

SECTION 2 - MATERIALS

1. GENERAL

All material to be incorporated in the project shall be first quality, new and undamaged material conforming to all applicable portions of these specifications.

2. PIPELINE DETECTION TAPE

Detectable pipeline location tape shall be plastic composition film containing one layer of metalized foil laminated between two layers of inert plastic film specifically formulated for prolonged use underground. Tape shall be a minimum of 5.5 mils thickness, green in color, and continuously printed in permanent ink to indicate caution for a buried sewer line below.

Tape shall be a minimum of 3 inches in width with a minimum tensile strength of 5000 psi. Tape shall be Terra-Tape as manufactured by Reef Industries, Inc., or approved equal.

3. LOW PRESSURE SEWER PIPELINE

Pipe material for this project shall be as described below. Material and size shall be as shown on the Drawings or as directed by the Engineer.

A. PVC (Polyvinyl Chloride) Plastic Pipe (1-1/2 inch to 4 inch) - PVC pipe 1-1/2 inch to 4 inch shall be pressure rated, gasket joint pipe manufactured in accordance with ASTM D-2241 for water service, Pressure Class 200, SDR 21, unless noted otherwise on the Drawings or as directed by the Engineer.

(1) Material - The pipe shall be manufactured of clean virgin Type 1 Grade 1 (PVC 1120) resin compound with cell classification 12454-B and shall conform to ASTM D-1784 for PVC compounds.

(2) Testing - Testing and inspection shall be accomplished at the factory in accordance with ASTM D-2241. Tests are to include:

Sustained Pressure Test: 420 psi for 1000 hours in accordance with ASTM D-1598.

Quick Burst Test: 600 psi for 60 to 70 seconds in accordance with ASTM D-1599.

Flattening Test: In accordance with ASTM D-2241.

Extrusion Quality: In accordance with ASTM D-2152, using acetone immersion.

Dimensions: Wall thickness and outside dimensions shall meet applicable portions of ASTM D-2122.

Tests shall be run on the maximum number of specimens called for under ASTM D-2241 for all pipe manufactured in each size and strength classification. If any specimen fails to meet any above stated test requirement, all pipe of that size and type between successful tests shall be excluded from use on this project.

The manufacturer shall provide the Engineering Department with three (3) certified copies of statements verifying that all required tests have been performed on the pipe provided for this project and that the pipe provided passed all tests. Such statements shall be submitted to the Engineering Department for review before any pipe is shipped to the jobsite.

- (3) Joint Design - Pipe joints shall be slip-joint gasket design conforming to ASTM D-3139. Gaskets shall conform to ASTM F-477. Gaskets and lubricants shall be compatible with the pipe material and the intended service and shall be furnished by the pipe manufacturer.

Unless approved otherwise by the Engineering Department, each gasket shall be factory installed in the bell end of the pipe and locked in place. The joint design shall be approved by the Engineering Department before the Contractor will be permitted to install any pipe on this project.

- (4) Manufacturing Standard - The manufacturer's equipment and quality control facilities must be adequate to insure that all pipe produced is uniform and meets the requirements of the specifications. All pipe for this project shall be manufactured in the USA by the same manufacturer, unless specifically approved otherwise by the Engineer.

Pipe used on this project shall have been approved by the NSF and the manufacturer shall provide certification to that effect.

- (5) Laying Lengths - The pipe may be furnished in the manufacturer's standard laying lengths from 18 feet to 40 feet.
- (6) Shipment and Storage - Shipment packets shall be constructed to protect the pipe, usually with supports not more than 5 feet from the pipe ends and such that unsupported lengths do not exceed 15 feet. While in storage and shipment, pipe shall be protected from excessive heat or cold and shielded from direct sunlight.
- (7) Marking - Each length of pipe is to be permanently marked with: manufacturer's name, nominal size, Class pressure rating or SDR number, material designation, ASTM D-2241, and NSF approval.

- B. PVC (Polyvinyl Chloride) Plastic Pipe (less than 1-1/2 inch diameter) - PVC pipe less than 1-1/2 inch diameter (for this project, 1-1/4 inch service line) shall meet all the requirements of Part A above except as specifically stated below. Pipe

shall be PVC Pressure Pipe, Schedule 40 manufactured in accordance with ASTM D-1785 and D-1784. Joints shall be solvent weld.

(1) Material - See above

(2) Testing - See above

(3) Joint Design - Joints shall be solvent weld type. Primer and cement shall be compatible with the pipe material and the intended use, shall be supplied by the pipe manufacturer, and shall conform to ASTM D-2564.

The joint design shall be approved by the Engineering Department before the Contractor will be permitted to install any pipe on this project.

(4) Manufacturing Standard - See above

(5) Laying Lengths - See above

(6) Shipment and Storage - See above

(7) Marking - See above

4. FITTINGS

Fittings shall be PVC, solvent weld for 1-1/4 inch and smaller PVC pipe and slip joint gasketed for 1-1/2 inch and larger PVC pipe. Fitting shall be designed and fabricated to the same pressure rating as the pipeline in which the fitting will be installed.

Fittings shall be fabricated by the same manufacturer as the pipe used on this project, unless approved otherwise by the Engineer.

Fittings shall meet the requirements of Section 7 with regard to material, testing, joint design, manufacturing standard, storage and marking.

5. VALVES

Valves for use on this project are for flow control such as on/off, directional, pressure regulating, flow rate regulating or special purpose such as air relief or air and vacuum release. The location and designation is as shown on the Drawings. The specifications below describe the valve to be furnished for particular designations.

A. Gate Valves - For the purpose of controlling flow either on or off or, in some cases, to regulate the rate of flow, gate valves shall be installed at locations shown on the Drawings or designated by the Engineer.

Gate valves may be used on lines 2 inches in diameter and larger.

Gate valves shall be resilient seat type, meeting all the requirements of AWWA C509. Bonnet bolts, studs and nuts shall be stainless steel. Valve gates shall be cast iron with resilient seat. Stem seals shall be "O-ring". Valves shall be furnished with mechanical joint ends in accordance with USA Standard A21.11

unless otherwise shown or directed. Valves shall be suitable for installation in approximately vertical position in buried pipe lines. All valves shall be open to the left (counterclockwise), and shall be provided with a hand wheel for operation.

Valves shall be for working pressures up to 200 psi and shall be equal to latest specifications of AWWA C509 in all respects.

Valve boxes for gate valves shall be as described below under heading "Valve Boxes".

- B. Ball Valves - On lines less than 2 inches in diameter, ball valves are to be used (and may be used on lines up to 4 inches in diameter) for controlling flow either on or off or to regulate the rate of flow. Ball valves shall be installed at locations shown on the Drawings or designated by the Engineer.

Ball valves shall be true union type with PVC body, high impact ABS operating handle, Teflon seat rings, and elastomer "O-ring" seals. Valves are to open and close with one-quarter turn. Pressure rating at 30° to 120° F shall be no less than 150 psi.

Ball valves shall be as manufactured by Asahi/America, Hayward, or approved equal.

Valve boxes for ball valves shall be as described below under heading "Valve Boxes".

- C. Check Valves - A check valve shall be located on each service line in the customer service box to protect against backflow from the collection system to the customer's premises in the event the customer's service line breaks.

Valve shall be 1-1/4 inch PVC with an internal flapper designed to swing clear of the flow path during forward flow and to seat tightly against backflow. Valve shall be full-flow design, angle seat, weighted flapper to seat against low pressures while holding up to 50 psi under some operating conditions (Test pressures may be higher - see line testing specification). Seal shall be Buna-N or as approved by Engineer.

Valve shall be supplied with compression type ends to serve as union connections. Body shall be PVC compatible with intended application (1-1/4 Schedule 40 PVC service piping). Valve shall be as manufactured by Flo Control, Inc., or approved equal.

- D. Air Release Valves - At the locations shown on the Drawings or where directed by the Engineering Department, air release valves (ARV) shall be installed to vent accumulations of air or other gases while the system lines remain under pressure. Valve size shall be as shown on the Drawings and suitable for system operating pressures of 0 to 50 psi (test pressures will be higher - see specification requirements for line testing, this project). Valve shall be suitable for use in

sewage (septic tank effluent). Installation will be in accordance with the detail drawings.

Valve shall be APCO No. 200A, or approved equal.

- E. Air And Vacuum Valves - At the locations shown on the Drawings or where directed by the Engineering Department, air and vacuum valves (A/VV) shall be installed to vent large quantities of air or relieve vacuum conditions. Valve size shall be as shown on the Drawings and suitable for system operating pressures of 0 to 50 psi (test pressures will be higher - see specification requirements for line testing, this project). Valve shall be suitable for use in sewage (septic tank effluent). Installation will be in accordance with the detail drawings.

Valve shall be APCO No. 140 series, or approved equal.

6. VALVE BOXES

Valve boxes for this project are designated on the Drawings as one of the following types:

- A. Type "A" Valve Box - For gate valves, nut operated, the valve box shall be heavy roadway type cast iron. Inside diameter shall be not less than 5 inches. Base section shall be enlarged to enclose and protect valve operating nut without actually being in contact with pipe or valve. Top section shall be adjustable for elevation. Cover shall be heavy cast iron with the word "SEWER" cast in raised letters. Boxes shall be screw type as manufactured by Clow Corporation, or approved equal.
- B. Type "B" Valve Box - For cleanout assemblies, ball valves and other lever or hand wheel operated valves, air release valves, and air and vacuum valves, the valve box shall be constructed of brick with a cast iron frame and cover in accordance with project detail drawings.

Frame and cover shall be heavy cast iron construction (traffic type) providing an opening of approximately 12 inches by 20 inches. Frame and cover shall be equal to John Bouchard Company No. 8110 with word "SEWER" cast in cover.

- C. Type "C" Valve Box - At locations where more room is required than is available in a Type "B" valve box, a Type "C" valve box shall be used. The box shall be constructed of brick with a cast iron frame and cover in accordance with project detail drawings.

Frame and cover shall be heavy cast iron construction (traffic type) providing an opening approximately 13 inches by 30 inches. Frame and cover shall be John Bouchard Company No. 8122, or approved equal, with word "SEWER" cast in cover.

Upon completion of the pressure sewer system, all pressure sewer valve boxes in public rights-of-way or dedicated easements shall be painted with orange paint. The Developer shall submit paint for approval.

- D. Type "D" Valve Box - At the customer service connection housing a cleanout connection, cut-off (ball) valve and check valve, a Type "D" valve box shall be installed in accordance with project detail drawings.

Valve box shall be a standard plastic meter box with a nominal size of 15 inches by 21 inches (bottom dimensions) by 12 inch height with (normally) one 6 inch extension piece for an overall (normal) height of 18 inches. Box shall be injection molded meeting the requirements of ASTM D-2853. Material shall be polyolefin with inorganic component reinforcing (or as otherwise approved by Engineering Department) with UV stabilizer additive to provide resistance to material degradation from exposure to sunlight.

The cover shall be molded of the same material as the base section(s). The cover shall contain a corrosion resistant steel plate affixed to the underside to enable a buried cover to be found with electronic detection equipment. The cover shall be imprinted with the word "SEWER".

Valve box including cover shall be green or other color approved by Department of Public Works to differentiate from other utility valve boxes.

7. PREFABRICATED GRINDER SEWAGE PUMP STATIONS

7.1 General

The Contractor shall furnish and install a factory- built simplex or duplex grinder pump station consisting of either locations shown on the Drawings or as directed by the Engineering Department.

The Contractor shall be responsible for all material furnished by him and shall replace at his own expense all such material found defective in manufacture or damaged on delivery. This shall include the furnishing of all material and labor required for the replacement of installed material discovered defective.

The Contractor shall be responsible for the safe storage of material furnished by him until it has been incorporated in the completed project. All motors and electrical and mechanical components shall be stored in a dry environment. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times.

7.2 Products

Grinder Pump

The manufacturer shall furnish a factory built simplex or duplex grinder pump station consisting of either one or two grinder pump units as applicable with mercury switch level controls, discharge piping, pump mounting plates with bottom rail supports, upper rail supports or guide rails, a quick disconnect coupling, lifting chain, reinforced fiberglass pump cover plate, and all necessary parts and equipment installed in a fiberglass reinforced polyester tank as described in the following specifications. The discharge piping and/or check valves shall be so designed as to prevent siphoning of

wastewater from the pump basin when conditions of negative pressure exist at the point of connection to the pressure system piping network. The grinder pump station shall be as manufactured by F. E. Myers, or approved equal.

Operating Conditions

The pumps shall be of centrifugal type. The pumps provided shall be capable of delivering a minimum of 16 GPM against a normal rated total dynamic head of 85' with a maximum shut-off head of 100'. Pump motor shall be a minimum of 2 HP, single phase, 230V, 3,450 rpm, 60 cycle. The pumps shall not overload at any point on the performance curve and shall be free from harmful effects of cavitation at either high or low head.

Tank

The tank shall be a minimum of 30" diameter for simplex systems and a minimum of 48" diameter for duplex systems of depth as shown on the Contract Drawings.

The tank shall be molded of fiberglass reinforced polyester resin of the lay-up and spray technique to assure that the interior surface is smooth and resin rich.

The tank shall have a minimum wall thickness of 1/4". A heavy rib or flange shall extend around the basin for strength and shall have holes through the rib for anchoring in concrete to prevent flotation.

Tank Cover

Cover shall be as indicated on Contract Drawings or as recommended by Manufacturer. Cover shall be bolted to basin with cap screws. Nuts for screws shall be completely embedded in the fiberglass to prevent turning and for corrosion resistance. Cover to be sealed with caulking compound or a gasket fastened to covers.

A basin inlet flange with "O-ring" for plastic pipe as indicated on Contract Drawings shall be included but not mounted on the basin. Flange to be mounted in the field at inlet height required by the installation. Condulet fittings shall be furnished for sealing cords from control box into conduit entering basin. This is to prevent sewer gases from carrying to control box.

Check Valve

A heavy all rubber flapper type check valve or ball check valve shall be an integral part of the lift out discharge seal assembly and shall lift out with the pump assembly.

Shut-Off Valve

A 1-1/4" PVC ball with extension handle to top of basin shall be installed in the discharge line for closing when pump assembly is removed. Discharge from station shall be through side of basin and shall consist of 1- 1/4" NPT coupling.

Pump and Motor

The grinder pump and motor are to be especially designed and manufactured so that they can operate completely submerged in the liquid being pumped. Electrical power cord is to be sealed by use of a cord grip with individual conductors additionally sealed into the cord cap assembly with epoxy sealing compound, thus eliminating water getting into the motor by following individual conductors inside the insulation. The cord grip shall have a male taper pipe thread which is threaded into a female taper pipe thread in a cord cap. The cord cap shall be sealed into the motor housing with a Buna-N "O-ring", providing an electrical connection which is completely watertight, yet may be easily removed for service.

The combination centrifugal pump impeller and grinder unit shall be attached to a common motor and pump shaft made of stainless steel. The grinder unit shall be on the suction side of the pump impeller and discharging directly into the impeller inlet leaving no exposed shaft to permit packing of ground solids. The grinder shall have two stages or have grinding impeller and shredding ring. Both stationary and rotating cutters shall be made of hardened and ground stainless steel. Pump and motor housings are to be high quality gray iron castings. Impeller shall be bronze. All fasteners shall be of a high grade stainless steel.

The pump motor shaft shall be sealed by two mechanical carbon and ceramic faced seals within an oil filled chamber to provide clean, constant lubrication. The shaft shall be supported by a ball radial and thrust bearing and a lower bronze radial sleeve bearing between the shaft seals to minimize overhang, both running in oil.

The motor winding and rotor are to be mounted in a sealed, submersible type housing which is filled with clean high dielectric oil for bearing lubrication and to transmit heat from motor winding to outer housing. Motor winding shall be securely held in the housing with machine screws or it shall be pressed into the housing.

Controls for Simplex Station

Sealed float type mercury switches shall be supplied to control sump level and alarm signal. The mercury tube switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket and a weight shall be attached to the cord above the float to prevent sharp bends in the cord when the float operates under water. The float switches shall hang in the sump supported only by the cord that is held to the NEMA 4 fiberglass junction box. Two float switches shall be used to control level. One for pump turn-on, one for pump turn-off, and a third switch shall be provided for alarm control.

A red alarm light is to be supplied for mounting on the control box.

The light shall consist of a 40-watt high-intensity bulb and a red polycarbonate lens with a neoprene gasket. The alarm light will flash to indicate a high water condition and go out when the water level drops.

Operation of Simplex System

On sump level rise the lower mercury switch shall first be energized, then upper level switch shall next energize and start pump. With pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. If level continues to rise when pump is operating, the alarm switch shall energize. All level switches shall be adjustable for level settings, from the surface.

Electrical Control Panel for Simplex Station

Control panel shall have a NEMA 3 R/12 weatherproof enclosure. A lock hasp shall be provided on door. A circuit breaker shall be provided for the pump and a magnetic starter with one leg overload protection for single phase operation shall be supplied. H-O-A Switches and run lights shall be supplied for the pump. Terminal strip shall be provided for connecting pump and control valves. Additional terminals shall be provided to connect alarm. Control circuit shall be 115V or a transformer shall be supplied to give 24V control circuit. The control panels shall be provided with a disconnect switch that will permit the servicing of the various electrical components without such components being subject electrical power.

Note: Control panel must be UL listed.

Controls for Duplex Station:

Sealed float type mercury switches shall be supplied to control sump level and alarm signal. The mercury tube switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket. A weight shall be attached to cord above the float to hold switch in place in sump. Weight shall be above the float to effectively prevent sharp bends in the cord when the float operates. The float switches shall hang in the sump supported only by the cord that is held to the NEMA 4 cast iron or cast aluminum junction box. Three float switches shall be used to control level; one for pump turn-on, one for pump turn-off, and a one for both pumps turn-on. A fourth switch shall be provided for alarm control.

A red alarm light is to be supplied for mounting on the control box.

The light shall consist of a 40-watt high-intensity bulb and a red polycarbonate lens with a neoprene gasket. The alarm light will flash to indicate a high water condition and go out when the water level drops.

Operation of Duplex System

On sump level rise, the lower mercury switch shall first be energized, then upper level switch shall next energize and start lead pump. With lead pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. Alternating relay shall index on stopping of pump so that lag pump will start on next operation. If sump level continues to rise when lead pump is operating, override switch shall energize and start lag pump. Both lead and lag pump shall operate together until low level switch turns off both pumps. If level continues to rise when both pumps are operating, alarm switch shall energize and signal the alarm. If one pump should fail for any reason, the second pump shall operate on the override control and if level continues to rise the alarm switch shall

energize and signal the alarm. All level switches shall be adjustable for level setting from the surface.

Electrical Control Panel for Duplex Station

Control panel shall have a NEMA 3 R/12 weatherproof enclosure. A lock hasp shall be provided on door. a circuit breaker shall be provided for each pump and a magnetic starter with one leg overload protection shall be supplied. An alternating relay or solid state alternator shall be provided to alternate pumps on each successive cycle of operation. Starters shall have auxiliary contact to operate both pumps on override condition. An interlock relay shall be provided to automatically reconnect the control circuit in case of circuit breaker trip on one pump. H-O-A switches and run lights shall be supplied for each pump. Terminal strip shall be provided for connecting pump and control wires. Additional terminals shall be provided to connect alarm. Control circuit shall be 115V or a transformer shall be supplied to give 24V control circuit. The control panels shall be provided with a disconnect switch that will permit the servicing of the various electrical components without such components being subject electrical power.

Note: Control panel must be UL listed.

Wiring

It shall be the responsibility of the electrical contractor to furnish and install, according to the plans and in compliance with appropriate national and local codes, the branch circuit protection and all wiring to the pump leads and to the high alarm indicator lamp.

Corrosion Protection

All materials exposed to wastewater shall have inherent corrosion protection; i.e., cast iron, fiberglass, stainless steel, PVC. Any exterior steel surfaces are to be suitably protected against corrosion.

Serviceability

The grinder pump unit shall have provisions for lifting to facilitate easy removal of the unit from the tank if necessary.

Manufacturer

The equipment specified shall be the 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 support program including complete parts and a service manuals; and be responsible for maintaining a continuing inventory of grinder pump replacement parts.

Warranty

The manufacturer shall warrant its product to be free from defects in material and factory workmanship for a period of one year from date of acceptance. Repair or parts

replacement required as a result of such defects will be made free of charge during this period.

The manufacturer will provide the General Contractor specific instruction on the assembly and installation of the pump stations and related equipment.

The manufacturer will furnish, at his own expense, the services of a factory trained serviceman to instruct the Owner's personnel in the operation and maintenance of the pumps and related equipment. The individual performing the instruction to the Owner is to be trained and/or certified by the manufacturer as its authorized operation, maintenance, and service specialist.

Execution

Install the grinder sewage pump station as shown on the Drawings and in accordance with the manufacturer's recommendations.

Obtain the services of the manufacturer's service engineer to check the installation of each grinder sewage pump station and make any field adjustments necessary to ensure proper operation.

For typical grinder pump installations see Standard Drawings attached hereto.

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