

SANITARY SEWER CONSTRUCTION AND MATERIAL SPECIFICATIONS FOR TYPICAL HOUSE CONNECTION

GRINDER PUMP UNIT/ PRESSURE SANITARY SEWER LATERAL

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CONEWAGO TOWNSHIP
MUNICIPAL AUTHORITY

ADAMS COUNTY, PENNSYLVANIA

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DIVISION 2 – SITEWORK
SECTION 02560 – PRESSURE SEWER LATERALS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This section consists of furnishing the materials; and installing and testing the pressure sewer laterals to serve specific homes which cannot be served by gravity laterals.

1.02 QUALITY ASSURANCE

- A. Shop Tests: The AUTHORITY/AUTHORITY REPRESENTATIVE may require that the pipe provided have evidence of factory testing of pipe materials. The pipe manufacturer shall have facilities to perform listed tests. As a minimum the polyvinyl chloride pipe shall be tested as required under ASTM D 2241 and D 1785. The AUTHORITY/AUTHORITY REPRESENTATIVE reserves the right to require the pipe manufacturer or independent laboratories to perform additional testing if he feels it necessary to establish the quality of the pipe.
- B. Laboratory Tests: Should the AUTHORITY/AUTHORITY REPRESENTATIVE require that laboratory testing be required in addition to shop testing, the pipe manufacturer shall furnish without additional compensation all materials, labor, and equipment to collect, label, and ship the material to the testing laboratory.
- C. Visual Inspection: The CONTRACTOR shall inspect each section of pipe prior to lying; any damaged pipe shall immediately be removed from the site.

PART 2 – PRODUCTS

2.01 PRESSURE LATERAL PIPE AND FITTINGS

- A. Pipe provided shall be polyvinyl chloride (PVC) and shall meet the following criteria
 - 1. ASTM D 2241, SDR 21
 - a. Pressure class: 200 psi.
 - b. Pipe Joints: Push-on or compression type, joint performance ASTM D3139, rubber gasket suitable for domestic sewage service ASTM F477.
 - 2. ASTM D 1785 Schedule 80 manufactured from Class 12454-B Rigid PVC Compounds with a hydrostatic design stress of 13.8 Mpa (2000 psi) designated as PVC 1120.
 - a. Joints: Socket – Type unless flanged joints are indicated on the Drawings.
 - b. Socket Type Fittings: ASTM D 2467 manufactured from Class 1254-B Rigid PVC Compound.
 - c. Flanges: PVC Schedule 80 150-lb. Flanges manufactured from Rigid PVC Compounds conforming to ASTM D 1784
 - (1) Gaskets: Soft rubber full-face flat type.
 - (2) Bolts: Steel conforming to ASTM A 307.
 - d. Solvent: ASTM D 2564
 - e. Pressure Class: 200 psi
- B. Provide adapters, bands, caps, etc. as required.
- C. Flanged Adapters: For joining plain-end pipe to flanged fittings, valves and pumps.
 - 1. Acceptable Manufacturers:
 - a. Ford Meter Box
 - b. Romac
 - c. Smith-Blair
 - d. Or Equal

- D. Trace Wire: For installation immediately over pressure sewer where non-metallic pipe is used. The wire used shall be Type 2E, 14 AWG, 600 volt with gasoline resistant coating.
- E. The grinder pump manufacturer shall furnish complete service lateral fitting kits (exclusive of piping, each consisting of one (1) male adapter for attachment to the station and one (1) combination curb stop/check valve assembly with curb box. All plastic valves and fittings are to be molded from engineered thermo plastic resins.

PART – 3 EXECUTION

3.01 PREPARATION

- A. The CONTRACTOR shall install the pressure sewer laterals as shown on the included detail taking care to stay within the right-of-way granted and causing as little property disturbance as possible.
- B. The pipe shall be installed on four (4”) inches of crushed stone aggregate conforming to PA. No. 1B. This crushed stone backfill shall continue to a height of twelve inches (12”) above the top of the pipe. Bottom trench width shall be between six (6”) inches and nine (9”) wider than the exterior diameter of the pipe of each side of the pipe.
- C. The CONTRACTOR shall install the pressure sewer laterals as shown on the detail at the end of this manual. The pipe shall be generally four (4) feet deep following the ground surface. The pipe diameter shall be 1-1/2” diameter. Hand tools shall be used to excavate within 24” of the grinder tank.
- D. Earth dams shall be provided in the pressure lateral trench for the purpose of stopping the natural flow of water. Earth dams shall be constructed at no greater than 50’ intervals. All laterals shall have at least one earth dam per lateral. Earth dams shall be constructed from layers of compacted soil. The soil shall be compacted with tools designed for this purpose. As a minimum the soil shall be placed and compacted in the following three layers:
 - 1. At pipe bottom
 - 2. At top of pipe
 - 3. At top of dam which shall be 12” above the top of pipe unless directed by the Inspector that additional height is required due to unusual circumstances.
- E. Directly above the pressure sewer lateral the CONTRACTOR will place a thin 14 AWG wire as specified above, installed as a trace wire. The ends of the trace wire will be accessible at the curb stop and grinder pump to attach future line locating equipment.
- F. The CONTRACTOR shall clean pipe interior prior to laying pipe and following the laying of the pipe the CONTRACTOR shall take precautions to cap or plug open ends of pipe until actual connection and testing of pipe to insure that pipe interiors remain clean.
- G. The CONTRACTOR shall provide concrete thrust blocks wherever a fitting is used to make a deflection in the pressure main. Use Class B concrete.
- H. Underground warning tape shall be installed above the pipe to warn those digging in the area of the pipe’s presence.
- I. The CONTRACTOR shall install the joint assembly according to ASTM D 2774 for Class I bedding material.
- J. The CONTRACTOR shall install near the curb box a redundant check valve and connect the pressure lateral to the curb box.
- K. Should the pressure lateral cross a driveway, the pressure lateral shall be installed in a liner pipe. The liner pipe shall be 3 inches (minimum) in diameter and be constructed of Schedule 40 PVC.
- L. The CONTRACTOR will be responsible for restoring the yards disturbed by the trench. To accomplish satisfactory yard restoration at least 4” of topsoil shall be used prior to seeding.

3.02 FIELD TESTING

- A. The CONTRACTOR shall conduct hydrostatic pressure tests on each completed section of pipe. After the pipe is constructed, backfilled, and cleaned the CONTRACTOR shall seal the end of the lateral with a suitable pipe plug and fill the line with clear water. The hydrostatic pressure in the line shall be raised to 55 psi and shall be maintained for a period of not less than thirty minutes. Under no conditions should the pipe pressure rating be exceeded. Upon completing the above steps, the lateral shall be acceptable when the measured leakage does not exceed 10 gallons per day per mile per inch of pipe diameter. The CONTRACTOR shall observe the following safety requirements during the hydrostatic test: (1) Securely brace pipe plugs to prevent blowouts. (2) Completely relieve air pressure from pipes before removing plugs. (3) During test keep people away from the area of the plugged pipe.
- B. Should the section of line not pass the hydrostatic test, the source of leakage shall be located and repaired and retested.
- C. All costs associated with the field testing shall be the responsibility of the CONTRACTOR.

3.03 SURFACE RESTORATION & BACKFILL

- A. From the height of 12" above the pipe to the ground surface clean earth backfill may be returned to the trench and properly compacted. Where a lateral crosses a driveway the trench shall be compacted in six-inch (6") layers to a distance of eight inches (8") from the ground surface. For unpaved driveways the CONTRACTOR shall place eight inches of the same type of material that was removed. For the paved driveway the last eight inches (8") of trench shall be replaced with select granular material to a height that allows for the replacement of bituminous material the same thickness of what was removed.
- B. In unpaved areas the trench shall be fine graded and seeded to match the surrounding yard area at no additional cost.

END OF SECTION

DIVISION 2 – SITEWORK
SECTION 02700 – GRINDER PUMP UNIT AND INSTALLATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Description of System:

The MANUFACTURER shall furnish complete factory-built and tested Wetwell/Drywell Grinder Pump Station(s), each consisting of grinder pump(s) suitably mounted in a basin constructed of high density polyethylene (HDPE) for simplex stations and HDPE or Fiberglass Reinforced Polyester Resin for duplex stations with dimensions and capacities as show on the Contract Drawings, NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon valve/check valve, each assembled in the basin, electrical alarm panel and all necessary internal wiring and controls. Component type grinder pump systems that require field assembly will not be acceptable due to the potential problems that can occur during field assembly. All components and materials shall be in accordance with section 2.0 of this Product Specification. For ease of serviceability, all pump, motor/grinder units shall be of like type and horsepower throughout the system.

1.02 QUALITY ASSURANCE

- A. **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.

- B. **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).

- C. **EXPERIENCE** : 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.

- D. **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.
- E. **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 PROPERTY OWNER'S/AUTHORITY'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 PROPERTY OWNER/AUTHORITY and will be corrected by the MANUFACTURER at no cost to the PROPERTY OWNER/AUTHORITY.
- F. **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.

1.03 SUBMITTALS

- A. 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.

1.04 GRINDER PUMP EVALUATION

- A. DEVELOPER/DEVELOPER'S ENGINEER shall evaluate and exhaust all possibilities regarding the use of conventional gravity sanitary sewers, centralized pump station, etc., prior to utilizing individual grinder pumps and low pressure sewers in an effort to minimize future maintenance.

PART 2 – PRODUCTS

2.01 DUPLEX GRINDER PUMP UNIT (SEMI-POSITIVE DISPLACEMENT TYPE)

- A. For sewer connections involving three (3) or more EDUs a Duplex Grinder Pump Unit shall be utilized.

2.02 SIMPLEX GRINDER PUMP UNIT (SEMI-POSITIVE DISPLACEMENT TYPE)

- A. 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.
- B. 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.
- C. **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.
- D. **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.
- E. **TANK AND INTEGRAL ACCESSWAY:** (Model DH071) High Density Polyethylene Construction. The tank shall be a Wetwell/Drywell design made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must

function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the contract drawings. The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

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

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

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

- F. **TANK & INTEGRAL ACCESSWAY:** High Density Polyethylene Construction. The tank shall be a Wetwell/Drywell design made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure. The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the contract drawings. The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The cover shall be high density polyethylene, green in color, with a load rating of 150 lbs per square foot. The accessway design and construction shall enable field adjustment of the station height in increments of 3" or less without the use of any adhesives or sealants requiring cure time before installation can be completed. The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.

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

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

- G. TANK & INTEGRAL ACCESSWAY: (DH272, 275-Gallon Duplex & DH502, 500-Gallon Duplex) Fiberglass reinforced polyester resin. The tank shall be a Wetwell/Drywell design custom molded of fiberglass reinforced polyester resin with a high density polyethylene accessway. Accessway corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All polyethylene seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the contract drawings. The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The cover shall be high density polyethylene, green in color, with a load rating of 150 lbs per square foot. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

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

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

The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32', 25' of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require

- no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.
- H. CHECK VALVE: The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.
- I. ANTI-SIPHON VALVE: The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.
- J. CORE UNIT: The grinder pump station shall have a cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level controls, electrical quick disconnect and wiring. The core unit shall be installed in the basin by the manufacturer. Field assembly of the pump and controls into the basin is not acceptable because of potential workmanship issues and increased installation time. In some cases, stations taller than 96" may be shipped on their side without the cores assembled in the basin for freight purposes but this is the only exception. The core unit shall seal to the tank deck with a stainless steel latch assembly. The latch assembly must be actuated utilizing a single quick release mechanism requiring no more than a half turn of a wrench. The watertight integrity of each core unit shall be established by a 100 percent factory test at a minimum of 5 PSIG.
- K. CONTROLS: All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. Locating the motor starting controls in a plastic enclosure is not acceptable. The wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. The level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. The level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. The level sensing housing must be a high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer. The use of PVC for the level sensing housing is not acceptable. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to

a pressure switch. The air column shall be integrally molded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily-exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.

All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY INSTALLED NEMA 6P EQD half attached to it.

- L. 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.

- M. 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.
- N. 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.”*
- O. 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.
- P. Acceptable Manufacturers:
 - 1. Environment/One Corporation, Pentair Pump Group
 - 2. Or Approved Equal

PART 3 – 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 PROPERTY OWNER/AUTHORITY, at the GRINDER PUMP MANUFACTURER’S facility.

3.02 **CERTIFIED SERVICE PROGRAM:** The grinder pump MANUFACTURER shall provide a program implemented by the MANUFACTURER'S personnel as described in this specification to certify the service company as an authorized serviced center. As evidence of this, the MANUFACTURER shall provide, when requested, sufficient evidence that they have maintained their own service department for a minimum of 30 years and currently employ a minimum of five employees specifically in the service department. As part of this program, the MANUFACTURER shall evaluate the service technicians as well as the service organization annually. The service company will be authorized by the MANUFACTURER to make independent warranty judgments. The areas covered by the program shall include, as a minimum:

- A. Pump Population Information — The service company will maintain a detailed database for the grinder pumps in the territory that tracks serial numbers by address.
- B. 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.
- C. Service Personnel Certification — Service technicians will maintain their level-specific certification annually. The certifications are given in field troubleshooting, repair, and training.
- D. Service Documentation and Records — Start up sheets, service call records, and customer feedback will be recorded and available by the service company.
- E. Shop Organization — The service company will keep its service shop organized and pumps will be tagged with site information at all times. The shop will have all required equipment, a test tank, and cleaning tools necessary to service pumps properly.

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

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

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

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

Remove packing material. Users instructions MUST be given to the PROPERTY OWNER/AUTHORITY. 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', 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 compactible soil, with less than 12 percent fines, free of ice, rocks, roots and organic material, it may be an acceptable backfill. Soil must be compacted in lifts not to exceed one foot to reach a final Proctor Density of between 85 percent and 90 percent. Heavy, non-compactible clays and silts are *not* suitable backfill for this or any underground structure such as inlet or discharge lines.

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

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

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

maximum frost protection. The finish grade line shall be 1" to 4" below the bottom of the lid, and final grade shall slope away from the grinder pump station.

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

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

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:

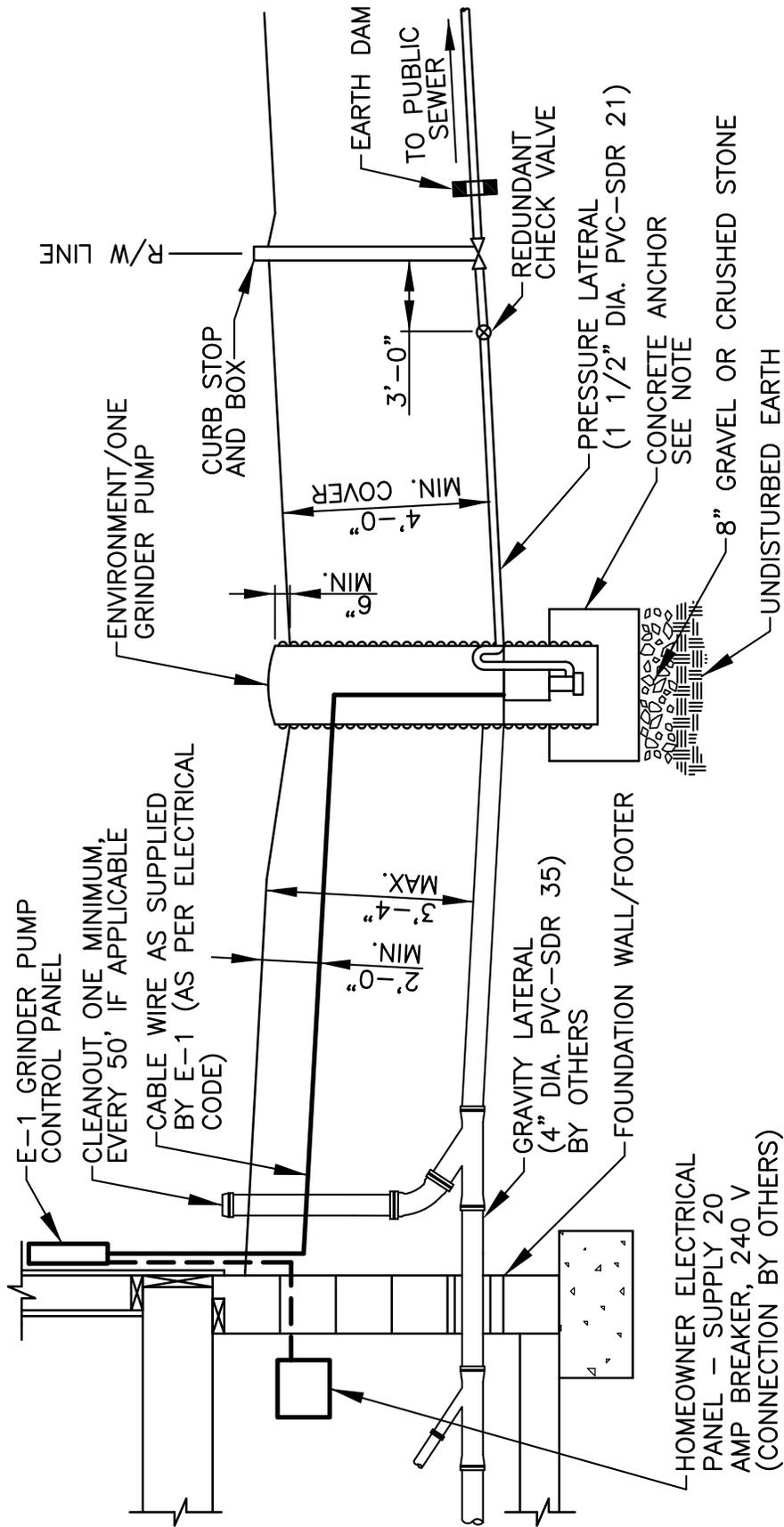
1. Make certain the discharge shut-off valve in the station is fully open.
2. Turn ON the alarm power circuit and verify the alarm is functioning properly.
3. Turn ON the pump power circuit. Initiate the pump operation to verify automatic "on/off" controls are operative. The pump should immediately turn 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.

PART 4 - OPERATION AND MAINTENANCE

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

END OF SECTION



GRINDER PUMP UNIT / PRESSURE SEWER LATERAL / DETAIL

SCALE: N.T.S.

NOTE:
CONCRETE ANCHOR IS TO BE 370 lbs. OF CONCRETE
PER FOOT OF GRINDER UNIT DEPTH.



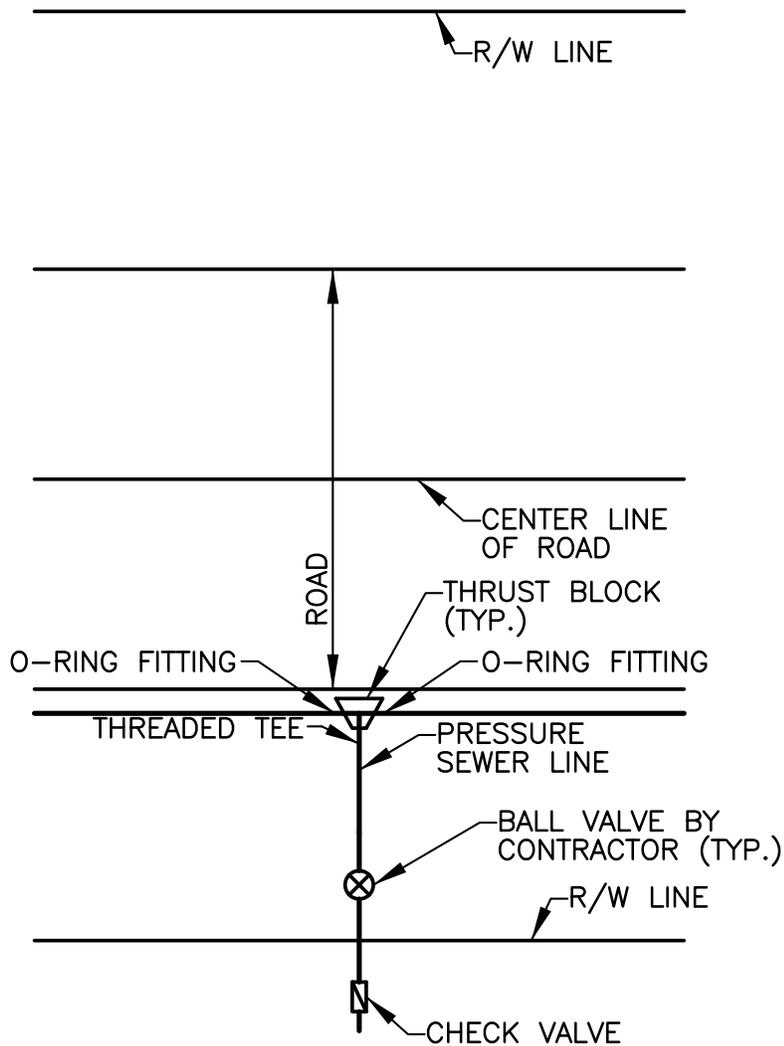
WM. F. HILL & ASSOC., INC.
 PROFESSIONAL ENGINEERS
 CIVIL ♦ MUNICIPAL ♦ ENVIRONMENTAL
 GETTYSBURG, PA 17325
 PH. (717) 334 - 9137

PLAN PREPARATION	
DRAWN BY: FSI	DATE: 5/17/12
DESIGNED BY: BAW	CHECKED BY: WFH

DETAIL 1

CONEWAGO TOWNSHIP MUNICIPAL AUTHORITY
 CONEWAGO TOWNSHIP, ADAMS COUNTY, PA

SCALE
AS SHOWN



NOTE:

WHERE NECESSARY CONTRACTOR TO PROVIDE A THREE (3) INCH PVC SCHEDULE 40 SLEEVE BENEATH ALL PRIVATE DRIVEWAYS TO SERVE AS A CONDUIT FOR THE 1 1/2" PRESSURE LATERALS.

PRESSURE SEWER LATERAL CONNECTION DETAIL

SCALE N.T.S.



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PLAN PREPARATION

DRAWN BY:
FSI

DATE:
1/31/06

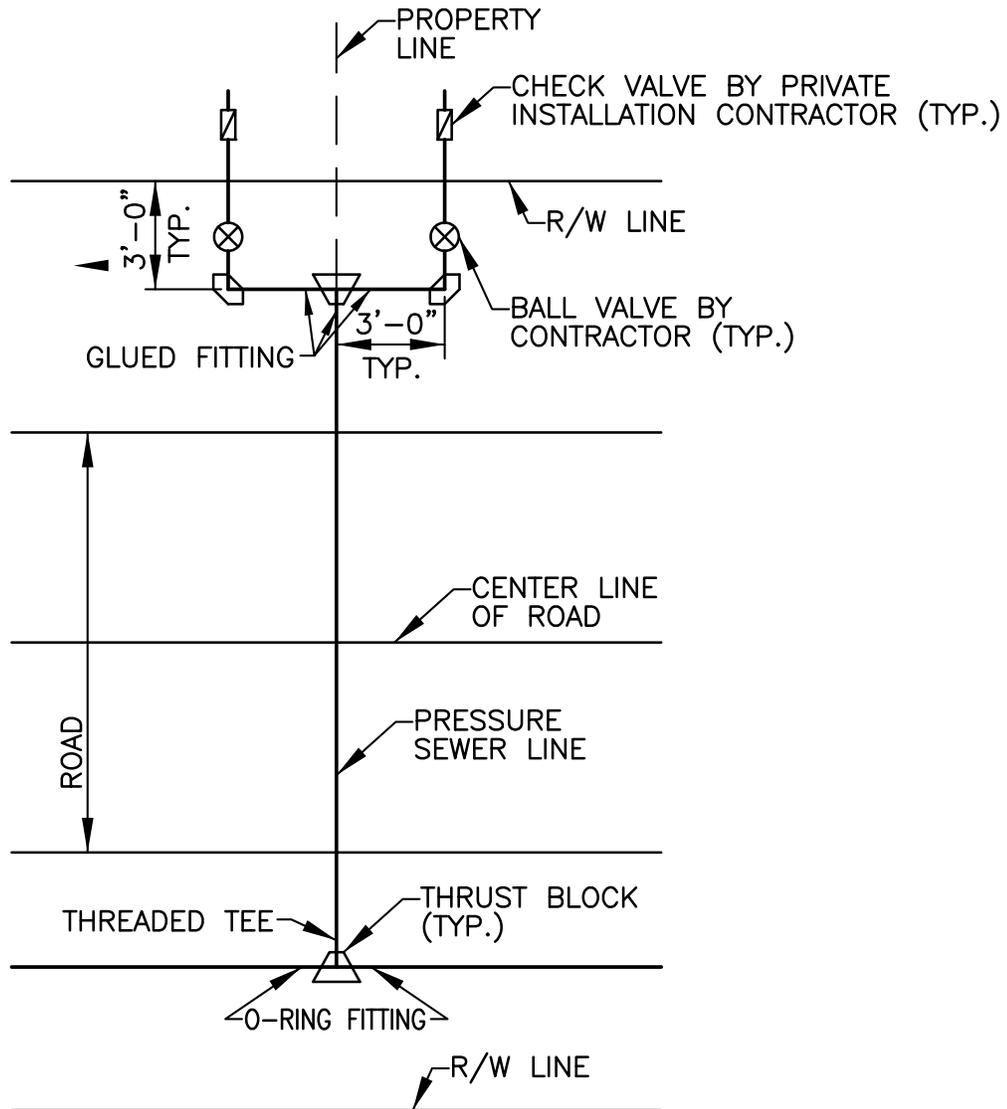
DESIGNED BY:
FSI

CHECKED BY:
WPH

DETAIL 2

CONEWAGO TOWNSHIP MUNICIPAL AUTHORITY
CONEWAGO TOWNSHIP, ADAMS COUNTY, PA

SCALE
AS SHOWN



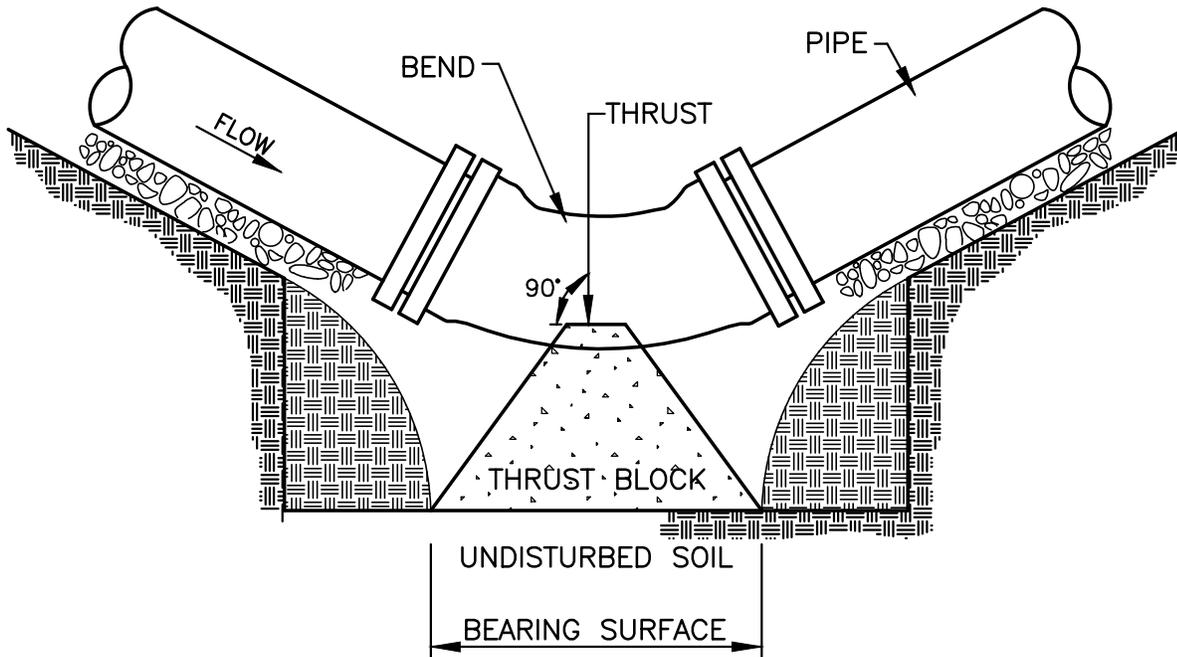
NOTE:

PLUMBING CONTRACTOR/CONTRACTOR TO PROVIDE A THREE (3) INCH PVC SCHEDULE 40 SLEEVE BENEATH ALL PRIVATE DRIVEWAYS TO SERVE AS A CONDUIT FOR THE 1 1/2" PRESSURE LATERALS.

PRESSURE SEWER LATERAL CROSSING CONNECTION DETAIL

SCALE N.T.S.

 WM. F. HILL & ASSOC., INC. PROFESSIONAL ENGINEERS CIVIL ♦ MUNICIPAL ♦ ENVIRONMENTAL GETTYSBURG, PA 17325 PH. (717) 334 - 9137	PLAN PREPARATION		DETAIL 3	SCALE AS SHOWN
	DRAWN BY: FSI	DATE: 1/31/06		
			CONEWAGO TOWNSHIP MUNICIPAL AUTHORITY CONEWAGO TOWNSHIP, ADAMS COUNTY, PA	



CONCRETE THRUST BLOCK FOR SANITARY SEWER PIPE

SCALE N.T.S.

THRUST BLOCK BEARING SURFACE REQUIREMENTS

PIPE SIZE (IN)	90° ELBOW	45° ELBOW	22 1/2° ELBOW	VALVES, TEES AND DEAD ENDS
2"	1.0 FT ²	1.0 FT ²	1.0 FT ²	1.0 FT ²
4"	2.0 FT ²	1.0 FT ²	1.0 FT ²	1.5 FT ²
6"	3.5 FT ²	2.0 FT ²	1.0 FT ²	2.5 FT ²
8"	6.0 FT ²	3.5 FT ²	2.0 FT ²	4.5 FT ²
10"	9.0 FT ²	5.0 FT ²	2.5 FT ²	6.5 FT ²
12"	13.0 FT ²	7.0 FT ²	3.5 FT ²	9.0 FT ²

NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI.
2. ALL REINFORCING STEEL SHALL BE DEFORMED BARS.
3. NO COUPLINGS OR JOINTS SHALL BE COVERED WITH CONCRETE.
4. THRUST BLOCK BEARING SURFACE REQUIREMENTS WERE CALCULATED USING A MAXIMUM PRESSURE OF 70 PSI, A SOIL BEARING STRENGTH OF 1500 LB/FT², AND THE OUTSIDE DIAMETER OF SDR-21 PVC PRESSURE PIPE.
5. BLOCK HEIGHT SHOULD BE EQUAL TO OR LESS THAN ONE-HALF THE TOTAL DEPTH TO THE BOTTOM OF THE BLOCK, BUT NOT LESS THAN THE PIPE DIAMETER.
6. BLOCK HEIGHT SHOULD BE CHOSEN SUCH THAT THE CALCULATED BLOCK WIDTH VARIES BETWEEN ONE AND TWO TIMES THE HEIGHT.



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PLAN PREPARATION

DRAWN BY:
FSI

DATE:
01/02/14

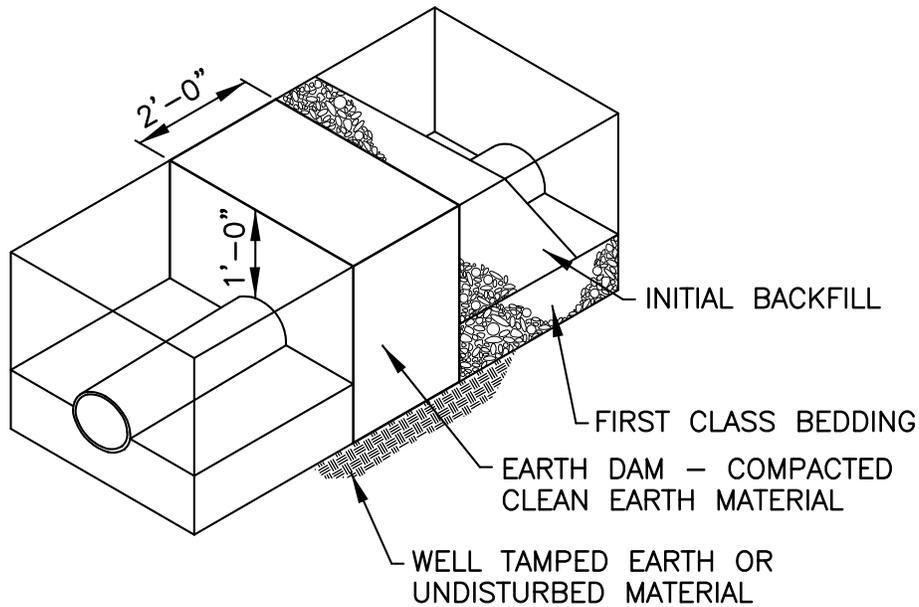
DESIGNED BY:
BAW

CHECKED BY:
WFH

DETAIL 4

CONEWAGO TOWNSHIP MUNICIPAL AUTHORITY
CONEWAGO TOWNSHIP, ADAMS COUNTY, PA

SCALE
AS SHOWN



TYPICAL EARTH DAM

SCALE: N.T.S.

NOTE:
 EARTH DAMS REQUIRED AT NOT LESS THAN (3) FEET
 UPSTREAM FROM INLINE STRUCTURES AND IN MAIN
 SEWER TRENCHES AT 100' INTERVALS; AND AT SUCH
 OTHER LOCATIONS REQUIRED BY OWNER/OWNER
 REPRESENTATIVE.



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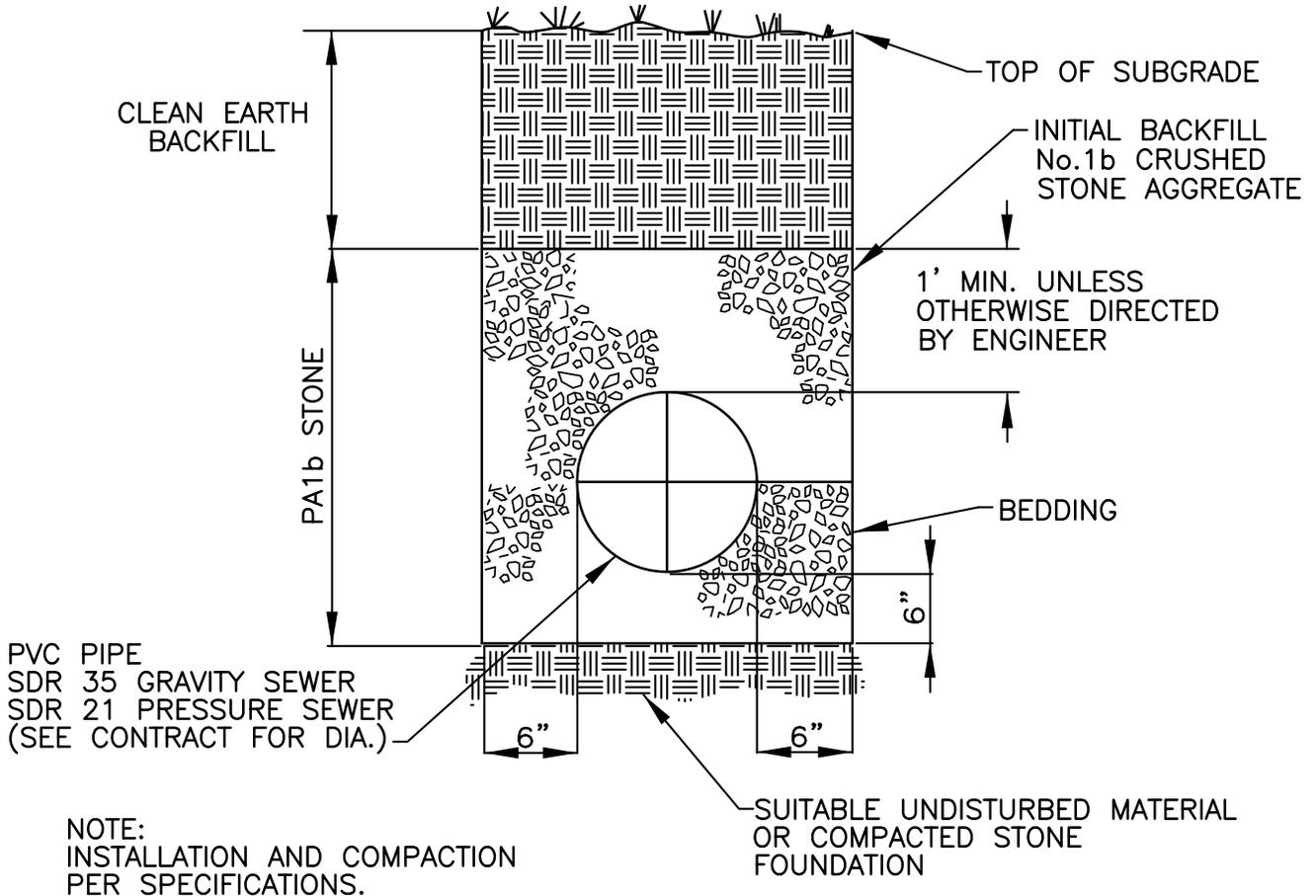
PLAN PREPARATION

DRAWN BY: FSI	DATE: 1/31/06
DESIGNED BY: FSI	CHECKED BY: WFH

DETAIL 5

CONEWAGO TOWNSHIP MUNICIPAL AUTHORITY
 CONEWAGO TOWNSHIP, ADAMS COUNTY, PA

SCALE
 AS SHOWN



SANITARY SEWER IN UNPAVED AREA TRENCH SECTION

SCALE: N.T.S.



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GETTYSBURG, PA 17325
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PLAN PREPARATION

DRAWN BY:

FSI

DATE:

1/31/06

DESIGNED BY:

FSI

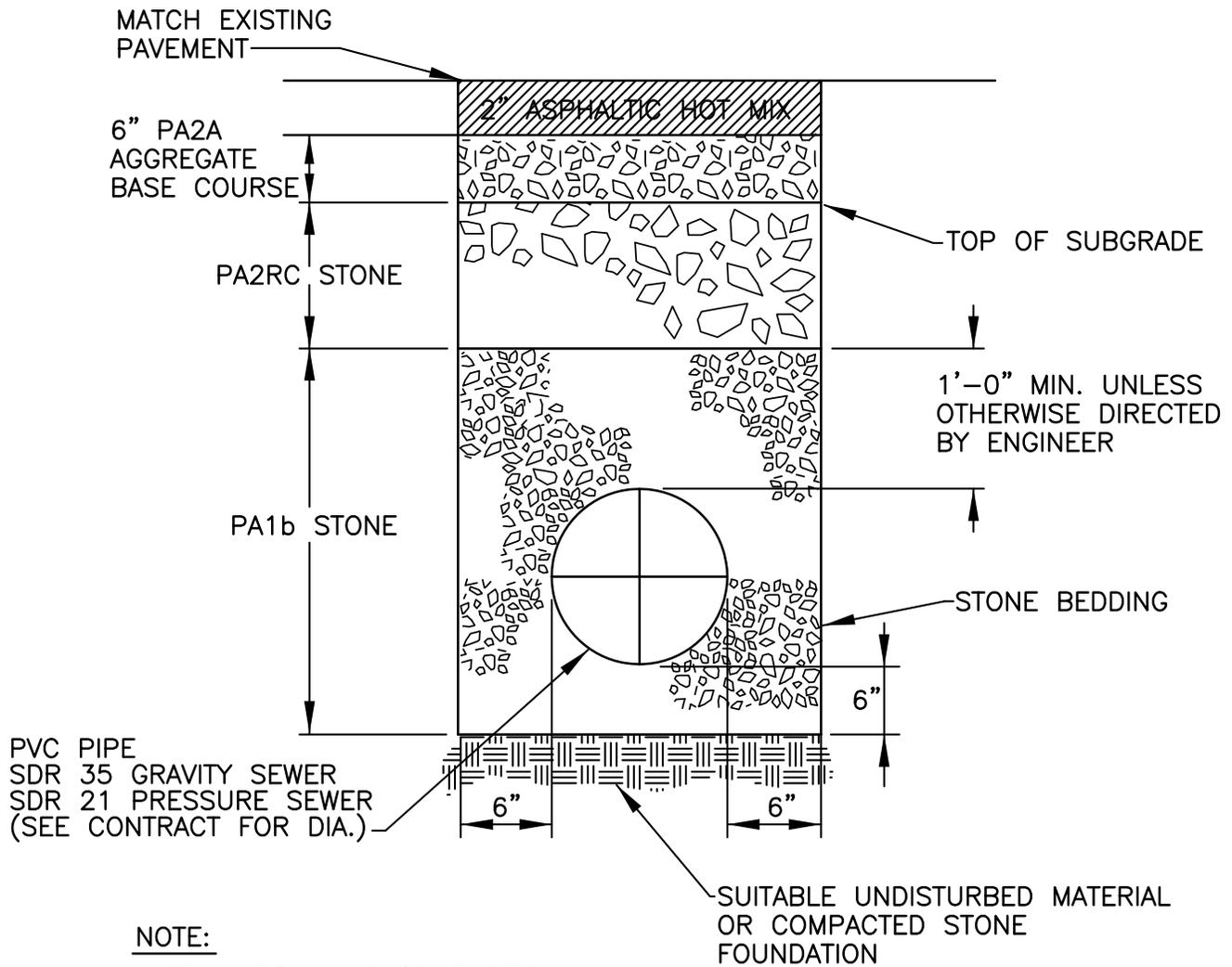
CHECKED BY:

WFH

DETAIL 6

CONEWAGO TOWNSHIP MUNICIPAL AUTHORITY
CONEWAGO TOWNSHIP, ADAMS COUNTY, PA

SCALE
AS SHOWN



NOTE:

INSTALLATION AND COMPACTION PER SPECIFICATIONS.

TEMPORARY PAVEMENT RESTORATION AND TRENCH BACKFILL IN PAVED AREA

SCALE N.T.S.