

SECTION 02566**LOW-PRESSURE SEWER SYSTEMS****02566.01 GENERAL****A. Description**

Low-pressure sewer system installation shall include, but not necessarily be limited to, furnishing and installing sewage grinder pumps and chambers; gravity and pressure pipes, valves, fittings, and appurtenances; and pump control and high water alarm panels at the locations shown on the Plans and in accordance with the Contract Documents and approved installation details.

B. Related Work Included Elsewhere

1. Trench excavation, backfill, and compaction; Section 02550.
2. Sanitary sewer and sanitary house connection installation; Section 02561.
3. Sanitary Sewer Force Mains; Section 02563
4. Directional Drilling; Section 02930
5. Cast-in-place concrete; Section 03310.
6. Precast concrete utility structure; Section 03400

C. Quality Assurance

1. Materials
 - a. The Engineer will inspect all materials before and after installation to ensure compliance with these Contract Documents. When specific materials tests are called for in the referenced standards and specifications the County shall have the option of requiring that any or all of these tests be performed for materials furnished for a specific project. When testing is required, it shall be so specified in the "Special Provisions".
 - b. High density polyethylene pipe (HDPE) shall be sound and without defects that will impair the performance of the pipe. Welds for diameters greater than 1.5-inches shall be either electrofusion coupling or butt welded; for diameters less than or equal to 1.5 inches, only electrofusion coupling will be accepted.
 - c. Polyvinyl chloride (PVC) pipe and fittings shall be homogeneous throughout and free from visible cracks, bubbles, blisters, holes, foreign inclusions, cuts,

or scrapes on inside or outside surfaces, or imperfections which may impair the performance or life of the pipe.

- d. Ductile iron pipe (DIP) (gravity lines only) and fittings shall be sound and without defects that will impair its service. Repairing defects by welding or other method will not be allowed if such repairs will adversely affect the serviceability of the piece.
- e. Electrical equipment and materials shall be new, listed by UL, and bear the UL label where UL requirements apply. Similar items in the project shall be the products of the same manufacturer. Equipment and materials shall be of industrial grade and of standard construction.

2. Field Tests

a. General

- 1) After installation, grinder pumps and chambers, gravity and pressure piping and appurtenances, and connections will be inspected by the Engineer and shall be Contractor tested for compliance with the Contract Documents. The Contractor shall furnish all labor, tools, materials, and equipment (except gauges and timers which will be furnished by the County) necessary to perform the specified tests.
- 2) The Contractor shall schedule all tests with the Engineer at least 48 hours in advance, and shall conduct all acceptance testing in the presence of the Engineer.
- 3) If the gravity pipe, pump chambers, PVC pressure pipe, pressure sewer main connections, sewage grinder pumps, or electrical control and alarm systems fail the inspections and/or tests, the Contractor shall, at his own expense, replace, repair, adjust, seal, or reseal the failed component until all requirements are met. The County will furnish personnel, and the equipment specified, to witness tests once only. If additional tests are required, all costs of County personnel and equipment will be deducted from amounts to be paid the Contractor.

b. Gravity Pipe

- 1) Gravity pipe will be inspected for proper pitch prior to backfill. Minimum pitch for 4-inch diameter drainpipe is 1/8 inch per foot.
- 2) Gravity pipe shall be visually inspected for evidence of leakage and material damage.

c. Pump chambers and other structures will be visually inspected by the Engineer for leakage. No visible leakage shall be allowed.

d. Polyvinyl chloride pressure pipe, valves, and fittings shall be hydrostatically pressure tested by the Contractor in accordance with the following:

The pipeline under test shall be filled with water, all air eliminated from the system, and the system pressurized to 80 psi at the highest point under test. Valves in the line shall be opened full and closed while the line is under test pressure. The pipeline will be accepted if it can hold 80 psi for 5 minutes without any evidence of leaking.

e. HDPE shall be tested according to Specification Section 02563 for both butt fusion testing (where applicable) and pressure testing.

f. Pressure Sewer Main Connections

No testing will be conducted on grinder pump connections to existing pressure sewer mains, however, the work will be visually inspected for leakage during the pump testing specified in the following paragraph. No visible leakage will be permitted at the connection.

g. Sewage Grinder Pumps

The Contractor shall conduct a field test of each installed sewage grinder pump unit to demonstrate that the pumping units are operating in a satisfactory manner and in accordance with the requirements of this Section. Each pump shall be operated through at least two normal and two alarm cycles.

h. Electrical control and alarm systems shall be tested to demonstrate that they operate in the manner intended. Pump start and stop and high water alarm shall be demonstrated.

D. Submittals

1. Shop Drawings

Shop drawings shall be submitted as specified in the "General Provisions" for the following materials, and include the following information:

a. Polyvinyl chloride (PVC) pipe and fittings: product information and dimensions; Schedule or SDR number; storage, handling, and installation recommendations.

b. HDPE pipe and fittings: provide product information per Specification Section 02563.

- c. Shut-off, check, anti-siphon, air release valves, combination air/vacuum valves, corporation valves, valve boxes, and miscellaneous appurtenances: product description, parts list, detailed assembly drawings, and maintenance requirements and procedures.
- d. Sewage grinder pumps: product description; parts and materials list; certified performance curves showing head versus capacity and power input versus capacity at normal operating speed over a capacity range of 0 to 20 gallons per minute; dimensioned outline drawings; wiring diagrams and schematics; detailed installation and user instructions including operation and maintenance manuals and weight of concrete anchor to prevent flotation for each unit furnished; evidence of an established service support program, and evidence of experience in design and manufacture of grinder pumps for low-pressure sewage systems.
- e. Electrical equipment: product description, catalog data, parts and materials list, connection diagrams, terminal diagrams, internal wiring diagrams, conductor sizes, finish, nameplates, and location of conduit entrances and access plates.

2. Certificates of Compliance

- a. Certificates of compliance shall be submitted as specified in the "General Provisions" for all pipe and fittings stating the item supplied is in accordance with the requirements specified herein.
- b. Electrical work shall conform to the rules and regulations of the National Electrical Code (NEC). The Contractor shall obtain all necessary permits and certificates, including the certificates of final inspection and approval, as required by the Anne Arundel County Inspection and Permits, Electrical Section, P.A.C.E. All costs associated with obtaining such permits and inspections shall be the sole responsibility of the Contractor. Upon completion of the entire electrical work, the Contractor shall present to the County all certificates of inspection and approval.

3. Certified Test Results

Certified test results shall be submitted as specified in the "General Provisions" for the following:

- a. High density polyethylene pipe (HDPE) and fittings;
- b. Ductile iron pipe and fittings;
- c. Polyvinyl chloride (PVC) gravity sewer pipe and fittings;
- d. Polyvinyl chloride (PVC) pressure sewer pipe and fittings.

4. Sewage Grinder Pump Manufacturer's Certificate and Warranty
 - a. Manufacturer's Certificate for the sewage grinder pump shall state that the equipment has been installed under either continuous or periodic supervision of the manufacturer's authorized representative, it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, it is operating in accordance with the specified requirements, and to the manufacturer's satisfaction.
 - b. In addition to the Contractor's guarantee as outlined in the "General Provisions", 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 initial operation, provided the product is properly serviced and operated under normal conditions and according to the manufacturer's instructions. Repair or parts replacement required as a result of any defect will be made without charge during this period.
 - c. The grinder pump shall be free from electrical and fire hazards and suitable for residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump in its tank shall be listed by Underwriters' Laboratories, Inc.
 - d. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, 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 low-pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the National Sanitation Foundation, or other similarly accredited testing organizations', seal of approval.

02566.02 MATERIALS

A. Materials Furnished by the County

1. The County will not furnish any materials for low-pressure sewer systems.
2. The Contractor may obtain potable water from the County's potable water system for testing the low-pressure sewer system. The Contractor shall contact the Bureau of Utilities, Meter Section, for requirements.

B. Contractor's Options

1. The Contractor may furnish HDPE, Schedule 80 or SDR 21 pipe polyvinyl chloride (PVC) for pressure lines, unless otherwise indicated in the Contract Documents.

2. The Contractor may furnish precast or cast-in-place construction for terminal flushing connection vaults unless otherwise noted.

C. Detailed Material Requirements

1. Portland cement concrete for pipe anchorages and buttresses sewage grinder pump anchors, and valve box supports shall be Mix No. 1 as specified in Section 03310.
2. HDPE pipe and fittings shall be as specified in Section 02563.
3. Ductile iron pipe and fittings shall be as specified in Section 02551 except that the minimum working pressure specified therein will not apply. Pipe Class shall be as shown on the Plans.
4. Pipeline coupling type adapters for connecting different pipe materials and sizes in gravity lines shall be as specified in Section 02561.
5. Pressure Pipe
 - a. General
 - 1) Polyvinyl chloride (PVC) pressure pipe for low-pressure sewer systems shall be manufactured from PVC compounds meeting the requirements of ASTM D 1784, Class 12454B. Pipe joints shall be as specified herein and elsewhere in the Contract Documents for various locations within piping systems.
 - 2) Solvent-cemented pipe joints at gravity grinder pumps stubs, and where shown on the Plans shall meet the materials and workmanship requirements of ASTM D 2672. Schedule 80 pipe fittings shall have solvent-cemented joints meeting the materials, workmanship and dimensional requirements of ASTM D 2466. Primer shall meet the materials requirements of ASTM F 656. Solvent cement shall meet the materials requirements of ASTM D 2564.
 - 3) Rubber gaskets for gasketed joints shall meet the materials requirements of ASTM D 477. Gaskets and lubricants shall be made from materials that are compatible with the pipe material and will not support bacterial growth.
 - b. Pressure sewer pipe shall be pressure rated SDR 21 pipe meeting materials, design, test, certification, and marking requirements of ASTM D 1785 or Schedule 80 pipe meeting the materials, design, test, certification, and marking requirements of ASTM D 1785. Pressure sewer mains 1 1/2-inch diameter and larger, unless otherwise shown in the Contract Documents shall have gasketed joints in accordance with ASTM D 3139. For HDPE pipe discharges, use 1.25" stainless steel (IPS) x 1.5" HDPE adaptor. Sewage

grinder pump discharge pipe smaller than 1 1/2-inch diameter shall have solvent-cemented joints. Threaded connections to schedule 80 pipe shall only be made using solvent-by-threaded adaptors.

- c. Pressure sewer fittings shall be Schedule 80 IPS fittings conforming to the materials, design, test, certification and marking requirements of ASTM D 1785. Threaded Schedule 80 fittings shall conform to ASTM D 2464.
6. Gravity sewer pipe and fittings shall be as specified in Section 02561.
 7. Service tees for sewage grinder pump to pressure sewer main connections shall be in accordance with Paragraphs 5.a. and 5.b. above and shall have gasketed mainline joints and female-socketed outlets. Mainline and outlet sizes shall be as shown on the plans.
 8. Couplings for connecting plain-end pieces of PVC pressure sewer pipe shall be furnished with end rings and gaskets specifically sized for polyvinyl chloride (PVC) pipe. The couplings shall have ductile iron center and end rings meeting ASTM D 536, gaskets made from virgin SBR suitable for use with sewage and meeting ASTM D 200, and 316 stainless steel bolts and nuts.
 9. Tapping saddles for connections to existing polyvinyl chloride (PVC) mains 4-inch diameter and larger shall be manufactured of high tensile ductile iron, ASTM A 536, protected with corrosion resistant paint. Saddles shall be furnished with two 316 stainless steel straps and a rubber gasket suitable for use with sewage.
 10. Valves
 - a. Ball Valves
 - 1) Provide bronze body ball valves at service valve assemblies. Valves shall be supplied by the same manufacturer and suitable for the conveyance of raw sewage.
 - 2) For pipe diameters less than 3-inches, use ball valves. For pipe diameters greater than or equal to three inches in diameter, use plug valves. The ball valve shall be suitable for use with sewage.
 - 3) Plug valves shall be furnished in accordance with the requirements of Section 02563 and be suitable for use with sewage.
 - b. Corporation stops at the pressure sewer main shall have iron pipe size (IPS) threaded inlets and outlets and shall be Mueller H-10045, Mueller H-10012, or equal.

- c. Curb stops in the sewage grinder pump discharge lines shall have IPS threaded inlets and outlets and shall be Mueller Mark II Oriseal, No. H-10283, or equal.
 - d. Plug valves, sewage air release valves and combination air/vacuum valves shall be the size and type indicated on the Plans and as specified in Section 02563.
11. Valve boxes shall be as specified in Section 02552, except the covers shall be labeled "SEWER".
12. Grinder pump systems shall be Model DH071 (simplex only) with accessway as manufactured by Environment/One Corporation as indicated on the Plans.
- a. The units shall be factory preassembled complete with one or two grinder pumps (depending on model) with check valves, high density polyethylene (HDPE) tank, controls, integral accessway and bolt-down lid. Accessway height shall be as indicated on the Plans and extend at least 6 inches above the finished grade. The pump enclosure shall come with 4-inch socket type inlets, sized for PVC DWV pipe and a 1-1/4 inch NPT outlet. All seals shall be factory tested for watertightness.
 - b. The pumping unit shall be integral, vertical rotor, motor driven progressing cavity type with a single mechanical seal; 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..
 - c. The capacitor start, induction motor shall be 1 horsepower, 1725 RPM, rated at 240 volts, single phase, 60 hertz, and shall come with an automatic-reset, integral thermal overload protector. The pump rotor shall be through-hardened, highly polished precipitation hardened stainless steel and directly connected to the grinder mechanism.
 - d. 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.

- e. 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.
 - f. Pump shall be capable of intermittent operation (3 minutes minimum) at any head up to 125% of normal rated dynamic head with a minimum flow of 8 gallons per minute.
 - g. The grinder pump station shall have a cartridge type, easily removable core assembly with lifting eyes, 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. The core unit shall be removable and provided with shut-off valve and quick disconnect piping and electrical connections containing a quick disconnect coupling in the accessway and ten (10) feet of control and power cable to allow rapid exchange of the entire core unit from the accessway and so the core units may be exchanged with other units in the County. Special wrenches and/or other special tools for core unit exchange shall be furnished with each unit and shall be securely stored inside the accessway and be of sufficient length to permit core removal from ground level. A rope or cable for extracting the core unit shall be fastened to lifting hooks on the core unit and secured to the top of the accessway.
 - h. 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 and shall be integral to the pump core assembly in a single, readily-exchanged unit.
 - i. The accessway and the panel shall be furnished with an approved locking device and lock. Two sets of keys, tagged for the specific location, shall be provided the County.
 - j. Spare replacement core units shall be provided for the number indicated in the Special Provisions.
13. Electrical Equipment
- a. 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.

- 1) The alarm panel shall be the Extreme Option Package which includes all the following features:
 - a) Basic Package: circuit breakers, 120/240 V service, terminal blocks and ground lugs, audible alarm with manual silence, manual run feature and run indicator, redundant "start" function with high level alarm, safety front, conformal-coated board, overload protection.
 - b) Protect Package: trouble indication that shuts down the pump temporarily in the event of an unacceptable operating condition (brownout, system over-pressure, run-dry).
 - c) All features of the PreSTAT Package: predictive status display module, pre-alarm and alarm indication for major operating parameters, programmable auto-dialer, hour meter, cycle counter and alarm delay, LCD display and user-friendly interface, inner cover (dead front), contact group (dry, powdered and Remote Sentry).
 - d) 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.
- b. Single conductors shall be stranded copper with type THWN insulation. Cables installed underground shall be type UF. Conductor size shall be as noted on the Approved Installation Details or Plans. Grounding electrode conductors may be insulated or bare. Equipment grounding conductors shall be insulated. Insulated equipment grounding conductors shall have green-colored insulation.
- c. Conduit

Except as otherwise noted, conduit and fittings shall be Schedule 40 polyvinyl chloride, conforming to UL Standard 651 and manufactured by Carlon, Hatfield Wire and Cable, or equal. Buried conduit shall be at least 18-inches below grade and will terminate within one foot of grinder can or pedestal.

Rigid galvanized electrical metallic tubing shall conform to ANSI Standard C80.3 and shall be manufactured by Republic Steel Corporation, Triangle PWC Incorporated, or equal. Fittings shall be watertight, compression type, manufactured by Thomas and Betts, OZ/Gedney Company, or equal.

- d. Nuts, bolts, screws, etc. shall be Type 304 stainless steel.
14. Metal detection tape shall be a printed polyethylene tape with a metallic core. The tape shall be furnished with an appropriate message imprinted on a colored background warning of buried sewer or electric line per Specification 02551.

02566.03 EXECUTION

A. Sewage Grinder Pumps

1. The sewage grinder pump units shall be installed and wired in accordance with the "Standard Details" for sewage grinder pumps, as specified herein, and as directed by the Engineer.
2. The unit shall be handled by the lifting eyes furnished with the unit and in accordance with the manufacturer's recommendations. Units shall be set plumb on a firm foundation of granular material as shown, and a concrete anchor poured around the tank section. The concrete shall extend at least 6 inches above the lip around the center of the tank plus such additional concrete as required to prevent flotation of the unit in accordance with the approved Shop Drawings. Furnish sleeves if the concrete extends above the inlet and outlet piping.
3. Electrical
 - a. The Contract Documents indicate general arrangements and locations for equipment, conduit, and other work. Installed locations shall be determined in the field after a careful review of site conditions, approved Shop Drawings, and the Contract Documents to assure a workable installation. Independent power sources for each pumping unit shall originate at the serviced structure.
 - b. Grounding of all electrical installations shall be in accordance with the National Electrical Code and the requirements of BGE. Maintain ground continuity throughout the system by installing a separate stranded copper green-insulated conductor with all branch circuit and feeder wiring installed in conduit. Connect the grounding conductor to the supplemental grounding system as well as the existing ground system. Size the grounding conductors as indicated and specified and install grounds in accordance with National Electrical Code.
 - c. Connections to equipment shall be in accordance with the manufacturer's recommendations with regard to size and arrangement.
 - d. Wall-hung equipment shall be anchored in place in a rigid and secure manner, utilizing fastenings that are appropriate for the load and the mounting surface. All cabinets shall be spaced minimum 1/4 inch away from walls by means of

FRP metal spacers or preformed projections on the cabinet to automatically provide the required space between the cabinet and the mounting surface.

- e. Conductor and Equipment Identification
 - 1) Provide identification to facilitate the control of circuits and equipment. Provide identification labels on all wires in every cabinet and outlet box.
 - 2) Color code 120/240 volt system conductors as follows: black, Phase A; red, Phase B; and white, neutral. Utilize color-coding tape where colored insulation is not available.

B. Solvent-Cemented Polyvinyl Chloride (PVC) Pipe Joints

Solvent-cemented polyvinyl chloride (PVC) pipe joints shall be assembled only by personnel knowledgeable and experienced in properly making solvent type joints in accordance with the solvent cement manufacturer's recommendations, as specified in ASTM D 2855, and as detailed herein.

1. Ends shall be cut square with the pipe axis using a fine-tooth hand or power saw. Pipe cutters not specifically designed for cutting plastic pipe or that raise a burr or ridge at the cut end of the pipe shall not be used. Cut ends shall be chamfered and deburred prior to joint assembly.
2. Surfaces to be joined shall be cleaned and free of dirt, moisture, oil and other foreign material. Cleaning shall be accomplished by wiping with a clean dry cloth, a chemical cleaner, or mechanical means. The surface temperature of the mating surfaces shall not exceed 110°F at the time of assembly. Pipe and fittings shall be shaded from direct exposure to the sun prior to assembling the joints if required.
3. The inside socket surfaces and the male end of the pipe shall be softened by application of one or more coats of primer. After the surfaces have been softened, and while still wet with primer, cement shall be applied to both surfaces in a uniform and even manner, taking care to keep excess cement out of the socket. Immediately after applying the last coat of cement to the pipe, and while both the inside socket surface and the outside surface of the male end of the pipe are soft and wet with solvent cement, forcefully bottom the male end of the pipe in the socket. Turn the pipe or fitting one-quarter turn during assembly to distribute the cement evenly. Hold the joints firmly together until the cement has received its initial set.
4. Handle newly assembled joints carefully until the cement has gone through the set period. Set time shall be in accordance with the manufacturer's recommendations or the following, whichever is longer:

<u>Minimum Time</u>	<u>Ambient Temperature</u>
30 minutes	60 to 100°F
1 hour	40 to 60°F
2 hours	20 to 40°F
4 hours	0 to 20°F

Pressure testing shall not be conducted until at least 24 hours after solvent cement joints have been assembled.

5. After the set period, the pipe shall be carefully placed in the trench and snaked from side to side. Minimum loop length and offset shall be 20 feet and 7 inches respectively.

C. Threaded Polyvinyl Chloride (PVC) Joints

When threaded polyvinyl chloride (PVC) joints are called for in the Contract Documents, the following procedures shall be followed:

1. Male and female threaded areas shall be clean and free of sand and dirt.
2. Joints shall be lubricated and sealed with non-hardening pipe dope or Teflon[®] tape.
3. Special care shall be taken when starting threads to prevent cross threading.
4. Hand tighten joint first, then wrench tighten only enough to produce a leak-free joint.

D. High Density Polyethylene (HDPE) Joints

Butt fused joints shall be made per Specification 02563, Sewer Force Mains, for HDPE pipe material. For pipe diameter less than 3-inches, electrofusion couplings shall be used. For pipe diameter greater than or equal to 3-inches, butt welds or electrofusion couplings are acceptable.

E. Pressure Sewer Connections and Appurtenances

1. Service tees for sewage grinder pump connections to pressure sewer mains shall be installed as the pressure sewer main is being installed. If it should become necessary to install a grinder pump connection where no mainline fitting has been provided, and the mainline size is 3-inch diameter or less, the mainline shall be shut-down, drained, cut, and a new service tee and coupling installed. When called for in the Contract Documents, the outlet side of the service tee shall be fitted with a corporation stop, otherwise a male pipe thread by socket adapter shall be furnished and installed.
2. Connections to pressure sewer mains 4-inch diameter and larger, when no service tee has been provided and the main is in service, shall be made by using tapping saddles. Saddles and corporation stops of the sizes indicated shall be attached to the main, and

the main drilled in accordance with the saddle, pipe, and drill manufacturer's recommendations.

3. Sewage grinder pump discharge lines shall be valved at the property line or where indicated on the Plans. The Contractor shall furnish and install corporation stops, PVC socket to threaded adapters, valve boxes and covers, and concrete valve box supports in accordance with the Standard Details.
- F. Gasketed polyvinyl chloride (PVC) pressure sewer pipe and fitting shall be installed in accordance with Section 02551.03, except that chlorination is not required.
- G. Polyvinyl chloride (PVC) gravity sewer pipe and fittings shall be installed in accordance with Section 02561.03.
- H. Plug valve installation shall be installed in accordance with Section 02552, except that ball valve jointing shall be threaded per this specification.
- I. Air release and combination air/vacuum valves shall be installed in accordance with the Standard Details where shown on the Plans and Specification 02563.

02566.04 METHOD OF MEASUREMENT

A. Sewage Grinder Pump Units

Measurement for furnishing and installing sewage grinder pump units will be made of the number and type of unit satisfactorily furnished and installed in accordance with the Contract Documents.

B. Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

Measurement for furnishing and installing polyvinyl chloride (PVC) pressure pipe and fittings will be made horizontally in linear feet along the centerline of the pipe without deduction for fittings or valves.

C. Sewage Air Release and Combination Air/Vacuum Valves

Measurement for sewage air release and combination air/vacuum valves will be made of the number, size, and type of valve satisfactorily installed complete including vaults.

D. Flushing Valves and Vaults

Measurements for flushing valves will be made of the number satisfactorily installed complete including vaults.

02566.05 BASIS OF PAYMENT**A. General**

1. Payment will be made at the unit/or lump sum prices bid. The prices bid shall include the furnishing of all labor, tools, equipment, and materials necessary to complete the work as shown and specified, in strict accordance with the Contract Documents, and accepted by the Engineer.
2. The price(s) bid for furnishing and installing low-pressure sewer systems shall include the following:
 - a. Trench excavation, backfill, compaction, and incidental items as specified in Section 02550.
 - b. Furnishing and installing granular pipe bedding materials as shown on the Standard Details and as required elsewhere in the Contract Documents.
3. Payment will be made for contingent items when ordered by the Engineer. Payment will be as specified in Sections 02951, 02952, 02953, 02954, 02955, 02956, and 02957.

B. Sewage Grinder Pump Units

Payment for furnishing and installing sewage grinder pump units will be made for each unit installed. The price(s) bid shall include furnishing and installing gravel bedding and concrete anchors; 4-inch PVC house connections, valves, and valve boxes to the limits shown on the Plans; all electrical connections; metallic detection tape; conducting system tests and all other incidental work necessary to make the units operational.

C. PVC Pressure Sewers

Payment for furnishing and installing PVC pressure sewers, complete and operational, will be made per linear foot of the size pipe installed. The price(s) bid shall include furnishing and installing all pipe, metallic detection tape, valves, valve boxes, fittings, and jointing materials; furnishing concrete and constructing anchorages and buttresses; connecting to existing pipelines and/or structures; testing; and all other incidental items of work necessary to satisfactorily complete and make the pressure sewers operational.

D. Sewage Air Release and Combination Air/Vacuum Valves

Payment for furnishing and installing sewage air release and combination air/vacuum valves complete and operational, will be made for each size and type of valve installed in accordance with the Standard Details. The price(s) bid shall include furnishing and installing precast or cast-in-place vaults and/or manholes; manhole frames and covers; furnishing tapping saddles and drilling holes in the pressure sewer main; and all other incidental materials and work necessary to satisfactorily complete the installation and make the valves operational.

E. Flushing Valves and Vaults

Payment for furnishing and installing flushing valves complete and operational will be made for each valve assembly installed in accordance with the Standard Details. The price(s) bid shall include furnishing and installing precast or cast-in-place vaults and/or manholes; manhole frames and covers; fittings on main; and all other incidental materials and work necessary to satisfactorily complete the installation and make the flushing valve assembly operational.