

CHAPTER 6 - SANITARY SEWER

6.1 GENERAL

This section covers the requirements for PVC plastic sewer pipe materials and installation in sanitary sewer construction.

6.2 PIPE

PVC gravity sewer pipe and fittings shall conform to ASTM D3034, for diameters from four-inch (4") to fifteen-inch (15") and ASTM F679 for eighteen-inch (18") to twenty-seven-inch (27"), with integral bell gasket joints. Rubber gaskets shall be factory installed and conform to ASTM F477. Pipe shall be made of PVC plastic having a cell classification of 12454A or 13364B (with minimum tensile modulus of 500,000 PSI) as defined in ASTM D1784 and shall have a SDR of 35 and minimum pipe stiffness of 46PSI according to ASTM test D2412.

Pipe shall be installed in compliance with ASTM D2321 and the manufacturer's requirements.

6.3 FITTINGS

Fittings shall be made of PVC plastic conforming to ASTM D1784 and a cell classification as outlined in ASTM D3034.

6.4 PIPE LAYING

Pipes shall be laid with uniform slope between manholes. All pipe installation shall proceed upgrade on a stable foundation, with joints closely and accurately fitted. Rubber gaskets shall be fitted properly in place, and care shall be taken in joining the pipe sections to avoid twisting of gaskets. Joints shall be clean and dry, and a joint lubricant as recommended by the pipe supplier shall be applied uniformly to the mating joint surfaces to facilitate easy positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. If adjustment of position of a pipe length is required after being laid, it shall be removed and re-jointed as for a new pipe. When laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material.

In addition to the above requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer.

6.5 GRAVEL FOUNDATION FOR PIPE

Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, and where groundwater must be drained, the subgrade shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place.

6.6 INSTALLATION REQUIREMENTS FOR LINE AND GRADE

All pipe shall be installed accurately to the defined line and grade and verified at every joint with grade-line pipe laser. Calibration documentation shall be provided to the City upon request.

Variance from established line and grade shall not be greater than one sixteenth (1/16) inch per inch of pipe diameter in ten feet, and not to exceed one half inch in ten feet, provided that such variation does not result in a level or reverse sloping invert; provided also that variation in the invert elevation between adjoining ends of pipe, due to

non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty fourth (1/64) inch per inch of pipe diameter, or one half (1/2) inch maximum.

6.7 PIPE BEDDING

See Section 2.5.3 Pipe Embedment Material Placement

6.8 CLEANING AND TELEVISIONING

After the pipe lines have been laid and the trench back-filled, all pipes shall be thoroughly cleaned. Cleaning shall be accomplished using a high-pressure jet cleaning machine, producing a minimum of 800 psi. Waste water and debris shall not be permitted to enter sewer lines in service, but shall be removed by a vacuum truck at the lowest manhole of the extension. Such cleaning shall be done by private crews at the expense of the Developer/Contractor.

All sewer pipe mains and laterals shall be cleaned and then inspected using a television inspection unit. The televised inspection of any pipes which reveal broken, misaligned or displaced pipe, or other defects shall be remedied by the contractor as directed by the City Engineer / Public Works Representative. The Developer/Contractor must provide the City with a DVD of the televising of the pipe and the Developer/Contractor shall pay all associated costs. The televised inspection shall have the slope of pipe shown on the DVD throughout the inspection. The televising equipment used must record on the DVD a continuous distance from the point of beginning. After cleaning and inspection have been completed, the pipe shall be tested as instructed in the following section.

6.9 TESTS

The Developer/Contractor will be required to conduct an air test and displacement test in the presence of the City Engineer / Public Works Representative. If these tests prove to be inconclusive, any or all of the other required tests shall be conducted in the presence of the City Engineer / Public Works Representative or his representative. Tests shall be performed as follows:

6.9.1 Infiltration Test:

The Developer / Contractor shall furnish labor, equipment, and materials, including pumps, and shall assist the City Engineer / Public Works Representative in making infiltration tests of the completed sewer before it can be placed into service. The Developer/Contractor shall furnish and install the measuring weirs or other measuring devices. The length of line to be tested at any time shall be subject to the approval of the City Engineer / Public Works Representative. The maximum allowable infiltration shall not exceed one-hundred-fifty (150) gallons per inch diameter per mile per twenty-four hours (24 hrs) for all installed sewer pipe. If the quantity of infiltration is in excess of the maximum allowable, the leaking joints shall be repaired to the satisfaction of the City Engineer / Public Works Representative at the expense of the Developer/Contractor.

6.9.2 Exfiltration Test:

The Developer/Contractor shall furnish labor, equipment, and materials, including pumps, and shall assist the City Engineer / Public Works Representative in making exfiltration tests of the completed sewer before it can be placed into service. The length of line to be tested at one time shall be limited to the length between adjacent manholes. The maximum allowable exfiltration shall not exceed one-hundred-fifty (150) gallons per inch diameter per mile per 24 hours for all installed sewer pipe. The end of the sewer line, which projects into the manhole, shall be plugged. The pipe shall then be filled with water from the upper manhole, and the line maintained under a light pressure of four feet (4') of head. The inflow of water necessary to maintain this head shall be recorded as the leakage of the system. If the quantity of exfiltration is in excess of the maximum allowable, the leaking joints shall be repaired to the satisfaction of the City Engineer / Public Works Representative at the expense of the Developer/Contractor.

6.9.3 Air Testing:

The Developer/Contractor or his representative (a qualified firm or individual agreed upon by the City Engineer / Public Works Representative and the Developer/Contractor) shall furnish labor, equipment, and materials, including pumps and compressors, and shall perform, in the presence of the City Engineer / Public Works Representative, air tests of the completed pipe before it can be placed in service. Each section of sanitary sewer pipeline between manholes shall be tested after all the service laterals (and plugs) have been installed. Each test section shall be pressurized to four (4.0) psi. For the purpose of stabilizing the air pressure in each test section, the four (4.0) psi pressure shall be maintained for a two-minute period. Each test section shall then be re-pressurized to 4.0 psi for a period of four minutes. The test section shall be accepted if, after four minutes, the pressure gauge indicates 3.5 psi or greater. Failure of the Developer / Contractor's testing equipment to properly function shall render the test unacceptable. All faulty sections of pipeline shall be repaired and re-tested until the minimum air testing requirements have been met.

6.9.4 “Go/No-Go” Mandrel Proof Testing:

Not less than thirty (30) days after installation of the flexible sewer or drain pipe, the Contractor shall test the buried pipe to insure that ring-deflection of the pipe does not exceed five percent (5%) of the pipe's specified minimum inside diameter (ID). This proof test shall establish that the Contractor has installed the flexible pipe in full compliance with the Project Specifications thereby providing required pipe/soil structural strength.

The Contractor, with the City Engineer / Public Works Representative present, shall pull a "Go/No-Go" Mandrel, inspected and approved by the City Engineer / Public Works Representative, through the full length of installed flexible pipe. The Mandrel shall be fabricated from suitable metal with a minimum of nine (9) properly sized radial fins mounted upon a center pulling shaft. In any case, the Mandrel shall be provided with an odd number of rigidly mounted radial fins. The Mandrel shall be provided with a proof-sizing ring that can demonstrate that the Mandrel's minimum outside diameter (OD) is not less than ninety-five percent (95%) of the specified minimum inside diameter of the installed flexible pipe. The Mandrel shall be pulled by the Contractor through one-hundred percent (100%) of the installed flexible pipe without using mechanical equipment. Failure of the Mandrel to pass through a pipeline shall be deemed evidence of inadequate installation by the Contractor not in compliance with the Project Specifications.

6.10 MANHOLE CONNECTIONS

PVC pipe connections to manholes shall be achieved by use of manhole coupling adapters, rubber gaskets, or positive seal gasket system with 300 series nonmagnetic stainless steel bands such as PSX: Direct Drive or approved equal. PVC may not be grouted directly to concrete.

Positive seal gasket systems boot shall be constructed solely of synthetic or natural rubber, shall have a minimum tensile strength of 1600 psi and have a minimum wall thickness of 0.275 inches. The boot shall either be “cast-in-place” in the precast base or attached to the precast base by means of an internal expanding band. When the boot is attached to the precast base, a water tight seal between the boot and the precast base must be accomplished. An external band (take-up clamp) shall be supplied and used to clamp and seal the boot to the pipe. The band shall be made of 300 series nonmagnetic stainless steel. After the band has been placed, it shall be completely coated with a bituminous material approved by the City Engineer / Public Works Representative.

6.11 SEWER LATERAL CONNECTIONS

All sewer lateral connections onto new sewer mains shall be made through pre-formed wye fittings installed in the main line at the time of main line installation. The minimum spacing between sewer lateral connections using a wye is thirty feet (30'). When spacing between sewer laterals is less than thirty feet (30'), Inserta Tee connections must be used.

Connections onto existing sewer mains shall be made with Inserta Tee connections or approved equal. All connections by Inserta Tees on existing sewer mains shall be done with a sewer tapping machine and all required fittings and materials. Connections shall be made as shown on the Standard Drawing and at the location specified herein, shown on the improvement drawings or as staked in the field.

6.12 SEWER SERVICE LATERALS

New service laterals shall be constructed with materials and procedures as specified herein.

In no case shall sanitary sewer laterals be less than four inches (4") in diameter.

6.12.1 Extent of Laterals and Location of Laterals:

New sewer laterals installed to lots shall be located ten feet (10') in the downhill direction from the lot centerline and a minimum of ten feet (10') from the culinary water service. Service laterals shall extend from the sewer main to a point fifteen feet (15') beyond the street right-of-way line unless shown or staked otherwise. Laterals shall be capped with a cap suitable to withstand test pressure and prevent any leakage into or out of the lateral.

Sewer cleanouts shall be installed every one-hundred feet (100') maximum.

Lateral connections directly into a manhole shall **not** be allowed.

A two-inch by four-inch (2" x 4") lumber marker, with the top twelve inches (12") painted green, extending from the end of the sewer lateral to a minimum of twelve inches (12") above finished grade, shall be installed to clearly mark the end of each lateral line. In addition to the 2" x 4" lumber marker, the Developer/Contractor shall install a brass pin, 1/2" in diameter, stamped with the letter "S" in the top back of curb at the location where the sewer lateral crosses the curb.

When an existing sewer lateral is encountered along the line and grade of a new pipeline it shall be relocated using appropriate pipe and fittings and graded to insure adequate slope to drain properly. Minimum slope shall be one-quarter-inch (1/4") per foot.

6.12.2 Excavation and Backfill:

Trench excavation and backfill shall conform to the applicable paragraphs of Chapter 2 and the bedding requirements of Section 2.5.3 Pipe Embedment Material Placement.

6.12.3 Pipe:

Pipe used for new service laterals shall be PVC Plastic Pipe conforming to ASTM D3034 SDR 35.

6.12.4 Cover Over Sewer Lateral Lines:

There shall be a minimum of 3 feet of cover over all sewer lateral lines.

6.12.5 Testing:

The service laterals shall be tested as a part of the sewer main to which they are connected.

6.12.6 Damage and Repairs of Sewers and Appurtenances:

The Developer/Contractor shall be responsible for the protection of existing improvements, and any damage resulting from its operations shall be its sole responsibility.

Damage to the sewers, laterals, or appurtenances shall be repaired by acceptable and approved methods.

6.13 ORANGEBURG PIPE

All Orangeburg pipe (currently in service) encountered during construction shall be completely removed and replaced to current standards.