

CHAPTER 5 - STORM DRAIN & IRRIGATION

5.1 GENERAL

This section covers the requirements for materials and installation of storm drain and other gravity flow pipes, manholes, and inlet boxes within the public right-of-way.

5.2 MINIMUM SIZES

In no case shall storm drain or irrigation mains be less than fifteen inches (15”) in diameter.

Minimum manhole interior diameter is five feet (5’) for all storm drain or irrigation manholes. Larger sizes may be required based on pipe size.

Minimum curb inlet box size is two feet by three feet (2’ x 3’). Precast boxes with knock-outs are allowed. Larger boxes to accommodate oil /debris separation devices, orifice plates, etc. shall be required as approved by City Engineer / Public Works Representative.

5.3 PIPE

Pipe used in storm drain and irrigation pipeline construction within the public right-of-way shall be reinforced concrete pipe Class III, unless otherwise approved by the City Engineer / Public Works Representative, as required by design loading and fill heights and as follows:

5.3.1 Reinforced Concrete Pipe:

All reinforced concrete pipe shall be of the rubber gasket type, bell and spigot joint design, conforming to the requirements of the latest revision of ASTM Designation C76. Pipe class shall be a minimum of Class III or greater, required by design loading and fill heights per the manufacturer.

Bell and spigot joints, including rubber gaskets, shall conform to the requirements of the latest revision of ASTM Designation C443. The pipe joint shall be so designed as to provide for self-centering, and when assembled, to compress the gasket to form a water tight seal. The gasket shall be confined in a groove on the spigot, so that pipe movement or hydrostatic pressure cannot displace the gasket

5.3.2 Corrugated High Density Polyethylene Pipe:

Corrugated polyethylene pipe shall be high density polyethylene corrugated exterior with a smooth interior wall with water-tight joints. Eight to ten (8-10) inch diameter shall meet the requirements of AASHTO M-252 and have a smooth interior liner. Twelve to thirty six (12-36) inch diameters shall conform to AASHTO M-294 Type S. Forty-two to forty-eight (42-48) inch diameter shall conform to AASHTO MP-6 type. Materials shall conform to ASTM D-3350. All pipe joints and fittings shall be water tight and conform to AASHTO M-353 or M-294, and shall be approved by the City Engineer / Public Works Representative. **Use of HDPE pipe within the public right-of-way is only allowed upon prior approval of the City Engineer.**

The pipe and fittings shall be free of foreign inclusions and visible defects. For pipe sizes 12" diameter and greater, holes of any kind in the corrugation crests or sidewalls shall be considered unacceptable. The ends of the pipe shall be cut squarely and cleanly so as not to adversely affect joining.

The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe. Fittings shall be molded by the manufacturer. Fittings produced by manufacturers other than the supplier of the pipe shall not be permitted.

A manufacturer's certification that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished to the City Engineer / Public Works Representative upon request.

All fittings, bolts and accessories shall meet applicable specifications of the pipe being used. Use accessories and gaskets recommended by the manufacturer.

5.4 PIPE LAYING

All storm drain 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. Pipes shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells. Specific installation requirements for RCP and Corrugated HDPE pipe are listed below:

5.4.1 Reinforced Concrete Pipe:

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.

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.

5.4.2 Corrugated High Density Polyethylene Pipe:

Select material shall be compacted around the pipe to firmly bed the pipe in position. Haunching material (bed to springline) should be carefully worked under the haunches of the pipe and compacted from the pipe to the trench wall or two and one half (2-1/2) pipe diameters on each side of the pipe to ensure support. 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.

5.5 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.

5.6 GRAVEL FOUNDATION FOR PIPE

Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, or 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.

5.7 PIPE BEDDING

See Section 2.5.3 Pipe Embedment Material Placement

5.8 CLEANING AND TELEVISIONING

After the pipe lines have been laid and the trench back-filled, all pipes shall be thoroughly cleaned. Cleaning shall be done using a high-pressure jet cleaning machine, producing a minimum of 800 psi. Waste water and debris shall not be permitted to enter existing lines, 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 mains shall be cleaned and then inspected using a television inspection unit capable of rotating the camera for overall pipe inspection. The televised inspection of any mains 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.

5.9 TESTS

The Developer/Contractor will be required to conduct an air test and in the case of HDPE pipe a “GO/NO-GO” mandrel 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:

5.9.1 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 pipeline between manholes shall be tested individually. Each test section shall be pressurized to 4.0 psi. For the purpose of stabilizing the air pressure in each test section, the 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

5.9.2 GO/NO-GO” Mandrel Proof Testing (For HDPE Pipe Only):

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.

5.10 MANHOLES OR JUNCTION BOXES

Manholes and junction boxes shall be installed at the locations and at the depth shown on the drawings. Manholes or boxes shall be furnished complete with cast-iron rings and covers. No steps shall be installed in any manhole or box.

Unless otherwise noted manhole bases or boxes shall be precast. Concrete for manholes and boxes shall comply with the requirements of Chapter 9 – Portland Cement Concrete.

All manholes shall be precast, sectional, reinforced concrete pipe sixty-inch (60") diameter minimum, or larger, as specified. Sections shall conform to all requirements of ASTM Designation C478-88 (or latest revision) for Precast Reinforced Concrete Manhole Sections.

All joint surfaces of precast sections and the face of the manhole base shall be thoroughly cleaned prior to setting precast sections. All joints shall be set in mastic. All joints shall be water tight and free from appreciable irregularities in the interior wall surface.

5.10.1 Setting of Manhole Frames and Covers and Placement of Concrete Collars

Covers shall be set to the finished grade and contour of the street. Rings and covers shall be protected during backfilling and compaction of the road base and during the placing or replacing of road surfaces. Any rings or covers damaged or broken shall be replaced by the Developer/Contractor at its expense. Prior to paving, the manhole ring and cover shall be GPS-located by the Developer / Contractor (shot at the center of the ring) and set below the finished road base elevation. After paving the asphalt shall be removed, and the manhole ring and cover shall be raised to match the grade and slope of the finished road surface and shall use the WHIRLYGIG manhole riser/collar system or approved equal.

Road base around the manhole ring and cover shall be recompacted, and the concrete collar placed. Manholes and boxes placed in asphalt surfacing shall be constructed such that the cast iron ring is one-quarter inch (1/4") lower than the pavement. The top of all concrete lids shall be a minimum of eight inches (8") and a maximum of twelve-inches (12") below the finished road surface. Manholes and boxes must be cleaned of all debris after setting of collars.

See Standard Drawings for concrete collar details.

5.11 PIPE CONNECTIONS

Pipe connections to manholes or other structures shall be achieved by the use of a concrete collar (see Chapter 9, Portland Cement Concrete) on the exterior of the structure around the pipe creating a watertight seal between the manhole and the pipe. Non-shrink grout shall be used on interior of the structure, filling all voids and creating a watertight seal between the manhole and the pipe. Pipes shall be cut flush with interior of the structure in a workmanlike manner. Pipe shall be supported by proper trench foundation outside of the structure and shall not rely on the structure for support.

Connections to an existing storm drain / irrigation system shall be made by installation of a manhole. The City Engineer / Public Works Representative shall approve connection locations and methods.