

## Appendix A

# Wastewater Pump Specifications

### SUBMERSIBLE SEWAGE PUMP SPECIFICATIONS

1. Pump Case: Cast iron, ASTM A48, class 35B
2. Motor Housing: Cast iron, ASTM A48, class 35B
3. Impeller: Cast Iron, ASTM A48, class 35B
4. Intermediate Housing (backplate): cast iron, ASTM A48, class 35B
5. Discharge Base Elbow: Cast iron, ASTM A48, class 35B
6. Pump/Motor Shaft: Entire shaft is to be ASTM A276 type 420 stainless steel)
7. Wear Ring, case: Cast iron, ASTM A48, minimum 200 Brinell
8. Wear Ring, impeller (enclosed impellers only): Stainless steel, AISI329, 350 Brinell
9. O-Rings: Nitrile rubber (NBR)
10. Fasteners (including impeller fastener): Stainless steel, ASTM A276 type 316Ti.
11. Lower Seal Faces: Silicon Carbide/Silicon Carbide
12. Upper Seal Faces: Silicon carbide stationary/carbon rotating
13. Guide Rails and Mounting Brackets: Stainless steel, ASTM A276 type 316
14. Lifting Chain or Cable: Stainless steel, ASTM A276 type 316
15. Oil-all uses ecologically safe, paraffin or mineral base
16. Power/Control Cable Jacket: Chloroprene with non-wicking fillers

Major pump components shall be of gray cast iron, ASTM A-48, class 35B with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be ANSI Type 316 stainless steel construction. All metal surfaces coming into contact with sewage, other than stainless steel, shall be protected by a factory applied spray coating of high solids two component thick coat paint with an epoxy resin base, free of any chips, cracks, voids or imperfections. This coating shall be non-toxic and be approved for water and wastewater applications.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with nitrite or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

#### Motor

Provide a motor which is squirrel cage, induction in design, housed in a completely watertight and air filled chamber - with a min 1.15 service factor. Insulate the motor stator with, at minimum, Class F insulation rated for 311 degrees F. Provide temperature protection and seal leak detection as described in Section 2.3. Provide adequately rated motor with sufficient surface area for ambient only cooling without the need for oil circulation systems or submergence (cooling) jackets which circulate pumped media for motor cooling. If cooling jackets are provided, they must be designed to pass 3 in. wastewater solids (or to filter out all solids) while maintaining a minimum 2 ft. per second non-settling velocity of coolant at all anticipated pump operating speeds. Provide motors which are capable of operating for unlimited periods of time in a dry mode without damage to motor or seals (motors rated for "short duty in air" or "15 minutes in air" will not be acceptable). Provide motors which are designed, rated and warranted for continuous operation. Do not provide motors which contain in excess of two gallons of oil (combined total for cooling and seals) or which contain other than ecologically safe paraffin base or mineral base oil. Provide motors which are FM listed for use in Class I Division 1 Groups C&D hazardous locations as defined by the National Electric Code

A performance chart shall be provided showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

**Power Cable**

Provide ample power/control cable with each pump to remove without disconnecting, suitable for submersible wastewater application, sized in accordance with NEC requirements. Provide cable terminal box on side of motor housing, with cable entry sealed to insure that no entry of moisture is possible into the high-voltage motor/terminal area even if the cable is damaged or severed below water level. The cable seal shall include a compressed rubber grommet to seal the cable exterior and epoxy fill to seal the interior passages. A strain relief device, in direct contact with both the cable and the cast iron entry housing, shall be provided. The cable entry shall be rated by Factory Mutual (or UL) for submerged operating depths to 85 ft.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

**Bearings**

Furnish upper and lower bearings, single row (preferred) or double row as needed to provide a B10 life of, at minimum, 100,000 hours at all anticipated axial and radial loadings. Provide sealed/shielded (permanently lubricated) bearings.

**Mechanical****Shaft Seal**

Provide two totally independent mechanical shaft seals, installed in tandem, each with its own independent single spring system acting in a common direction. Install the upper seal in an oil-filled chamber with drain and an inspection plug (with positive anti-leak seal) for easy external access to the pump. Provide seals requiring neither routine maintenance nor adjustment, but capable of being easily inspected and replaced. Provide seals which are non-proprietary in design, with replacements available from a source other than the pump manufacturer or its distributors.

Do not provide seals with the following characteristics: conventional double mechanical seals with single or multiple springs acting in opposed direction; seals incorporating coolant circulating impellers, seals with face materials other than those specified.

Cartridge type systems shall be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used. Proprietary seals shall not be allowed.

**Pump Shaft**

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft.

Couplings shall not be acceptable.

**Impeller**

The impeller(s) shall be of gray cast iron, class 35B, dynamically balanced, semi-open, non-clogging design capable of handling soils, fibrous materials, heavy sludge and other matter found in wastewater. The impeller(s) shall have a back shroud only with back pump-out vanes to equalize axial thrust, and curved blades which protrude into the pump casing for maximum efficiency. The impeller will create a vortex which carries solids through the pump casing without passing through the blades. Impeller(s) shall be capable of passing a minimum 3 in. diameter solid. Specific impeller configuration may be required by the City depending on specific material within the pumped wastewater. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. The impellers shall be keyed to the shaft, retained with an allen head bolt.

**Wear Rings**

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a replaceable wear ring insert fitted to the volute inlet see "Materials" Section above for proper material and hardness.

**MAJOR COMPONENTS**

Furnish major components (pump case, impeller, intermediate housing, motor housing) of cast material as specified with smooth surfaces devoid of blow holes and other irregularities. Pump case design shall incorporate a centerline discharge for stability when mounted on the base elbow.

**TEMPERATURE PROTECTION**

Furnish temperature monitoring devices in motor windings for use in conjunction with and supplemental to external motor overload protection. Arrange controls to shut down pump should any of the monitors detect high temperature and automatically reset once motor temperature returns to normal. Set temperature monitors at levels recommended by pump manufacturer

**SEAL LEAK DETECTION**

Provide a detector in the motor's stator cavity which allows a control panel mounted relay to indicate leakage into the motor. In addition, on motors 80HP and larger provide a stainless steel float switch in a separate leakage collection chamber to indicate leakage past the inner mechanical seal prior to its entrance into either the motor stator cavity or the lower bearing. Electronic probes which depend on sensing resistance value changes in seal oil will not be acceptable as seal leak indicators.

**MOTOR SENSOR MONITORING RELAY**

The pump supplier shall furnish all relays required for monitoring all motor sensors. The relays shall be installed by others in the motor control panel and properly wired in accordance with pump manufacturer's instructions. Relays shall mount in standard 12-pin socket bases (provided) and shall operate on available control voltage of 24-240 VAC. If relays require an input voltage that is not available in the motor control panel an adequate transformer (with fused input) shall be provided by the pump supplier. Relays shall have a power consumption of no more than 2.8 watt and shall be UL approved. Relays shall be modular in design, with each relay monitoring no more than two motor sensor functions.

Each relay module shall include a dual color (red/green) LED to indicate the status of each monitored sensor. Green will indicate "status OK"; red will indicate a failure or an alarm condition. A self-corrected fault will allow the relay output contacts to reset, and cause the LED to change from a steady alarm indication to a flashing signal. The LED shall continue to flash until locally cleared, providing the operator an indication of a potential intermittent fault. Each relay shall also include a power-on LED and both "test" and "reset" push buttons.

An independent fail-safe (switch on power loss) form-C output contact shall be included for each monitored sensor to provide a normally-open and normally-closed dry contact to initiate a remote alarm device or shut down the motor. Contacts shall be rated for 5 amps at 120 volt.

**Miscellaneous**

The pump guide rails shall be 2-in. diameter minimum, 316 stainless steel pipe.

All brackets and mounting hardware shall be 316 stainless steel construction.

Each pump shall be fitted with a 316 stainless lifting bracket large enough to be easily attached to with a crane lifting hook without manned entry into the wet well. Attach stainless steel lifting chains.

The following spare parts shall be provided:

One set mechanical seals

One set O-rings

One set wear rings

**SCREW CENTRIFUGAL PUMP SPECIFICATIONS**

**PART 1 GENERAL**

There shall be supplied, as shown by the plans, dry or wet pit screw centrifugal pumps - specifically designed to pump raw, unscreened sewage, bio solids, or other media containing solids and/or rags and other fibrous materials without clogging.

**QUALITY ASSURANCE**

All pumping systems furnished under this Section shall be of a design and manufacture that has been used in similar applications, and it shall be demonstrated to the satisfaction of the owner that the quality is equal to systems made by that manufacturer specifically named herein. Manufacturers shall provide evidence of at least five installations in which similarly sized systems have provided satisfactory performance for a minimum of five years in a similar application.

To insure a consistent high standard of quality, the manufacturer of this pumping system shall comply with the requirements of the ISO 9001 Quality System and such compliance shall be verified by an independent certification agency approved by the International Organization for Standardization. Documentation shall be submitted for approval showing compliance with this requirement, and the pumping system will not be released for shipment until approved.

Unit responsibility. Screw centrifugal pump, complete with immersible motor, fast-out and lifting cable or pump base and all other specified accessories and appurtenances shall be furnished by the pump manufacturer to insure compatibility and integrity of the individual components, and provide the specified warranty for all components.

The screw centrifugal pumps specified in this Section shall be furnished by and be the product of one manufacturer.

**SUBMITTALS**

Submit shop drawings and product data.

Submit manufacturer's installation instructions.

Submittal data shall be prepared, in its entirety, by the equipment manufacturer. Shop drawings prepared by the manufacturer's sales representative, fabrication shop, or other than the listed manufacturer shall not be acceptable. No additions or modifications to the manufacturer's submittal shall be accepted, with the sole exception of a cover letter provided by the manufacturer's local representative.

**OPERATION AND MAINTENANCE DATA**

Submit operation and maintenance data Include maintenance instructions, assembly views, lubrication instructions and replacement parts lists.

**DELIVERY, STORAGE AND HANDLING**

Deliver, store, handle and protect under provisions of section

**SERVICES OF MANUFACTURER**

Furnish the services of a representative of the manufacturer to assist in adjusting and testing the equipment furnished, to supervise in the initial operation, and to make any final adjustments as may be necessary to assure the owner that the pump(s) are in satisfactory operating condition.

Furnish sufficient supervision, data, and information from the manufacturer to train operators in the proper operation and maintenance of the pump(s) furnished.

**PART 2 PRODUCTS**

**PERFORMANCE**

The pumps shall be designed for continuous operation and will be operated continuously under normal service. To minimize operational power costs, the hydraulic efficiencies listed for each pump are the minimum acceptable and must be guaranteed by the manufacturer.

**B. OPERATION CRITERIA**

	Flow GPM	TDH FT	Brake HP Required	Min. Shut-Off TDH	Motor Size	Motor RPM
Maximum Condition						
Minimum Condition						

C. PUMP CRITERIA

- 1. Minimum suction diameter \_\_\_\_\_
- 2. Minimum discharge diameter \_\_\_\_\_
- 3. Minimum non-compressible solids passage \_\_\_\_\_
- 4. Minimum B-10 bearing life \_\_\_\_\_

D. PRODUCT DESIGN

The basic design shall be a single-passage, clog-free pump, utilizing a screw-centrifugal impeller. The overall pump design shall combine high efficiency, low required NPSH, a large solid passage and the ability to handle rags or other fibrous material without plugging.

1. The hydraulic design of the impeller shall combine the action of a positive displacement screw with the action of a single-vane centrifugal impeller to provide a single, non-bifurcated flow stream with only gradual changes in flow direction.

The leading edge of the impeller vane shall blend into the impeller body in such a way that any rag or other fibrous material caught on the leading edge and folded over both sides of the vane will be unfolded and released as the textile follows the flow stream through the pump.

The impeller flange or impeller shall contain a spiral groove on the rear face so that any solids in the pumped media are discharged from the space between the backplate and the rear of the impeller.

2. In order to maintain optimum running clearances along the entire length of the impeller, to maintain design hydraulic efficiencies, the geometry of the impeller and suction piece shall be conical, so any axial adjustment of the impeller will cause the clearance between the impeller and suction piece to change uniformly along the entire length of the impeller. Designs incorporating curved, or combination curved/conical impeller and suction piece are not acceptable as in such designs, clearances cannot be adjusted uniformly over the full length of the impeller.

3. Suction and discharge flanges shall be drilled to meet ANSI 125 lb. bolting.

**MATERIALS OF CONSTRUCTION**

**Abrasion-Resistant Construction**

The pump volute, backplate and suction piece housing shall be of close-grained cast iron, ASTM A 48-CL30.

The impeller shall be of 450 Brinell hardness hi-chrome Iron, ASTM A 532-CL.III Type A1.

Liner - The suction shall have an independently replaceable suction liner of minimum 450 Brinell hi-chrome Iron, ASTM A 532-CL.III type A1 and shall be externally adjustable by means of three stainless steel regulating screws (except D3K and D4K, which shall be adjustable by shims). Each adjusting screw shall incorporate a mechanism for positively advancing, positively retracting, and positively locking the position of the suction liner, so that the necessary running clearances between the liner and impeller can be maintained without disassembly of the pump and/or piping.

**IMMERSIBLE MOTOR**

**Design**

Motors shall be of the explosion-proof design, approved by Factory Mutual for uses in class I, groups C&D and hazardous locations.

The motors shall be of the immersible type, suitable for full-load, continuous operation either completely dry or fully submerged in the pumped liquid of up to 65 ft. depths. Motors shall be of the "air-filled" type, to optimize efficiency, with stator and rotor housed in a watertight chamber containing only air. Motors of the "oil-filled" type with stator and rotor immersed in oil or motors which circulate the pumped media through internal cooling media channels, ports, or jackets are not acceptable.

Motors shall incorporate a separate heat-exchanger circuit, with a shaft-mounted cooling pump circulating oil from a jacket surrounding the stator housing to a heat-exchanger surface cast into the pump backplate. The circulating oil shall transfer excess motor heat directly to the pumped media inside the pump volute, without the need of submergence for adequate motor cooling at any continuous power output up to and including rated powers in ambient of 40 degrees Celsius. Alternately, motors shall dissipate heat directly (by convection) from the exposed stator housing to surrounding ambient air, without the need of submergence for adequate motor cooling at any continuous power output up to and including rated power in ambient of 40 degrees Celsius.

Motor stator windings and leads shall be Class H wire, insulated with moisture-resistant Class F insulation for operation at temperatures up to 155 degrees Celsius.

Motors shall have the stator varnish applied by the "vacuum-pressure impregnation" method to ensure thorough and complete varnish penetration. The stator shall be heat-shrink fitted into the stator housing. Motor cable-entry sealing assembly shall consist of the following five components to ensure a positive, redundantly watertight seal:

The sealing components shall be mechanically isolated from cable strains by a two-piece restraining clamp, which will securely grip the cable above the moisture-sealing components and bear any mechanical forces applied to the cable.

The cable moisture seal shall consist of an elastomer grommet, prevented from extruding past the cable by stainless-steel retaining washers on either side. The grommet shall be compressed tightly against the cable outside diameter (and the entry assembly inner diameter) by a screwed follower gland.

Each individual conductor shall be interrupted by a solid-copper isolation dam to prevent wicking of moisture through the conductor strands.

The cable insulation shall be sealed by an epoxy poured into the cable entry and totally encapsulating the stripped-back insulation and the individual copper dams. This poured epoxy seal shall also function as a redundant seal for the cable outside diameter.

The cable-free end shall be sealed from moisture-entry during shipping, storage and prior to connection to the control panel by a plastic sleeve securely clamped over the cable end.

Motors which use only a compress-grommet gland or only a poured epoxy seal, without benefit of redundancy of both types together, are not equal or acceptable.

Shaft sealing shall be by independently-mounted, tandem mechanical seals contained in an oil chamber that is formed as an intrinsic part of the motor frame and allows the seals to be completely submerged in and lubricated by the oil bath.

The mechanical seal nearest the bearing shall utilize carbon/ceramic faces, and shall isolate the seal cooling oil from the motor frame.

The mechanical seal nearest the impeller shall be a stainless steel or rubber bellows-type construction firmly attached to the rotating face and clamped to the shaft, to prevent contaminants from contacting the stainless-steel spring which loads the seal face. The seal faces shall be a solid tungsten-carbide rotating face running against a solid silicon-carbide stationary face. Seals with both faces of similar materials or seals with bonded, soldered, or converted face surfaces are not equal or acceptable.

The mechanical seal nearest the impeller shall be contained in a seal chamber formed by the impeller flange and a recess cast into the motor frame. To prevent debris from entering the chamber and to prolong the mechanical seal life, a flush port shall be provided so that an optional external water flush can be supplied directly into the seal channel

The mechanical seal nearest the impeller shall be isolated from contaminants in the pumped media by a labyrinth-fit between the backside of the impeller and the backplate, as well as by pump-out grooves cast into the impeller back shroud and into the backplate, to minimize debris reaching the shaft seal.

Both inner and outer seals shall be dimensionally interchangeable with standard off-the-shelf, in.-size, john crane mechanical seals, or equal, to allow second-source availability of seals from local distributors for emergency repairs.

The thrust bearings shall be designed to take the full axial load of the impeller.

Motors shall be submersible, 3 phase, 60 cycle, with HP, RPM and volts to meet design criteria.

Protection devices. The motor shall be provided with the following protection devices:

Two normally closed thermal sensors embedded in the stator windings, wired in series, will open a protective circuit if winding temperature exceeds rated operating temperature. These sensors automatically reset when winding temperature has cooled to a safe operating temperature.

A conductivity probe to monitor the moisture content of the oil in the chamber between the outer and the inner mechanical seals. The probe shall be wired to a separate protective circuit, which, when connected to a conductivity-sensitive relay in the control panel, will trip an alarm if moisture content of the oil indicates a failure of the outer mechanical seal.

#### B. Mounting

Fast Out System. The manufacturer shall provide a cast fast-out fixture which shall be permanently mounted in the wet well as shown by the plans.

The fixture shall cantilever the entire pump and motor from the volute discharge flange, providing an unobstructed sump floor under the pump.

b) The fixtures shall include a 90 degree elbow to connect to vertical piping, and shall provide mounts for two-316 stainless steel rails of standard schedule pipe, which will guide the pump into position.

c) The pump shall be supported by a positive metal-to-metal interlocking flange, which is additionally sealed by a leak-proof nitrile rubber ring pressed against the fixture flange by the weight of the pump.

Wet Well, Valve Vault, Piping, Fittings and Valves:

The wet well shall be a pre-cast manhole meeting the requirements of ASTM C 458 with a flat top cover and aluminum access hatch designed for H-20 loading. Wet well shall be a minimum of six ft. in diameter. A larger diameter wet well may be required upon review by the City. If wet well is too large to be of pre-cast type, a cast in place or sunken cession may be required.

The wet well shall be designed for the soil conditions on the site including soil bearing conditions and ground water levels. Ladder rungs shall not extend below the high-water level line.

The valve vault shall be a pre-cast utility vault as manufactured by Utility Vault, Inc. Provide solid walls without knockouts, but with pre-cut holes for pipe penetrations. All pipes shall be grouted in place with non-shrink grout. Vault shall have a floor with drain sump and drain line back to wet well with an inline check valve and inline trap to prevent odors from entering the vault.

The access hatches shall be hinged, spring-assisted hatches designed for H-20 loading. The hatch for the pump station shall be the size recommended by the pump manufacturer but shall be no less than 2-36 in. x 36 in. minimum clear inside opening. The hatches for both the wet well and valve vault shall be by the same manufacturer and shall be Halliday products or approved equal. The access hatch shall include a written manufacturer's guarantee to seal out all offensive odors completely.

The inside of the wet well shall be coated completely to prevent corrosion.

Wet Well Coating:

The wet well coating material shall be Spectra Shield or approved equal.

The product shall be installed in accordance with the manufacturer's instructions by a factory certified applicator.

The wet well shall be thoroughly pressure washed using a minimum of 5,000 psi in preparation for the application to remove any dirt, debris or loose material.

The sprayed-on material shall be applied completely and uniformly to cover the wet well concrete floor, walls and underside of lid, a minimum of 0.40 in. in thickness. Finished surface shall be free of imperfections.

All manhole joints and pipe penetrations shall be watertight to prevent infiltration or ex-filtration of the wet well prior to application of the product.

Any drilling, cutting or fabricating done in the wet well that breaks or disturbs the newly applied coating shall be repaired with the same Spectra Shield coating in accordance with the manufacturer's instructions.

All piping and fittings in the wet well and valve pit and between the two units shall be ductile iron, class 52 and shall be 401 ceramic lined to a minimum of 40 mils. or be constructed of 316 stainless steel.

The isolation valves in the vault shall be epoxy coated M&H Series valves or approved equal, meeting the requirements of AWWA C 509. Valves larger than 6 in. shall have gear reduction operation with hand wheels. 4 in. and 6 in. valves shall have hand wheel operator.

The check valves shall be epoxy or P.E. lined and coated cflow F 5381 equipped with outside spring and levers or approved equal.

The by-pass emergency pumping connections shall be equipped with 6-in. PT coupling aluminum, female, Cam lock fittings or approved equal. A 6 in/ Cam lock plug shall be installed in each fitting.

**AUXILLARY SCREW PUMPING UNIT SPECIFICATIONS**

## EQUIPMENT AND COMPONENT NAME(S) AND NUMBER(S)

## PART 1 GENERAL

## 1.1 WORK OF THIS SECTION

- A. Work: The work necessary to furnish a complete portable pumping unit including screw centrifugal pump, diesel engine, vacuum assisted dry priming system, controls, noise enclosure and associated accessories and appurtenances.
- B. Unit Responsibility: The work requires that the centrifugal screw portable pumping complete with all accessories and appurtenances (including, but not necessarily limited to, diesel engine, starter, control panel, hoses, priming system, trailer, and noise enclosure be the end product of the supplier. The supplier shall furnish all components and accessories of the system to enhance compatibility, ease of operation and maintenance and, as necessary, to place the equipment in operation conforming to the specified performance, features, and functions. The foregoing shall in no way alter or modify the contractor's responsibilities under the contract documents. The contractor is responsible to the owner for providing the equipment systems as specified herein.
- C. Like items of equipment provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts and manufacturer's service.
- D. See Conditions of the Contract and Division 1, General Requirements, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

## 1.2 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  1. American Bearing Manufacturers' Association (ABMA)
  2. American National Standards Institute (ANSI): B16.1
  3. Cast Iron Pipe and Flanges and Flanged Fittings
  4. ASTM International (ASTM): A48, Standard Specification for Gray Iron Castings
  5. Hydraulic Institute Standards (HIS)
  6. Occupational Safety and Health Administration (OSHA).

## 1.3 DEFINITIONS

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

## 1.4 SUBMITTALS

- A. Action submittals:
  1. Shop drawings:
    - a. Make, model, weight, and horsepower of pump assembly.
    - b. Complete pump, diesel engine, and vacuum pump catalog information, descriptive literature, specifications and identification of materials of construction.
    - c. Performance data curves at nominal pump speed showing head, capacity, horsepower demand, NPSH required and pump efficiency over entire operation range of pump, from shutoff to maximum capacity. Indicate separately: head, capacity, and horsepower demand, NPSHR and overall efficiency require at rated conditions and at secondary conditions.
    - d. Performance data curves for rated pump RPM.
    - e. Certified detailed mechanical and electrical drawings showing equipment dimensions, arrangement, assembly, including locations and type of connections and weights of major equipment and components.



- f. Complete diesel engine nameplate data, engine manufacturer, including any motor modifications.
- g. Factory Finish System
- B. Information submittals:
  - 1. Special shipping, storage and protections, and handling instructions.
  - 2. Manufacturer's printed installation instructions.
  - 3. Suggested spare parts list to maintain equipment in service for period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement and maintenance with current price information.
  - 4. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
  - 5. Operation and maintenance Data: As specified in Section 01430 "Operation and Maintenance Data".

#### 1.6 OPERATIONS AND MAINTENANCE DATA

- A. O&M Manuals: Content, format and schedule for providing as specified in Section 01430 "Operation and Maintenance Data".
- B. Maintenance Summary Forms: As specified in Section 01430, "Operation and Maintenance Data".

#### 1.7 EXTRA MATERIALS

- A. Furnish for each set of pumps: One complete set of any special tools required to dismantle pump.

### PART 2 PRODUCTS

#### GENERAL

- A. Provide a complete, coordinated, and fully functional operating system.
- B. Coordinate pump, diesel engine, and priming system as a system.
- C. Pumps supplied under this section to be a standard product of manufacture and to have proven reliability.
- D. Portable pump system to be capable of running dry or in snoring conditions.

#### MANUFACTURERS

- A. "Screwsucker™" Pumping System, by APSCO, Inc. of Kirkland, WA. (Ph. 425-822-3335).

#### EQUIPMENT DESCRIPTION AND CONSTRUCTION DETAILS

- A. Pump:
  - 1. Pump shall be a Hidrostal Pump. The basic design shall be a single passage, clog free pump utilizing a screw centrifugal impeller.
  - 2. Continuously rising head-capacity curve from run out to shutoff.
  - 3. Designed to operate continuously at any point in specified operating range of performance curve without cavitation, overheating, or excessive vibration.
  - 4. Engine nameplate horsepower rating not to be exceeded by pump brake horsepower required at any point on nominal pump performance curve.
  - 5. Pump shall be capable of continuous operation in dry condition.
- B. Casing:
  - 1. Back pullout design allowing for removal of rotating element without disturbing piping connections.
  - 2. Heavy wall, one-piece volute construction with integral flanged discharge flange and smooth fluid passages.
  - 3. Provide drilled and tapped volute vent and drain connections.
  - 4. The pump volute, backplate and suction piece housing shall be of close-grained cast iron, ASTM A48-CL30.

5. The impeller shall be ASTM A-536 72 iron, HB 270.
  6. The suction shall have an independently replaceable suction liner minimum 270 Brinell Iron, ASTM A 536-72 and shall be externally adjustable by means of three stainless steel regulating screws. Each adjusting screw shall incorporate a mechanism for positively advancing, positively retracting and positively locking the position of the suction liner in so that the necessary running clearances between the liner and impeller can be maintained.
- C. Bearing Housing:
1. The bearing housing shall be of cast iron, ASTM A48Cl-30 and shall be of the back pull out design.
  2. The shaft shall be steel and provided with suitable bearings capable of taking all mechanical and hydraulic loads. Unless otherwise specified, bearings shall provide a minimum B10 bearing life of 50,000 hours without credit for hydraulic balancing by pump out vanes, grooves, or wear rings.
  3. The shaft seals shall be isolated from contaminants in the pumped media by a labyrinth fit between the impeller backside and the volute back plate, as well as by pump-out grooves machined into the impeller back shroud and into the volute back plate, to prevent debris reach the shaft seal.
- D. Mechanical Seal:
1. Tandem mechanical seal arrangement requiring no external flush. Shaft sealing shall be by independently-mounted, tandem mechanical seals contained in an oil chamber that is formed as an intrinsic part of the bearing frame and allows the seals to be completely submerged in and lubricated by the oil bath. Externally-mounted oil reservoirs are not acceptable.
  2. The mechanical seal nearest the bearing shall utilize carbon/ceramic faces and shall isolate the seal cooling oil from the bearing frame.
  3. The mechanical seal nearest the impeller shall be a stainless steel or rubber bellows type construction firmly attached to the rotating face and clamped to the shaft, to prevent contaminants from contacting the stainless-steel spring which loads the seal face. The seal faces shall be a solid tungsten-carbide rotating face running against a solid silicon-carbide stationary face. Seals with both faces of similar materials or seals with bonded, soldered or converted face surfaces are not equal or acceptable.
- E. Diesel Engine
1. The diesel engine shall be a Deutz, John Deere or Caterpillar, four-stroke, water-cooled, high efficiency diesel engine.
  2. The engine starting system shall be a 12 volt. Operation may be manual or with automatic level switching.
  3. A 12-volt electric starter shall be an integral part of the engine.
- F. Priming System and Control Panel
1. The priming system shall be a "dry prime" vacuum system which shall incorporate a priming chamber, priming probes, and controlled via an electronic control module.
  2. A Busch Vacuum pump shall be supplied. The vacuum pump shall be oil lubricated and driven by a magnetic clutch from the diesel engine via a V-belt from the pump shaft. A solenoid valve will operate simultaneously with the vacuum pump clutch. The normally closed solenoid valve will only open when the magnetic clutch on the vacuum pump is engaged.
  3. The priming chamber shall have a clear Plexiglas viewing window with electronic level probes mounted in the priming chamber.
  4. An electronic control panel shall be furnished to control the dry prime vacuum system.
- G. Control Panel

1. A control panel will be furnished in a NEMA 4X enclosure. The outside of the panel shall be furnished with an hour meter, run light, automatic start/stop and level control switch, low fuel light, and tachometer.
2. The control panel will be furnished with a connection for automatic start-stop of the unit with level control probes.
3. The control module must be supplied with functionality to automatically exercise the system weekly for a minimum of ten minutes.
4. A cell phone connection will be supplied in the electronic control module so that the unit can be monitored from a remote location.
5. The control panel shall operate and incorporate all the electrical features for the engine, pump, priming system, and automatic level control.
6. A magnetic clutch is to be provided that couples the primary pump, vacuum pump and diesel engine together. The magnetic clutch control is to be incorporated into the electronic control module.
7. Engine temperature and oil pressure shutdown protection shall be included.

#### H. Sound Attenuated Enclosure

1. The pump, diesel engine, control panel, and priming system shall be mounted in a sound enclosure. With the unit operating at full speed, Contractor must guarantee a noise level not to exceed 65 dBA at 23 ft.
2. A 125 gallon integrated fuel tank shall be part of the enclosure. Under the fuel tank shall be a containment vessel to prevent fuel, water or oil from spilling on the ground around the unit. A fuel gauge is to be supplied that will have a connection to the integrated cell phone in the electronic control module.
3. A lifting eye is to be integrated into the sound enclosure for lifting of unit.
4. The pumping unit is to be supplied with four sound proof doors that are all lockable.
5. Heavy duty 12-volt marine battery is to be furnished.
6. Flanged suction and discharge connections to be furnished.

- I. Fuel Consumption - The pump system shall be capable of running continuously without re-fueling for 48 hours at 1,500 rpm on 125 gallons of diesel fuel.

### 3.5 MANUFACTURER'S SERVICES

#### A. Installation, Startup, and Testing Services:

1. Provide complete manufacturer's installation, startup, and testing services in accordance with Section 01640 "Manufacturers' Services" and Section 01810 "Equipment Testing and Facility Startup".
2. Provide qualifications of manufacturer's representative.
3. Provide 3 hard copies and 2 electronic O&M manuals on or prior to delivery of equipment.

#### B. Training Services

1. Provide training of owner's personnel in accordance with Section 01640 "Manufacturers' Services".
2. Provide 1 person per day of pre-startup training, which shall be provided in one session.

**SUBMERSIBLE CHOPPER PUMP SPECIFICATIONS****GENERAL****1.1 DESCRIPTION**

The pump shall be specifically designed to pump waste solids at heavy consistencies without plugging or dewatering of the solids. Materials shall be chopped/macerated and conditioned by the pump as an integral part of the pumping action. The pump must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in tests and field applications.

**1.2 QUALITY ASSURANCE AND PERFORMANCE AFFIDAVIT**

The pump shall meet City's standard 2 (two) year warranty and a performance affidavit for equipment to be furnished in accordance with this section. The warranty for workmanship and materials shall be manufacturer's standard for 2 years from startup, not to exceed 30 months from factory shipment. In the performance affidavit, the manufacturer must certify to the Contractor and the Owner, that the Contract Documents have been examined, and that the equipment will meet in every way the performance requirements set forth in the Contract Documents for the application specified. Shop drawings will not be reviewed prior to the receipt by the Engineer of an acceptable performance affidavit. The performance affidavit must be signed by an officer of the company manufacturing the equipment, and witnessed by a notary public. The performance affidavit must include a statement that the equipment will not clog or bind on solids typically found in the application set forth.

**PART 2 PRODUCTS****2.1 APPROVED MANUFACTURER**

Pump shall be manufactured by Vaughan Co., Inc. or approved equal.

It is the express intent of these specifications to accurately describe equipment that is a regular production item of the specified manufacturer, and that has a proven record of performance in identical (not just similar) applications in other treatment facilities. The chopper pump manufacturer shall have a minimum of twenty (20) years of documented experience in the design and production of chopper pumps of all types, and not less than five (5) years of experience in the production of the exact equipment as specified herein.

Alternates shall be pre-approved no less than 15 days prior to the bid date, accompanied by a list of no less than twenty five (25) reference installations of chopper pumps in identical service applications. At least five (5) of the reference installations provided shall be of the exact model pump specified herein. References shall be pumps that have been used in continuous service for a period of no less than three (3) years. Only equipment that is in service at the time of referral shall be considered valid. Pumps that have been removed from service for any reason will not be considered as references. Telephone numbers and contact names shall be provided for any/all references upon request from the Engineer. Provision of performance bonds or other means of circumventing the above requirements for historical references and verification of past performance in identical applications are not considered an acceptable means of verifying the manufacturers experience.

**2.2 SERVICE CONDITIONS**

The pumps specified in this section will pump \_\_\_\_\_ using the following design flow criteria:

GPM: \_\_\_\_\_ TDH: \_\_\_\_\_ HP: \_\_\_\_\_ RPM: \_\_\_\_\_

**2.3 PUMP CONSTRUCTION**

**Casing and Back Pull-Out Plate:** The pump casing shall be of volute design, spiraling outward to the 125 lb. flanged centerline discharge. Back pull-out design shall incorporate jacking bolts for accurate adjustment of impeller-to-cutter bar clearance. Casing & backplate shall be ductile cast iron with all water passages to be smooth, and free of blowholes and imperfections for good flow characteristics. A pressure tap shall be included on or near the discharge flange. Backplate shall include a replaceable Rockwell C 60 steel cutter adjustable for 0.005-0.015" clearance to cut against the rotating impeller pumpout vanes for removing fiber and debris.

**Impeller:** Shall be semi-open type with pump out vanes to reduce seal area pressure.

Chopping/maceration of materials shall be accomplished by the action of the cupped and sharpened leading edges of the impeller blades moving across the cutter bar at the intake openings, with a maximum set clearance between the impeller and cutter bar of 0.015-0.025" cold. Impeller shall be cast alloy steel heat treated to minimum Rockwell C 60 and dynamically balanced. The impeller shall be keyed to the shaft and shall have no axial adjustments and no set screws.

Cutter Bar Plate: Shall be recessed into the pump bowl and shall contain at least 2 shear bars extending diametrically across the intake opening to within 0.010-0.020" of the rotating cutter nut tooth, for the purpose of preventing intake opening blockage and wrapping of debris at the shaft area. Chopper pumps utilizing individually mounted shear bars shall not be acceptable. Cutter bar shall be alloy steel heat-treated to minimum Rockwell C 60.

Cutter Nut: The impeller shall be secured to the shaft using a cutter nut, designed to cut stringy materials and prevent binding using a raised, rotating cutter tooth. The cutter nut shall be cast steel heat treated to minimum Rockwell C 60.

Upper Cutter: Shall be threaded into the back pull-out adapter plate behind the impeller, designed to cut against the pump-out vanes and the impeller hub, reducing and removing stringy materials from the mechanical seal area. Upper cutter shall be cast steel heat treated to minimum Rockwell C 60. The upper cutter teeth are positioned as closely as possible to the center of shaft rotation to minimize cutting torque and nuisance motor tripping. The ratio of upper cutter cutting diameter to shaft diameter in the upper cutter area of the pump shall be 3.0 or less.

Shafting: Pump shafting shall be heat-treated alloy steel. The pump shaft shall directly couple to the motor shaft, with a bolt and keyway.

Stainless Steel Nameplates: Shall be attached to the pump and drive motor giving the manufacturer's model and serial number, rated capacity, head, speed and all pertinent data.

#### 2.4.SUBMERSIBLE ELECTRIC MOTOR

Submersible Electric Motor: The submersible motor shall be U/L LISTED EXPLOSION PROOF for Class 1, Group D, Division 1 hazardous locations, rated at \_\_\_ HP, \_\_\_ RPM, 480 Volts, 60 Hertz and 3 phase, with a 1.15 service factor (1.0 for Continuous In-Air) and Class F insulation. Motor shall be equipped with tandem independently mounted mechanical seals in oil bath and with dual moisture sensing probes. The inner and outer seals shall be separated by an oil-filled chamber. Double-seal (back to back) configurations are not acceptable due to the potential for failure of both seals as a result of lodged solids. The oil chamber shall act as a barrier to trap moisture and provide sufficient time for a planned shutdown. The oil shall also provide lubrication to the internal seal. The inner seal shall be a standard UL listed John Crane Type 21 or equal, with carbon rotating face and ceramic stationary face. The outer seal construction shall be designed for easy replacement. Outer mechanical seal shall be 316 stainless steel pusher type with silicon or tungsten carbide faces. Seal shall be positively driven by set screws. Elastomers shall be of Viton®. Motor shall include two normally closed automatic resetting thermostats connected in series and imbedded in adjoining phases. Motor frame shall be cast iron, and all hardware and shaft shall be stainless steel.

#### 2.5 GUIDE RAIL SYSTEM

Provide a guide rail system consisting of two stainless steel guide rails, cast ductile iron pump guide bracket and discharge elbow with mounting feet and 125 lb. flanges, an upper stainless steel guide rail mounting bracket and intermediate guide brackets every 10 feet.

#### 2.6 SURFACE PREPARATION

Solvent wash, coat with minimum 3 MDFT epoxy.

**SERVICE LATERAL KIT WITH STAINLESS STEEL VALVES AND  
ENGINEERED THERMOPLASTIC COMPRESSION FITTINGS SPECIFICATION****General**

**Description:** The **MANUFACTURER** shall furnish service lateral kits (exclusive of piping); each consisting of three (3) compression fittings, one (1) combination curb stop/check valve assembly and one (1) curb box. The curb stop/check valve assembly shall be 304 stainless steel and have a two-piece cast 304 stainless steel housing. All plastic compression fittings are to be molded from polypropylene and shall be tested for resistance to aging, pressure rating, tensile strength, and flexural strength. All components shall incorporate compression fitting connections for easy, reliable installation of piping. The lateral kit shall be rated for 150 psi service. Lateral kits with pressure-tested combination curb stop/ check valve assembly shall be provided by Environment One Corporation, Niskayuna, New York, or approved equal.

**Shop Drawings:** After receipt of notice to proceed, the **MANUFACTURER** shall furnish a minimum of six (6) sets of shop drawings detailing the equipment to be furnished, including dimensional data and materials of construction. The **SPECIFYING ENGINEER** shall promptly review this data and return two (2) copies as accepted, or with requested modifications. Upon receipt of accepted shop drawings, the **MANUFACTURER** shall proceed immediately with fabrication of the equipment.

**Warranty:** All merchandise is warranted to be free from defects in materials and factory workmanship. Environment One shall provide, free of charge, new products in equal quantities for any that prove defective within two (2) years from date of shipment from our factory. **MANUFACTURER** shall not be liable for any loss, damage, or injury, direct or consequential, arising out of the use of or the inability to use the product. Before using, the user shall determine the suitability of the product for his intended use and user assumes all risk and liability whatever in connection therewith. No claims for labor or consequential damage will be allowed. The foregoing may not be changed except by agreement signed by an officer of the **MANUFACTURER**.

**Product**

**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.

**Stainless Steel Curb Stop/Check Valve Assembly:** 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.

**Curb Boxes:** Shall be manufactured by Carson or approved equal of adequate size and depth to maintain valves.

Valves shall be at edge of ROW on owners side and shall remain owners responsibility to maintain.

**High Density Polyethylene Pipe (Supplied by others)**

Pipe shall have a working pressure of 200 psi minimum and shall be classified SDR per ASTM D 3035.

**Deviations:** If a supplier chooses to submit a bid that does not meet all the requirements of this specification, the bid shall include a written description of the deviation with data that shows the magnitude of the deviation and the justification for the deviation from this specification. The decision to accept material deviating from this specification shall be the responsibility of the **SPECIFYING ENGINEER**.

**Certification:** The owner or the **SPECIFYING ENGINEER** may request certified lab data to verify the physical properties of the pipe materials supplied under this specification or may take random samples and have them tested by an independent laboratory.

**Rejection:** Polyethylene pipe may be rejected for failure to meet any of the requirements of this specification.

**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**. SDR 7 fittings will not work with SDR pipe.

**Execution**

**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 City of Gig Harbor Public Works Standards trench/backfill requirements.

END OF SECTION

**SECTION: GRINDER PUMP STATIONS****1.0 General**

- 1.01 GENERAL DESCRIPTION:** The **MANUFACTURER** shall furnish complete factory-built and tested grinder pump unit(s), each consisting of a grinder pump core suitably mounted on an integral stand of stainless steel, special polyethylene tank, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly/shut-off valve, anti-siphon valve/check valve assembly, electrical alarm assembly and all necessary internal wiring and controls. 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**.
- 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: Polyethylene Construction.** The tank shall be made of rotational molded polyethylene with high environmental stress cracking resistance. 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 overall basin capacity shall be 476 gallons. The basin shall incorporate a tapered bottom with an inside diameter of no greater than 46 inches, reducing to a diameter no greater than 42 inches, to minimize the retained volume. The largest diameter must be no less than 50 inches and no greater than 52 inches.

A station that is 77 inches tall shall have no greater than a 36 inch outside diameter flat fiberglass cover. The 77 inch tall station can be extended in 6 inch increments with normal cylindrical fiberglass extensions.

Taller stations shall have an accessway with a shroud and domed cover. The accessway shall be an integral extension of the wetwell assembly and shall include a lockable cover assembly with integral vent 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. To minimize the station's on-site footprint, the domed cover shall have an outside diameter of no greater than 30 inches. Accessway design and construction shall enable field adjustment of station height in 3-inch increments without the use of any adhesives or sealants requiring cure time before installation can be completed. Corrugated sections are to be made of a double-wall HDPE construction with the internal wall being generally smooth. Corrugations of the outside wall are to be of a minimum amplitude of 1-1/2 inch to provide necessary transverse stiffness. Any incidental sections of a single-wall construction are to be a minimum .250 inch thick. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The accessway wall must withstand the pressure exerted by saturated soil loading at maximum burial depth and must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

The tank and factory penetrations shall be factory tested and guaranteed to be watertight.

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

- 2.06 DISCHARGE HOSE AND DISCONNECT/VALVE:** All discharge fittings and piping shall be constructed of 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.
- 2.07 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 32' total, 25' of useable, electrical supply cable (ESC) to connect to the alarm panel. The EQD shall require no tools for assembly, 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. Junction boxes are not acceptable due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required.

- 2.08 CHECK VALVE:** The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the 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 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 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.
- 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 motor starting controls in a plastic enclosure is not acceptable. 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; solvents or glues are not acceptable. 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-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 ALARM PANEL(S): SIMPLEX STATION:

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 – Note: The Alarm Contacts Package is included with Sentry Simplex PreSTAT Panels**

- **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.
- **Alarm Activated Remote (Powered) Contacts** – Normally open contacts that close on alarm, providing 120V on high level alarm.

**(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

**2.13 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.

**2.14 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.”*

**2.15 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.

All HDPE basins shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

**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 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 core units, including level controls, will be delivered to the job site 100 percent completely assembled, including testing, ready for installation. Grinder pump cores will be shipped separately from the tanks. Installing the cores and discharge piping/hose into the tanks is the only assembly step required and allowed due to the workmanship issues associated with other on-site assembly. Grinder pump cores must be boxed for ease of handling.

**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" to 4" 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.

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' total, 25' 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 compactable soil, with less than 12% 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% and 90%. Heavy, non-compactable 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 four 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%. 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 station. 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 or portion thereof, 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



**WARRANTY PERFORMANCE CERTIFICATION**

As a pre-bid certification requirement, each bidder shall provide a Warranty Performance Certification executed by the most senior executive officer, which certifies a minimum of a two (2) year 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 original equipment deficiency for the effective period of the warranty.

I, \_\_\_\_\_, by and through my duly authorized signature below as its most senior operating executive, certify that \_\_\_\_\_ will provide a two (2) year warranty on grinder pump equipment manufactured and supplied by \_\_\_\_\_ for the \_\_\_\_\_ project. I further certify that, other than failure to install equipment in accordance with manufacturer's instructions, no exclusions and/or cost items to maintain said equipment in warrantable condition, including labor, travel and shipping fees, exist except as detailed immediately below:

- EXCLUSIONS: 1. \_\_\_\_\_  
 2. \_\_\_\_\_  
 3. \_\_\_\_\_

COST ITEMS TO MAINTAIN EQUIPMENT IN WARRANTABLE CONDITION:	Required Frequency (mos)	Avg. monthly cost (\$) times warranty period
1. _____	_____	\$ _____
2. _____	_____	\$ _____
3. _____	_____	\$ _____
4. _____	_____	\$ _____
5. _____	_____	\$ _____

Total labor/material cost to maintain equipment in warrantable condition for warranty period (\$):

For any items not identified as exclusions or additional cost items above, OR for additional labor & material costs required to maintain equipment in warrantable condition that exceed the Avg. monthly cost (\$) detailed above, \_\_\_\_\_ will bear all costs to correct such original equipment deficiency for the effective period of the warranty including all applicable labor, travel and shipping fees.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

**MANUFACTURER’S DISCLOSURE STATEMENT**

Note: To be completed if proposing an alternate

**1.0 GENERAL:**

**1.01 General Description**

Describe all non-conforming aspects to the specification:

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**1.04 Experience**

List 10 low pressure sewer system installations *of the type of pump/station specified (progressive cavity type)* that have been in operation for a period of no less than ten years with a minimum of 100 pumps pumping into a “common” low pressure sewer system. Provide Name and Location, Contact Name, Phone Number, Number of Pumps, and Install Date for each.

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**1.05 Operating Conditions**

Describe all non-conforming aspects to the specification:

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**1.06 Warranty**

Fully state the manufacturer’s warranty:

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**2.0 PRODUCT:**

**2.01 Pump**

Describe all non-conforming aspects to the specification:

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**2.02 Grinder**

Describe all non-conforming aspects to the specification:

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**2.03 Motor**

Describe all non-conforming aspects to the specification:

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**2.05 Tank**

Describe all non-conforming aspects to the specification:

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**2.07 Electrical Quick Disconnect**

Describe all non-conforming aspects to the specification:

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**2.08 Check Valve**

Describe all non-conforming aspects to the specification:

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**2.09 Anti-Siphon Valve**

Describe all non-conforming aspects to the specification:

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**2.11 Controls**

Describe all non-conforming aspects to the specification:

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**2.15 Safety**

Describe all non-conforming aspects to the specification:

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**3.0 EXECUTION:**

**3.01 Factory Test**

Describe all non-conforming aspects to the specification:

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I attest that all questions are answered truthfully and all non-conforming aspects to the specifications have been described where requested.

Manufacturer: \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Name of Corporate Officer Signature

\_\_\_\_\_  
Title of Corporate Officer

Witness: \_\_\_\_\_ Date: \_\_\_\_\_  
Name Signature

## SECTION: GRINDER PUMP STATIONS

### 1.0 General

- 1.01 GENERAL DESCRIPTION:** The **MANUFACTURER** shall furnish complete factory-built and tested grinder pump unit(s), each consisting of a grinder pump core suitably mounted on an integral stand of stainless steel, special polyethylene tank, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly/shut-off valve, anti-siphon valve/check valve assembly, electrical alarm assembly and all necessary internal wiring and controls. 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**.
- 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: Polyethylene Construction.** The tank shall be made of rotational molded polyethylene with high environmental stress cracking resistance. 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 overall basin capacity shall be 237 gallons. The basin shall incorporate a tapered bottom with an inside diameter of no greater than 28 inches to minimize the retained volume and shall be designed to fit into most septic tanks after removal of the septic tank cover. The largest diameter must be no less than 50 inches and no greater than 52 inches.

A station that is 55 inches tall shall have no greater than a 36 inch outside diameter flat fiberglass cover. The 55 inch tall station can be extended in 6 inch increments with normal cylindrical fiberglass extensions.

Taller stations shall have an accessway with a shroud and domed cover. The accessway shall be an integral extension of the wetwell assembly and shall include a lockable cover assembly with integral vent 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 domed cover shall have an outside diameter of no greater than 30 inches. Accessway design and construction shall enable field adjustment of station height in 3" increments without the use of any adhesives or sealants requiring cure time before installation can be completed. Corrugated sections are to be made of a double-wall HDPE construction with the internal wall being generally smooth. Corrugations of the outside wall are to be of a minimum amplitude of 1-1/2 inch to provide necessary transverse stiffness. Any incidental sections of a single-wall construction are to be a minimum .250 inch thick. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The accessway wall must withstand the pressure exerted by saturated soil loading at maximum burial depth and must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

The tank and factory penetrations shall be factory tested and guaranteed to be watertight.

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

- 2.06 DISCHARGE HOSE AND DISCONNECT/VALVE:** All discharge fittings and piping shall be constructed of 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.
- 2.07 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 32' total, 25' of useable, electrical supply cable (ESC) to connect to the alarm panel. The EQD shall require no tools for assembly, 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. Junction boxes are not acceptable due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required.



- 2.08 CHECK VALVE:** The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the 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 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 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.
- 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 motor starting controls in a plastic enclosure is not acceptable. 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; solvents or glues are not acceptable. 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-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 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 – Note: The Alarm Contacts Package is included with Sentry Simplex PreSTAT Panels**

- **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.
- **Alarm Activated Remote (Powered) Contacts** – Normally open contacts that close on alarm, providing 120V on high level alarm.

**(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 or not
  - 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

**2.13 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.

**2.14 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.”*

**2.15 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.

All HDPE basins shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

- 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 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 core units, including level controls, will be delivered to the job site 100 percent completely assembled, including testing, ready for installation. Grinder pump cores will be shipped separately from the tanks. Installing the cores and discharge piping/hose into the tanks is the only assembly step required and allowed due to the workmanship issues associated with other on-site assembly. Grinder pump cores must be boxed for ease of handling.

- 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" to 4" 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.

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' total, 25' 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 compactable soil, with less than 12% 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% and 90%. Heavy, non-compactable 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 four 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%. 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 station. 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.
4. 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 or portion thereof, 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



**WARRANTY PERFORMANCE CERTIFICATION**

As a pre-bid certification requirement, each bidder shall provide a Warranty Performance Certification executed by the most senior executive officer, which certifies a minimum of a two (2) year 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 original equipment deficiency for the effective period of the warranty.

I, \_\_\_\_\_, by and through my duly authorized signature below as its most senior operating executive, certify that \_\_\_\_\_ will provide a two (2) year warranty on grinder pump equipment manufactured and supplied by \_\_\_\_\_ for the \_\_\_\_\_ project. I further certify that, other than failure to install equipment in accordance with manufacturer's instructions, no exclusions and/or cost items to maintain said equipment in warrantable condition, including labor, travel and shipping fees, exist except as detailed immediately below:

- EXCLUSIONS: 1. \_\_\_\_\_  
 2. \_\_\_\_\_  
 3. \_\_\_\_\_

COST ITEMS TO MAINTAIN EQUIPMENT IN WARRANTABLE CONDITION:	Required Frequency (mos)	Avg. monthly cost (\$) times warranty period
1. _____	_____	\$ _____
2. _____	_____	\$ _____
3. _____	_____	\$ _____
4. _____	_____	\$ _____
5. _____	_____	\$ _____

Total labor/material cost to maintain equipment in warrantable condition for warranty period (\$):

For any items not identified as exclusions or additional cost items above, OR for additional labor & material costs required to maintain equipment in warrantable condition that exceed the Avg. monthly cost (\$) detailed above, \_\_\_\_\_ will bear all costs to correct such original equipment deficiency for the effective period of the warranty including all applicable labor, travel and shipping fees.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

**MANUFACTURER'S DISCLOSURE STATEMENT**

Note: To be completed if proposing an alternate

**1.0 GENERAL:**

**1.01 General Description**

Describe all non-conforming aspects to the specification:

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**1.04 Experience**

List 10 low pressure sewer system installations *of the type of pump/station specified (progressive cavity type)* that have been in operation for a period of no less than ten years with a minimum of 100 pumps pumping into a "common" low pressure sewer system. Provide Name and Location, Contact Name, Phone Number, Number of Pumps, and Install Date for each.

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**1.05 Operating Conditions**

Describe all non-conforming aspects to the specification:

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**1.06 Warranty**

Fully state the manufacturer's warranty:

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**2.0 PRODUCT:**

**2.01 Pump**

Describe all non-conforming aspects to the specification:

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**2.02 Grinder**

Describe all non-conforming aspects to the specification:

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**2.03 Motor**

Describe all non-conforming aspects to the specification:

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**2.05 Tank**

Describe all non-conforming aspects to the specification:

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**2.07 Electrical Quick Disconnect**

Describe all non-conforming aspects to the specification:

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**2.08 Check Valve**

Describe all non-conforming aspects to the specification:

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**2.09 Anti-Siphon Valve**

Describe all non-conforming aspects to the specification:

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**2.11 Controls**

Describe all non-conforming aspects to the specification:

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**2.15 Safety**

Describe all non-conforming aspects to the specification:

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**3.0 EXECUTION:**

**3.01 Factory Test**

Describe all non-conforming aspects to the specification:

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I attest that all questions are answered truthfully and all non-conforming aspects to the specifications have been described where requested.

Manufacturer: \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Name of Corporate Officer      Signature

\_\_\_\_\_  
Title of Corporate Officer

Witness: \_\_\_\_\_ Date: \_\_\_\_\_  
Name                              Signature