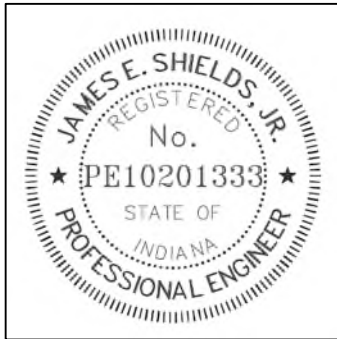




Aqua Indiana State Standards

Low Pressure Sewer System (LPSS) Construction

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FOREWORD

The “Aqua Indiana State Standards” for Aqua Indiana and its subsidiaries (the Utility) have been prepared to set forth Aqua Indiana’s minimum criteria for construction within the Utility’s limits.

All construction projects which are connected to the Utility system shall conform to these standards. Construction drawings and specifications must be approved by the Utility and a written permit obtained for sewer extensions in accordance with existing ordinances before construction begins. In addition, sanitary sewer projects must be submitted to the Indiana Department of Environmental Management (IDEM) for approval and issuance of a construction permit. Developers may not submit projects to IDEM until the Utility issues a wasteload allocation and approval of plans.

Construction observation will be performed by the Utility. A minimum of 48 hours’ notice shall be given prior to starting construction.

These standards were prepared with the intent of obtaining the highest quality of construction possible, consistent with accepted industry practices and specifications. As new materials become available and acceptable, the standards may be revised and updated.

Critical Design Criteria for Low Pressure Grinder Pump System Construction:

1. The Design Engineer shall submit a low pressure sewer system (LPSS) service area map.
2. State Utility Engineer will make the determination as to the need for improvements to downstream sanitary sewer facilities. Early coordination is recommended to eliminate delays during design.
3. State Utility Engineer will make final determinations as to the ability to reasonably comply with these Design Specifications.
4. These Design Specifications are intended to define the design requirements of sanitary sewer facilities which are constructed and operated under typical conditions in Aqua Indiana service areas. Depending on field conditions and the composition and characteristics of the sanitary sewer flow, different or unusual conditions may occur which cannot be anticipated in a document of this nature. Consequently, the State Utility Engineer may impose additional or special design requirements under such circumstances.
5. Low pressure sewer systems (LPSS) will only be considered in areas where sanitary sewers currently serve the surrounding areas and where conventional sanitary sewer facilities cannot be constructed.
6. Grinder pumps stations shall be of semi-positive displacement pump design. Use of centrifugal grinder pumps stations and designs are discouraged.
7. Design Engineer shall submit LPSS calculations including:
 - a. calculation worksheet
 - b. individual pump curves
 - c. make and model number of pumps for design
8. Force main shall be designed per Aqua Indiana State Standards for Sanitary Sewer Construction.
9. The Utility shall be responsible for the operation and maintenance of the common force main and the portion of the lateral from the common force main to, and including, the curb stop assembly.
10. The Customer/Homeowner shall be responsible for all piping, pumping equipment, and appurtenances between the building and the curb stop assembly.
11. Manuals and warranty shall be provided to the Grinder Pump Owner (Customer).
12. Customer/Grinder Pump Owner is responsible for all future maintenance and replacement of the grinder pump and control system.

PART 1 - GENERAL**1.1 SCOPE OF WORK**

- A. CUSTOMER shall furnish and install a complete factory-built and tested grinder pump station consisting of a grinder pump suitably mounted in a basin constructed of high density polyethylene (HDPE) or fiberglass, electrical quick disconnect, pump removal system, shut-off valve, anti-siphon valve, and check valve assembled within the basins, electrical alarm/disconnect panel, and all necessary internal wiring and controls.
- B. UTILITY shall operate and maintain the low-pressure sewer system collection line and appurtenances constructed.

1.2 QUALITY ASSURANCE**A. Manufacturer Qualifications:**

- 1. The equipment specified shall be a product of a company experience 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 this 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.

1.3 SUBMITTALS**A. Submit shop drawings for review by the utility and customer showing the following:**

- 1. Complete description in sufficient detail to permit an itemized comparison with the specifications.
- 2. Dimensions and installation requirements.
- 3. Descriptive information including manufacturers' catalog cuts and specifications for all components.
- 4. Electrical schematics and layouts.
- 5. Hydraulic calculations demonstrating compliance with the specified hydraulic characteristics.

PART 2 - PRODUCTS**2.1 GRINDER STATION**

- A. Grinder pumps shall be of semi-positive displacement pump design. Grinder pump stations shall be manufactured by Environment One Corporation, Zoller Pump Company or approved equal.

2.2 GENERAL GRINDER STATION REQUIREMENTS**A. PUMP:**

- 1. The pump shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet and 9 GPM against a rated total dynamic head of 138 feet. The pump must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance,

grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance.

B. GRINDER:

1. The grinder shall be placed immediately below the pumping elements and shall be direct driven by a single, one-piece motor shaft. The grinder will be of the rotating type with a stationary hardened and ground stainless steel shredding ring spaced in close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars.
 - a. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump.
 - b. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

C. ELECTRIC MOTOR:

1. 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 a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. 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.

D. MECHANICAL SEAL:

1. 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.

E. TANK AND INTEGRAL ACCESSWAY:

1. The tank shall be made of fiberglass or high density polyethylene.
 - a. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of the outside wall are to be of a minimum amplitude of 1 1/2" 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. 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.
 - b. The grinder pump station tank shall have an optimum capacity of 70 gallons.
 - c. The accessway shall be an integral extension of the wet well assembly and include a lockable cover assembly mounting and watertight capability.

Accessway design and construction shall enable field adjustment of station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

- d. The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations shall be acceptable.
- e. All discharge piping shall be constructed of 304 Series Stainless Steel and terminate outside the accessway bulkhead with a stainless steel, 1 1/4 inch female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi; PVC ball valves will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.
- f. The accessway shall include a single NEMA 6P electrical quick disconnect for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. The accessway shall also include a 2-inch PVC vent to prevent sewage gases from accumulating in the tank.

F. CHECK VALVE:

- 1. The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure.
 - a. Each grinder pump installation shall also include one separate curb stop with check valve in the 1 1/4" service lateral between the grinder pump station and the sewer main. Said assembly shall be the responsibility of the Utility to install and maintain.

G. ANTI-SIPHON VALVE:

- 1. The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from a glass-filled 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.

H. CONTROLS:

- 1. All necessary controls, including motor and level controls, shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners.

- a. 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 level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell 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.
- b. To assure reliable operation of the pressure switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent accidental entry of water into the motor compartment.

I. ALARM PANEL:

1. Each grinder pump station shall include a NEMA 4X, UL listed ALARM PANEL suitable for wall mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic to assure corrosion resistance. The enclosure shall include a hinged, lockable cover, padlock, and secured dead front.
 - a. The Alarm Panel shall include the following features: audio & visual alarm, push-to-run switch, and high level (redundant) pump starting control. The alarm sequence is to be as follows:
 - 1) When liquid level in the sewage wet-well rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.
 - 2) The audio 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.
 - 4) The entire Alarm Panel as manufactured, shall be listed by Underwriters Laboratories, Inc.

J. SERVICEABILITY:

1. The grinder pump core unit shall have two lifting hooks complete with nylon lift-out harness connected to its top housing to facilitate easy core removal when necessary. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. A push-to-run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

K. OSHA CONFINED SPACE:

1. 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."

L. SAFETY:

1. 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 will not be acceptable.
2. 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 will not be acceptable.

2.3 LOW PRESSURE SEWER SYSTEM PIPING

- A. Low Pressure Sewer System (LPSS) shall be constructed using High Density Polyethylene pipe (HDPE). No PVC low pressure sewer main shall be permitted.
- B. All pressure sewer lateral pipe and fittings shall be not less than 1-1/4 inch inner diameter HDPE, brass or stainless steel.
- C. Refer to Aqua Sanitary Sewer Construction Standards Part 2.3.E for HDPE pressure pipe specifications.
- D. Refer to Aqua Sanitary Sewer Construction Standards Part 4.1.C.7 for HDPE pressure pipe testing.
- E. Pipe and Fittings
 1. Shall be either DR-9 or DR-11
 2. All pipe shall have fused joints
 3. Electrofusion fittings or butt fusion connections are preferred
 4. Polypropylene (PP) Compression Fittings for Polyethylene (PE) pressure piping applications are permitted
 5. Brass fittings (pre-approval by Aqua required)
 6. Stainless Steel (pre-approval by Aqua required)
 7. No clamp on style saddles are permitted on PE pipe. Electrofusion saddles are required for all lateral connections.
- F. Joints:
 1. All pipe joints shall be fused
 2. Brass (pre-approval by Aqua required)
 3. Stainless Steel (pre-approval by Aqua required)
 4. Compress style couplings will be supplied with stainless steel inserts or approved equivalent where required.

2.4 LOW PRESSURE SEWER SYSTEM COMPONENTS

- A. Isolation Valve
 1. Valve shall be manufactured of high density polyethylene (PE). Valve shall be a ball valve design with a full bore opening. The valve shall be suitable for operation in systems with pressure up to 200 psig. The valve operation shall be ¼ turn (clockwise open) using a 2” square drive. Valve shall be suitable for installation

by butt fusion, electrofusion or mechanical jointing. Valve shall meet requirements of NSF/ANSI 61, AWWA C901/906, ASTM-D2513, ASTM D3261 and ASME16.40.

B. Fitting and Connections

1. PE fittings shall be of molded high density polyethylene (PE) design with no inner fusion bead, fully pressure rated up to 200 psig and a wall thickness that remains consistent throughout fitting. All fittings shall be manufactured from the highest quality Virgin black high density resin designed for use in wastewater applications. Joints shall be made using either butt fusion, electrofusion or use of an approved transition fitting. Fittings shall meet requirements of ASTM –D2513 AWWA C-901/C-906 and manufactured with resin having a material designation code of PE 3408, PE 3608, PE 4710, and PE 100.
2. Connections may be made using compression fitting connections including a Buna-N O-ring for sealing to the outside diameter of the pipe. Polypropylene (PP) compression fittings for PE pressure piping applications shall be of injection molding design using PP material. All fittings shall be designed for use in wastewater applications. 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. Fitting shall be full port and with a pressure rated up to 200 psig. Fittings shall meet requirements of AWWA C-901/C-906.

C. Curb Stop Check Valve Assembly

1. The pressure lateral shall have a ball valve curb stop and 1-1/4 inch redundant check valve installed at the property line or permanent easement boundary
2. A curb box with arch pattern base shall be installed over the curb stop assembly.
3. Curb Stop/Check Valve Assembly: The ball valve actuator shall include position stop features at the fully opened and closed positions and shall be of stainless steel material. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.
4. 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
5. Curb Boxes shall be constructed of cast iron or ABS, conforming to ASTM-D 1788. All components shall be heavily coated with asphalt paint to assure durability in the ground. Curb boxes shall provide 12" of height adjustment downward (shorter) from their extended height. The curb box shall say SEWER on its lid.
6. The valve shall operate through a compound lever system that will seal both the pressure orifice and the air and vacuum orifice simultaneously.

D. Flushing Station

1. Flushing stations shall be constructed using a 20-inch minimum diameter HDPE corrugated meter pit style. Frames and covers shall be cast iron and labeled "SEWER" and be the "drop-in" type. Locking covers are not permitted. Flushing stations shall be installed within the right-of-way or easement line. Each flushing station shall be furnished with an isolation valve, 3-inch male camlock coupler with Female NPT threads and camlock dust plug. Flushing stations shall be installed vertically and shall be perfectly centered over the 3-inch camlock.

Flushing stations shall never be installed in any sidewalk, or in a driveway in the area where the public sidewalk crosses the driveway. Flushing stations shall be installed such that the top of the box is flush with the dirt surface. Flushing stations shall never pose a trip hazard or pose a potential threat of damage to lawn mowers. The cast iron frame shall be centered on the box.

PART 3 - EXECUTION

3.1 FACTORY TEST

- A. Each grinder pump shall be submerged and operated for 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 will not be acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two (2) different points on its curve, with the maximum pressure no less than 60 psi.
- B. All completed stations 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.).

3.2 INSTALLATION

- A. CONTRACTOR shall install grinder pump units in accordance with the MANUFACTURER'S Drawings, shop drawings and instructions.

3.3 START-UP AND FIELD TESTING

- A. 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, and instruct the personnel in the operation and maintenance of the equipment before the stations are accepted by the OWNER (Customer).
- B. All equipment and materials necessary to perform testing shall be the responsibility of the installing CONTRACTOR. This will include, as a minimum, a portable generator (if temporary power is required) and water in each basin.
- C. The services of a trained factory-authorized technician shall be provided.
- D. Upon completion of the start-up and testing, the CONTRACTOR/OWNER (customer) shall submit to the UTILITY the start-up form describing the results of the tests performed for each Grinder Pump Station.

END