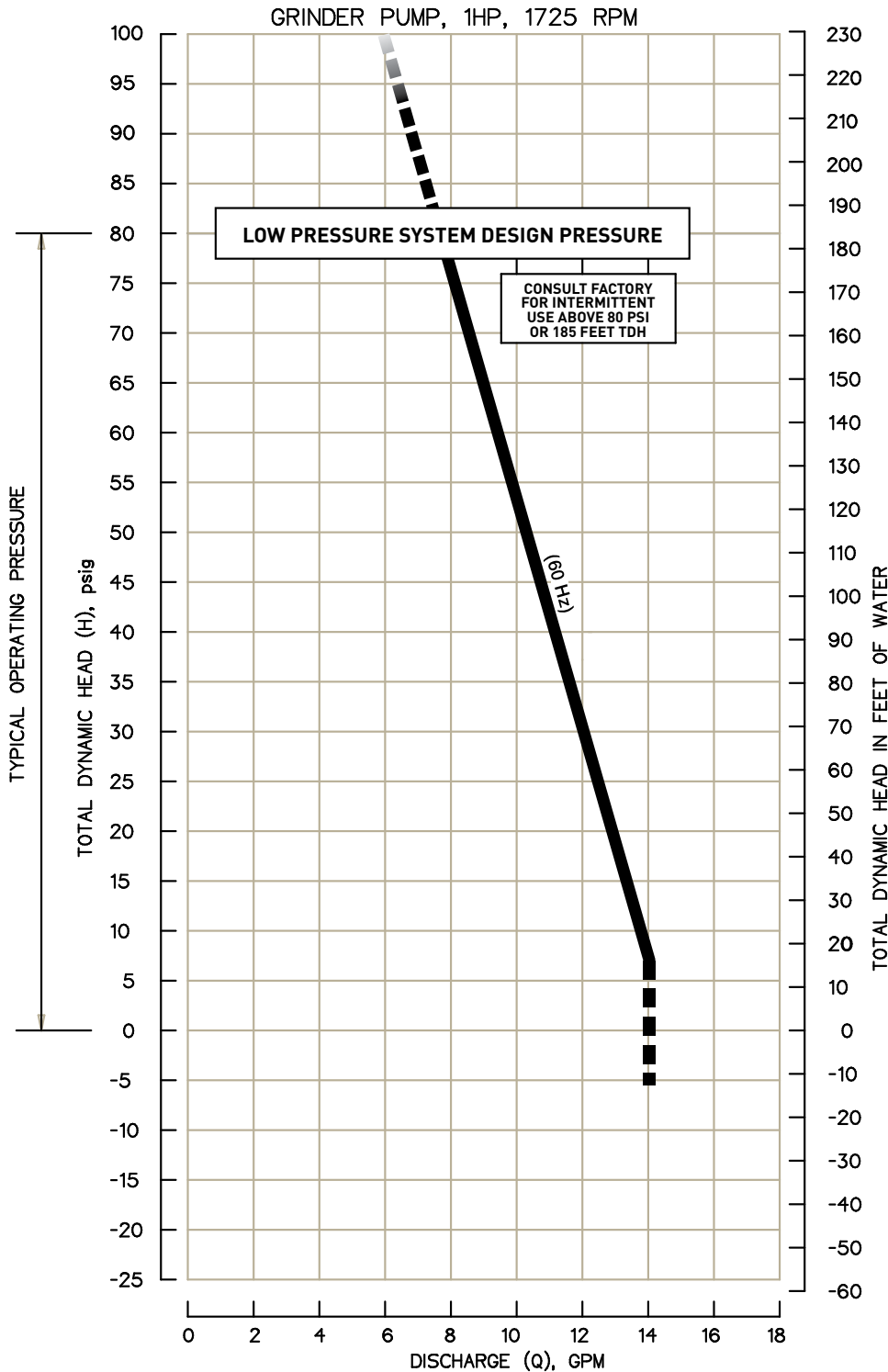
SOME KEY ADVANTAGES:

- **HIGH HEADS/NEGATIVE HEADS.** Reliable operation from negative head to 185 feet of total head for continuous duty reduces the number of lift stations and pipe sizes. This cuts costs – both initially and in long-term operation and maintenance.
- **CONSTANT FLOW.** The system pressures to be overcome by any given grinder pump in a low pressure system vary dramatically over the course of a day. E/One's progressing cavity pump readily accommodates these pressure variations while maintaining a nearly constant flow without ever operating at "near shut off" – thus avoiding the wear and motor burn-out suffered by other pump types.
- **HIGH GRINDING TORQUE.** Our unique pump system, driven by a one-horsepower motor turning at 1725 rpm, produces grinding torque greater than a two-horsepower pump turning at twice the speed.
- **ENERGY EFFICIENT.** The pump is activated automatically and runs for short periods. Typical annual energy consumption is comparable to a 40-watt light bulb.
- **LOW MAINTENANCE SUBMERSIBLE MOTOR.** Low maintenance and long life are the hallmarks of our air-filled motor. Permanently lubricated ball bearings and Class F insulation eliminate the need for periodic oil changes and oil disposal costs required by oil-filled submersible motors.
- **LARGE-DIAMETER GRINDER ASSEMBLY.** Almost twice the diameter of most other types of grinder pumps, contributing to a dramatic reduction of inflow velocity for less wear and no blinding, clogging or jamming.
- **NO PREVENTIVE MAINTENANCE.** Non-fouling static level sensors require no preventive maintenance. Because of our unique, near constant discharge rate, no main line flushing is required in a properly designed system.
- **CORROSION RESISTANCE.** E/One's stainless steel ball-type discharge valve and piping won't corrode like copper or galvanized, and hold up years longer. No corrosion, no maintenance.
- **DEPENDABILITY.** E/One pumps typically run ten years between service calls with 40 years of in-ground experience.
- **PROVIDES FOR ENVIRONMENTALLY SOUND WASTEWATER MANAGEMENT.** The E/One Extreme Series grinds waste material into small particles. This enables the use of inexpensive, small-diameter pressure pipes, buried at shallow depths, to transport wastewater to a suitable processing site. Result: Ground water contamination from failing septic tanks can be eliminated.
- **SERVICEABILITY.** Our unique core design eliminates the need for in-field troubleshooting and pump servicing. This means lower maintenance costs and minimum homeowner inconvenience.

GRAVITY SEWERS ARE NO LONGER THE RULE FOR SOLVING WASTEWATER PROBLEMS.

At the heart of the system is the E/One progressing cavity grinder pump – with high heads that can eliminate costly lift stations, and a robust, powerful design that translates into the industry’s highest levels of reliability, availability and maintainability.

E/ONE SPD PUMP PERFORMANCE CURVE



ENGINEERED LOW PRESSURE SYSTEMS

REPEALING THE LAW OF GRAVITY

NOBODY CAN TOUCH OUR CURVE.

In a low pressure system, constant, predictable pump output is the foundation for proper hydraulic design. It enables the engineer to minimize retention time, pump wear, and keep scouring action at effective levels.

Environment One’s semi-positive displacement, progressing cavity pump has a nearly vertical H-Q curve. It is by far the most “forgiving” pump design – providing predictable flow over the full range of typical system pressures; strengths critical in a large-scale, low pressure sewer.

E/One’s superior high head capability allows a system with few, if any, lift stations. And, it easily accommodates additional future connections without compromising system performance.

These E/One pump characteristics translate into:

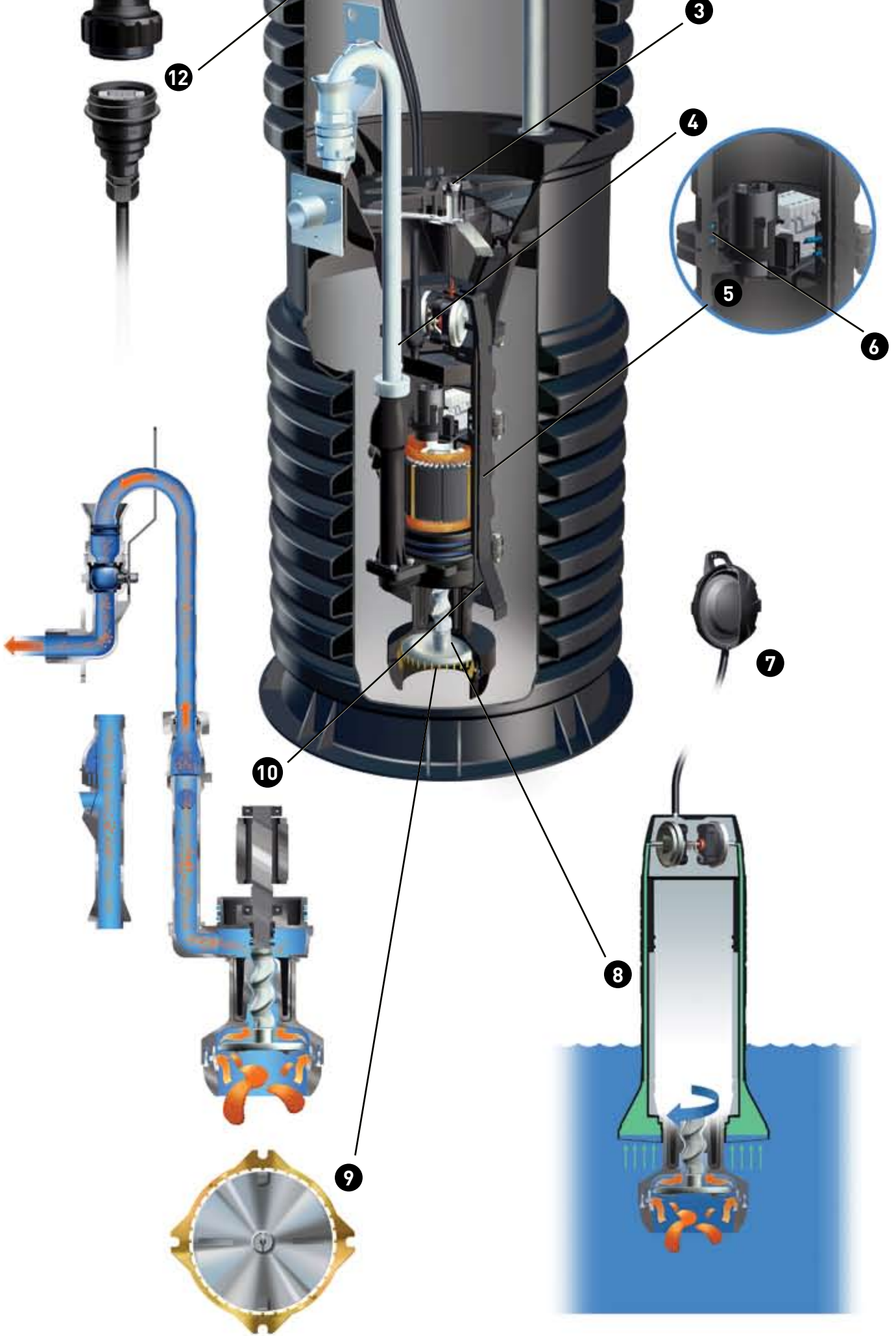
- predictable hydraulic design
- lower collection system capital costs
- less maintenance
- lower operating costs

ANATOMY OF A LEADER:

THE INSIDE STORY ON THE E/ONE GRINDER PUMP STATION.

- 1 LOW-PROFILE COVER:** Aesthetically pleasing. Provides easy access for service while blending with surroundings.
- 2 HIGH-DENSITY POLYETHYLENE TANK:** Double-wall construction of high-density thermoplastic for rugged reliability. Factory pressure tested for infiltration and exfiltration free installation.
- 3 QUICK-RELEASE CORE LATCH:** All stainless mechanism secures core in place and can be easily released from ground level.
- 4 STAINLESS STEEL PIPING & HARDWARE:** E/One's SS discharge piping and ball valve won't corrode. No corrosion, no maintenance, no tools required.
- 5 UNIQUE CORE DESIGN:** Eliminates the need for in-field troubleshooting and service. Modular controls simplify service.
- 6 DOUBLE O-RING SEALS:** Make assemblies waterproof and novel joint geometry minimizes the effects of crevice corrosion.
- 7 E/ONE EQUALIZER:** Compensates for fluctuations in atmospheric pressure to enable accurate level sensing while assuring the level sensing system is watertight.
- 8 PROGRESSING CAVITY PUMP:** A deceptively simple design produces a nearly constant flow under a wide range of continuously varying conditions.
- 9 GRINDER WHEEL AND SHREDDER RING:** Hardened corrosion-resistant cutter bars and teeth process sewage, grinding wastewater solids, as well as wood, plastic and cloth. Will not jam or clog!
- 10 PRESSURE SWITCH LEVEL CONTROL:** Self-cleaning level sensors require no preventive maintenance.
- 11 DIRECT-BURY CABLE:** For simple and inexpensive installation.
- 12 ELECTRICAL QUICK DISCONNECT:** For safe and easy service. UL-listed, compatible with OSHA regulations for confined space entry.





LEADING THE INDUSTRY WE INVENTED.

Environment One not only pioneered the low pressure sewer system, but consistently leads the industry both in system deployment and innovation. The company is dedicated to Total Quality, Continuous Improvement, and Customer Satisfaction, as evidenced by the E/One Extreme Series. Today, there are nearly a million end users worldwide.

SEWER ANYWHERE

Driven by the remarkable E/One Extreme grinder pump, E/One Sewers give engineers, developers, municipal sanitarians, and land planners unprecedented new freedom in land usage and septic tank replacement.

With a smaller footprint and a softer touch on the land, they're so much easier to install. Front-end costs can be reduced by as much as 80%. Total installed costs by half. And O&M costs by up to 75%.

The E/One Extreme grinder pump reduces all forms of sanitary waste to a non-clogging slurry and pumps it through a network of small-diameter pipes. Since gravity is replaced by the power of the pump, sewer systems need not run downhill nor require large-diameter pipes, deep trenches, multiple booster stations – or their associated costs.

A system powered by the E/One Extreme grinder pump converts formerly cost-prohibitive building sites into cost-effective reality. "Problem areas," with high ground water, elevation changes or impenetrable bedrock, are transformed into valuable, developable real estate.

Of course, E/One's low upfront cost advances apply to conventional building sites as well.

In addition, E/One units are easy to install and virtually maintenance-free – refined through 40 years of experience with the largest installed base in the industry.



SAVE THOUSANDS, VIRTUALLY SERVICE-FREE.

Contact your local distributor:

e one

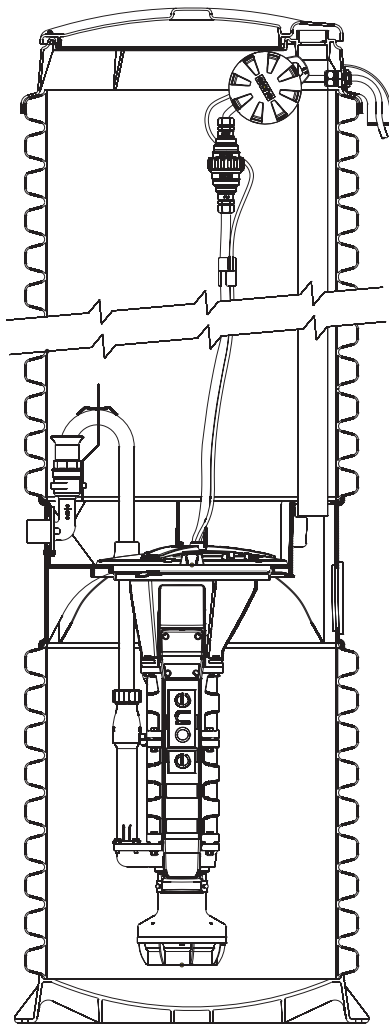
SEWER SYSTEMS

Environment One Corporation
2773 Balltown Road
Niskayuna, NY USA 12309-1090
Voice (01) 518.346.6161
Fax 518.346.6188
www.eone.com

A Precision Castparts Company
LM000364 Rev B



DH071/DR071



General Features

The model DH071 or DR071 grinder pump station is a complete unit that includes: the grinder pump, check valve, HDPE (high density polyethylene) tank, controls, and alarm panel. A single DH071 or DR071 is a popular choice for one, average single-family home and can also be used for up to two average single-family homes where codes allow and with consent of the factory.

- Rated for flows of 700 gpd (2650 lpd)
- 70 gallons (265 liters) of capacity
- Indoor or outdoor installation
- Standard outdoor heights range from 61 inches to 160 inches

The DH071 is the “hardwired,” or “wired,” model where a cable connects the motor controls to the level controls through watertight penetrations.

The DR071 is the “radio frequency identification” (RFID), or “wireless,” model that uses wireless technology to communicate between the level controls and the motor controls.

Operational Information

Motor

1 hp, 1,725 rpm, high torque, capacitor start, thermally protected, 120/240V, 60 Hz, 1 phase

Inlet Connections

4-inch inlet grommet standard for DWV pipe. Other inlet configurations available from the factory.

Discharge Connections

Pump discharge terminates in 1.25-inch NPT female thread. Can easily be adapted to 1.25-inch PVC pipe or any other material required by local codes.

Discharge

15 gpm at 0 psig (0.95 lps at 0 m)
11 gpm at 40 psig (0.69 lps at 28 m)
7.8 gpm at 80 psig (0.49 lps at 56 m)

Accessories

E/One requires that the Uni-Lateral, E/One’s own stainless steel check valve, be installed between the grinder pump station and the street main for added protection against backflow.

Alarm panels are available with a variety of options, from basic monitoring to advanced notice of service requirements.

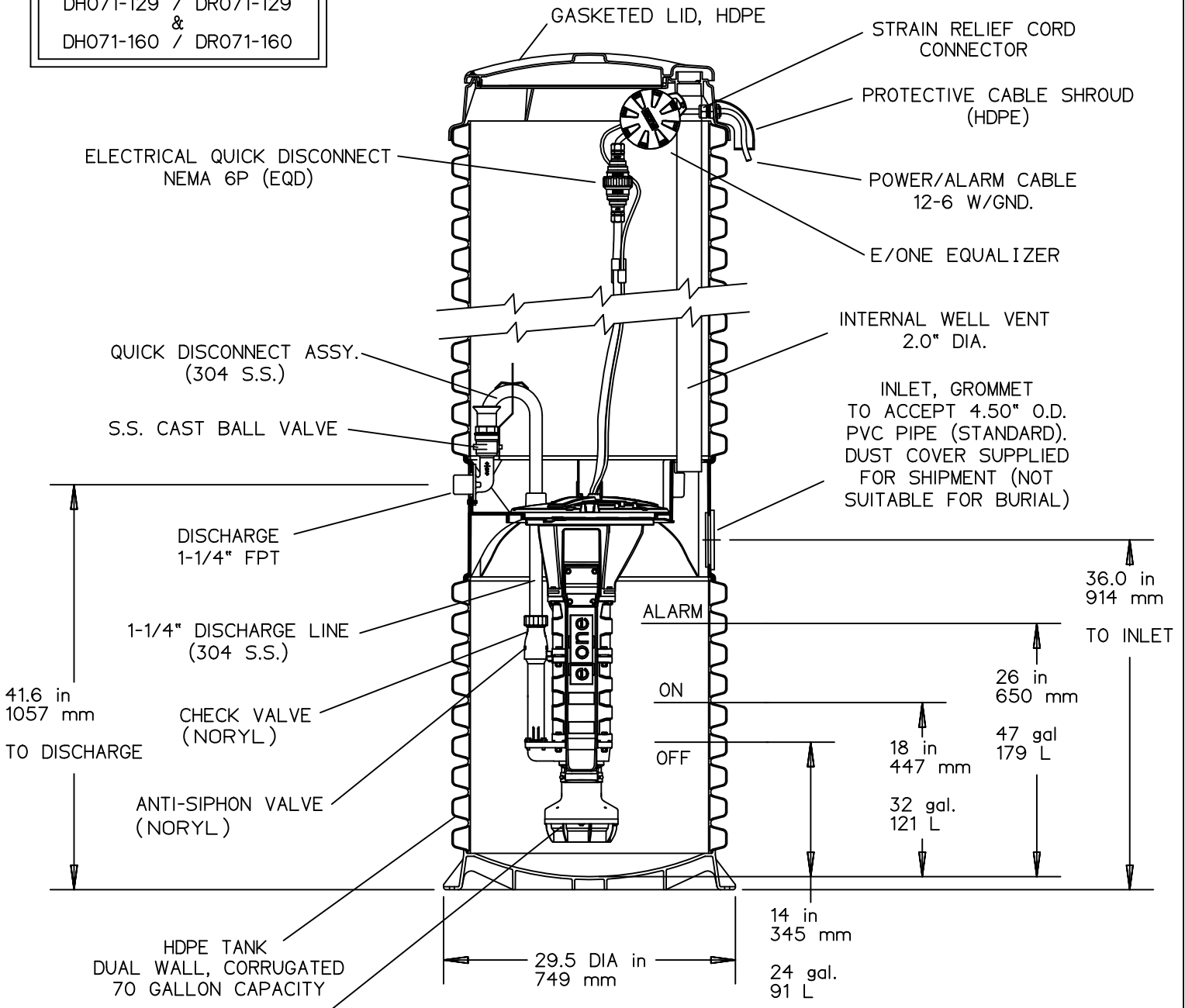
The Remote Sentry is ideal for installations where the alarm panel may be hidden from view.

Patent Numbers: 5,752,315
5,562,254 5,439,180

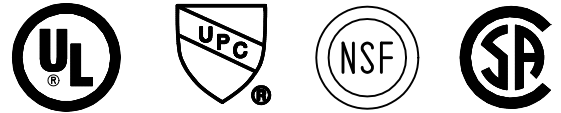
NA0050P01 Rev C

OPTIONS : **DH071** (HARD WIRED LEVEL CONTROLS)
 DR071 (WIRELESS LEVEL CONTROLS)

FIELD JOINT REQUIRED
 FOR MODELS
 DH071-129 / DR071-129
 &
 DH071-160 / DR071-160




SEMI-POSITIVE DISPLACEMENT TYPE PUMP.
 EACH DIRECTLY DRIVEN BY A 1 HP MOTOR



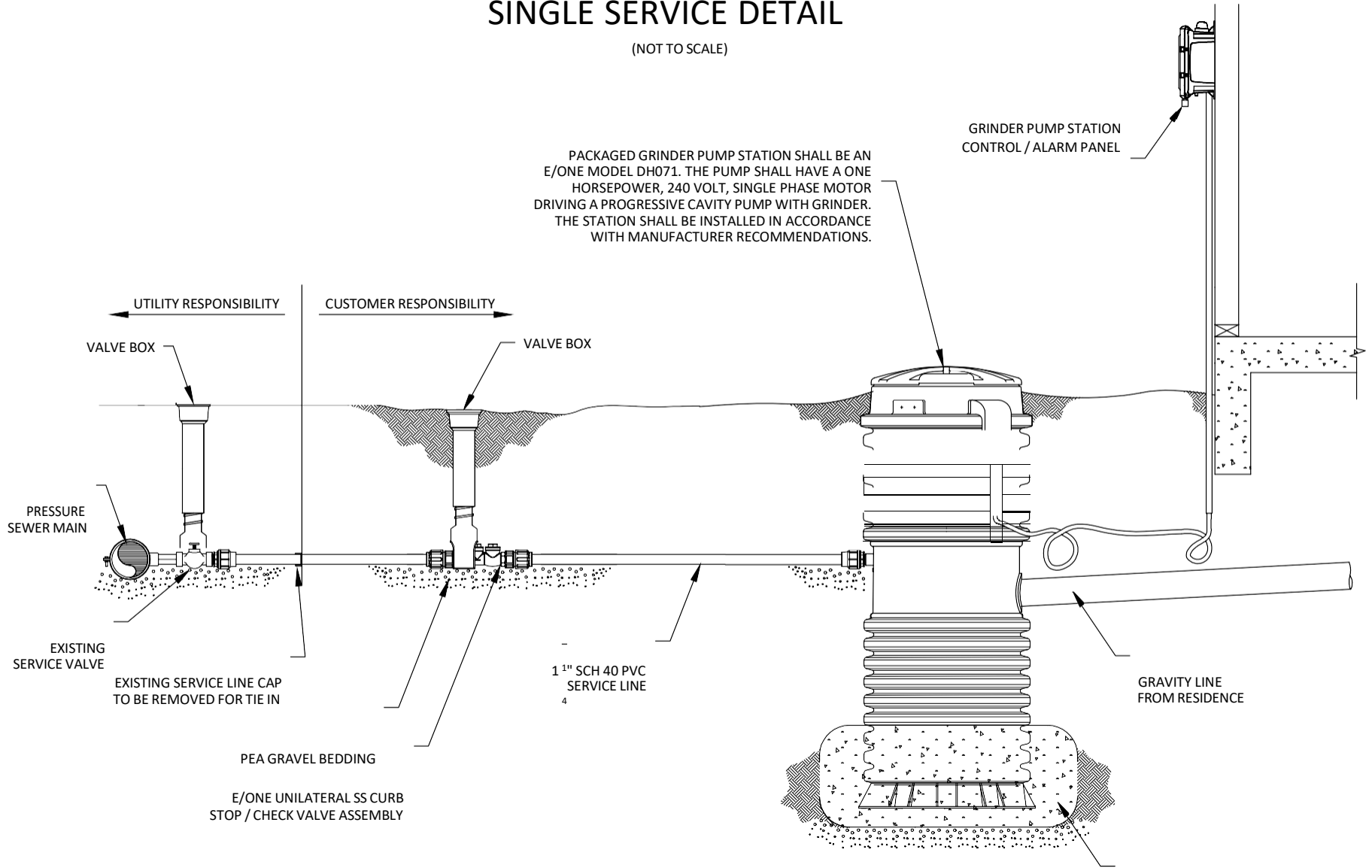
CONCRETE BALLAST MAY BE REQUIRED
 SEE INSTALLATION INSTRUCTION
 FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

AD	CH	10/20/10	E	
DR BY	CHK'D	DATE	ISSUE	SCALE
				
MODEL DH071 / DR071 DETAIL SHEET				
NA0050P02				

UNDINE DEVELOPMENT LLC GREENSHORES SUBDIVISION SINGLE SERVICE DETAIL

(NOT TO SCALE)



PACKAGED GRINDER PUMP STATION SHALL BE AN E/ONE MODEL DH071. THE PUMP SHALL HAVE A ONE HORSEPOWER, 240 VOLT, SINGLE PHASE MOTOR DRIVING A PROGRESSIVE CAVITY PUMP WITH GRINDER. THE STATION SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

GRINDER PUMP STATION CONTROL / ALARM PANEL

GRAVITY LINE FROM RESIDENCE

NOTE: NO CONNECTION TO THE UTILITIES SERVICE LINES SHALL BE MADE UNTIL AUTHORIZED BY UNDINE DEVELOPMENT LLC

CONCRETE ANTI-FLOTATION COLLAR