

6. WASTEWATER SYSTEM

6.1 General:

The design and construction of the wastewater collection system to serve the development shall be in accordance with good engineering principles, these Standards of Design, the Standard Specifications for Construction, the Standard Details and the requirements of the Texas Commission on Environmental Quality (TCEQ). No construction shall commence prior to the approval of the plans and specifications by the City of Royse City. All sewer mains and lift stations shall be sized and located to conform to the projected flows in accordance with the latest sanitary Wastewater Master Plan.

All facilities shall be of sufficient size to provide adequate capacity for the ultimate development. The wastewater lines shall be sized to meet the peak-day dry weather flow plus an appropriate allowance for infiltration of storm water. The minimum wastewater pipeline size (other than service lines) for all developments shall be eight inches (8") in diameter. The design criteria and calculations shall be submitted to the City with the plans and specifications. The City reserves the right to require a pipeline of a larger size than that required by the development in order to provide capacities for areas outside of the development.

All wastewater lines shall be installed at a depth sufficient to permit all water pipelines to be above the wastewater when the water pipeline has a minimum cover of four feet (4'). In such cases where water pipelines either cross or otherwise come within nine feet (9') of a wastewater pipeline, the wastewater pipe may be PVC pressure pipe with a minimum working pressure class of 150 psi.

6.2 Connections to Existing Wastewater Collection System:

Preliminary discussion concerning entrance points in the collection system shall be conducted with the City of Royse City Public Works Department prior to finalizing the preliminary designs of the collection system. In a proposed development where City waste water collection facilities are not adjacent to the property but are accessible, the developer shall provide, at his expense, a wastewater interceptor of sufficient size to serve his development and the contributing service area (using fully developed flows).

In general, the City will not approve a development which cannot be served by extensions to the City's wastewater collection system.

6.3 Location of Facilities:

A. Wastewater Pipelines: Wastewater pipelines shall be located in the parkways between the back of the curb and the street right-of-way. The location shall be three feet (3') from the back of the curb on the south side of east-west streets and on the east side of north-south streets. A green EMS Locator Pad is to be installed. No wastewater services can be connected to wastewater mains at depths greater than five feet (5').

- B. Wastewater Service Pipelines: Wastewater service pipelines shall be laid to each lot. The service pipelines shall be PVC pipe having a minimum diameter of six inches (6") and shall extend to the property corner. Wastewater service pipelines shall be located at alternating corners of each lot and as approved on the final construction plans by the City. In general, a service pipeline shall serve two lots. The minimum diameter shall be six inches (6"). Special wastewater service sizing may be required. No sewer line shall be located nearer than five feet (5') from any tree or structure, nor any closer than ten feet (10)' from any water service or main.

All sewer services shall be connected to the main using a wye connection with a 45 degree bend to complete the connection. No tee connections will be allowed.

The service shall be stubbed out a minimum of 10-feet from the back of curb and at a depth no greater than five feet (5'). The stub-out shall be capped with a proper fitting and shall have a double sweep cleanout installed within five feet (5') of the lot corner and which extends to at least two feet (2') above the finished lot grade. The cleanout stack shall be set to grade during construction of the structure to be served and before a certificate of occupancy will be issued. After the street paving is complete, the letter "S" shall be cut into the concrete curb to locate the service.

- C. Manholes: In general, manholes shall be located at all intersections of wastewater pipelines, changes in grade, changes in alignment and at distances not to exceed five hundred feet (500'). All manholes will be hydrostatically or vacuum tested. For sewer line flowlines connecting eighteen inches (18") or greater above invert, an internal drop manhole shall be constructed. Manhole size shall be per Table 6.1. Construct manholes at both ends of lines that are installed by other than open cut and at each end of aerial crossing lines.

TABLE 6.1

MINIMUM MANHOLE SIZES

<u>Sanitary Sewer Line Size</u>	<u>Minimum Manhole Diameter</u>
6", 8" and 10"	4.0 feet
12", 15", 18", 21", 24" and 27"	5.0 feet
30" and 36"	6.0 feet

- D. Cleanouts shall be installed at the ends of all lines that do not end with manholes. The maximum distance between a manhole and an upstream cleanout is 300 feet. Cleanouts may be used in residential developments and located at the ends of lines only. Commercial and industrial developments require manholes at the ends of all lines.

6.4 Flows in Wastewaters and Their Appurtenances:

- A. Minimum Grades: Wastewater lines should operate with velocities of flow sufficient to prevent excessive deposits of solid materials, otherwise objectionable clogging may result. The controlling velocity with regard to sediment deposition is near the bottom of the conduit and considerably less than the mean velocity flowing full of 2.5 feet per second (f.p.s.). TABLE 6.2 indicates the minimum grades for wastewater pipe with a Manning's "n" = 0.013 and flowing at 2.4 f.p.s.
- B. Maximum Velocities: The slope of a wastewater should also be such that excessive velocities will not damage the pipeline. The maximum desirable velocities for wastewater wastewaters shall be based upon the pipe manufacturer recommendations not to exceed 10 feet per second (fps).

TABLE 6.2

MINIMUM GRADES FOR WASTEWATER PIPELINES

Pipe Size (Inches)	Slope in Foot/Foot (n = 0.013)
6	0.005
8	0.0033
10	0.0025
12	0.0023
15	0.0023
18	0.0018
21	0.0015
24	0.0013
27	0.0011
30	0.0009
33	0.0008
36	0.0007
39	0.0006
42	0.0006
45	0.0005
48	0.0005
54	0.0004
60	0.0004
66	0.0004
72	0.0003
78	0.0003
84	0.0003
96	0.0002

6.5 Materials and Installation:

- A. Pipe: Pipe used for wastewater collection systems shall be PVC pipe conforming to the Standard Specifications for Construction. The wastewater pipeline shall conform to ASTM D3034 for sewer pipe and fittings from 4" to 15" in diameter and with ASTM F679, for Sewer pipes and fittings greater than 15" in diameter, and shall have a minimum earth cover of three feet (3'). For depths of ten feet (10') or greater, the wastewater pipeline shall be a minimum pipe stiffness of 115-psi (SDR 26).

All pipes shall be installed in embedment material as shown on the Standard Details, and in conformance for the Standard Specification for Construction. All pipelines shall be tested as specified in the NCTCOG Standard Specifications for Public Works Construction.

- B. Curved Sewers: No vertical curves will be allowed. Horizontal curvature may be by joint deflection or pipe flexure but not both. The Engineer must specify on the plans the method of deflection allowed and the allowable radius or joint deflection for each pipe size.

When pipe flexure is used, the minimum radius of curvature shall be equal to that recommended by the pipe manufacturer or $300 \cdot D_0$, where D_0 is the average outside diameter of the pipe in inches, whichever is greater. The Engineer shall note on the plans that when using pipe flexure, all joints are to remain fully seated.

If a joint deflection will be used to provide horizontal curvature, the allowable deflection shall be 5° or 80% of the Manufacturer's recommended maximum joint deflection, or 80% of the National Reference Standard maximum recommended joint reflection, whichever is less. When joint reflection is used, the Engineer must specify the size of mandrel used for reflection testing. The mandrel shall be sized to verify that the maximum joint deflection has not been exceeded.

Horizontal curves shall match change in street direction as near as possible, but will not be allowed across residential single family and duplex lots.

Slopes on curved sewers shall be a minimum of 3% greater than the corresponding minimum slope of sewers on a straight line.

Manholes on curved sewers shall be located at the P.C. and P.T. of the curve and at a maximum spacing of three hundred feet (300') along the curve.

- C. Manholes: Manholes shall be of pre-cast concrete or cast in place and shall conform to Standard Details and the Standard Specifications for Construction.

The interior of manholes shall be coated with an epoxy coating. The epoxy coating shall be a total 125-mil thickness of Raven Lining System's Raven 405, Tnemec's Perma-Shield H2S Series 434 or Standard Cement Material's Standard 4553 Epoxy Coating. The concrete surfaces shall be prepared in accordance with the manufacturer's recommendations prior to application. All products shall be

applied according to the manufacturer's recommendations and shall be tested for thickness during application in at least three locations selected by the Owner and shall be tested for holidays once the coating has cured in accordance with the manufacturer's recommendations.

- D. Cleanouts: In general, manholes shall be installed at the upper end of all wastewater collector mains. Cleanouts may be installed in lieu of manholes at some locations subject to the approval of the final engineering plans by the City. Cleanouts shall not be more than three hundred feet (300') from a manhole. Cleanouts shall conform to the Standard Details and the Standard Specifications for Construction.

6.6 Testing:

All wastewater lines shall be tested for infiltration in accordance with the procedures set forth in the NCTCOG Standard Specifications for Construction. A television survey shall be performed at the end of the construction period and will again be performed as part of the final testing in the tenth (10th) month of the maintenance period. Deficiencies noted shall be promptly corrected by the developer. The City's representative shall be present at all testing and copies of the testing reports shall be provided to the City upon completion. All expenses for this work shall be the developer's responsibility.

6.7 Wastewater Lift Stations and Force Mains:

All lift station design plans and specifications shall be submitted to the City Public Works Department and TCEQ for review and approval prior to construction. Developments which increase the flow to existing lift stations will be subject to a pro-rata charge if sufficient capacity is available in the existing lift station or will be required to increase the capacity of the existing facility. Lift stations and force mains shall be designed and built for the upstream drainage area using a fully developed condition. This will include off-site areas if applicable. Developers are responsible for the construction of regional lift stations and force mains, as required by the Wastewater Master Plan. Developers may request a pro-rata agreement be executed with the City, where the City collects a pro-rated amount as other developments connect to the system and then reimburses the developer for the portion of the oversized system. The pro-rata agreement requires approval by City Council, prior to approval of the plans.