

## **WASTEWATER SYSTEM REQUIREMENTS**

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### I. GENERAL:

- A. Design criteria for all wastewater systems shall comply with Texas Commission on Environmental Quality (TCEQ) Chapter 217 (Design Criteria for Domestic Wastewater Systems), latest revision.
- B. Sizes and grades for wastewater mains shall be as required by the Town Engineer, and consideration shall be given as to possible extensions for future development. No wastewater main, other than laterals and force mains, shall be less than eight-inch (8") in diameter.
- C. Permits from agencies other than the town must be submitted through the town.
- D. All grades shall be shown to the nearest one-hundredth of a foot (0.01').
- E. Where applicable, line sizes shall comply with the Wastewater Collection System Master Plan or subsequent revisions.
- F. Wastewater mains shall be sized and extended through the limits of a development to serve adjacent properties. In phased construction of thoroughfares, the wastewater mains shall be extended the entire length of the thoroughfare being constructed.
- G. Finished floors shall be set a minimum of one half foot (0.5') above the upstream manhole.

### II. WASTEWATER MAIN LOCATION:

- A. Wastewater mains in right of way shall be installed in the street at five feet (5') from the face of curb opposite side of the water main or otherwise directed by the Public Works Department. Wastewater mains are usually located in the center of the street. Each project is unique; therefore, no fixed rules will apply to all cases.
- B. No public wastewater main shall be located at least five feet (5') from any tree unless approved by the Public Works Department.
- C. Where a new non-pressure rated wastewater main or lateral crosses under a new water main, the wastewater main or lateral shall be embedded in cement stabilized sand for the total length of one pipe segment plus twelve inches (12") beyond the joint on each end and there shall be a minimum of twenty-four inches (24") of clearance or otherwise as governed by TCEQ Chapter 217 requirements.

### III. WASTEWATER MAIN MATERIALS:

The material used for the wastewater main shall be designed for a minimum structural life cycle, of fifty (50) years. If the pipe material will deteriorate when subjected to corrosive conditions, the Engineer shall provide, for an acceptable corrosion resistant liner or provide calculation and data that demonstrated that the design and operational characteristics will provide for the minimum life cycle.

- A. All gravity wastewater mains shall be in green in color. Four-inch (4") to fifteen-inch (15") pipe shall be PVC SDR 35 or 26 (ASTM D3034). Eighteen-inch (18") and larger pipe shall be PVC ASTM F679. PVC fittings may be either green or white in color.
- B. All mains to be installed under existing roadway should be installed by bore unless otherwise approved by the Town Engineer. Rust resistant steel casing minimum one-fourth-inch (1/4") thick, or thicker if deemed necessary by the design engineer, shall be used with Raci patented casing

spacers, or approved equal. No wood skids will be permitted.

- C. PVC pipe used for force mains shall be white in color. Twelve-inch (12") and smaller pipe shall be ASTM 2241 SDR 21. Pipes larger than twelve-inch (12") shall be C905 DR25.
- D. Profile wall pipe shall not be permitted in the Town of Addison without written authorization by the Town Engineer. If allowed by the Town Engineer, twenty-four inches (24") and larger profile wall pipe shall conform to ASTM 794 and the Town of Addison specifications. "Helically wound" or "pipe stiffness series 10" profile wall pipe will not be allowed.
- E. Cement stabilized sand shall have a minimum of ten percent (10%) cement per cubic yard of cement stabilized sand mixture, based on loose dry weight volume (at least 2.5 bags of cement per cubic yard of mixture). The cement stabilized sand bedding shall be a minimum of six inches (6") above and four inches (4") below the wastewater main or lateral. Brown coloring shall be added to the cement stabilized sand mixture for pressure rated wastewater main or lateral bedding.

IV. WASTEWATER MAIN SIZING:

- A. Wastewater flow shall be computed in accordance with Tables 1a and 1b shown below, with the exceptions, as required by the Town Engineer.

**Table 1a: Residential Design Flows**

Land Use	Design Flow Rate
Single Family	<ul style="list-style-type: none"> <li>• 100 gallons per person per day</li> <li>• 4.5 units per acre</li> <li>• 3 persons per unit</li> </ul>
Apartment	<ul style="list-style-type: none"> <li>• 100 gallons per person per day</li> <li>• 20 units per acre</li> <li>• 3 persons per unit</li> </ul>
Patio Home	<ul style="list-style-type: none"> <li>• 100 gallons per person per day</li> <li>• 5 units per acre</li> <li>• 3.5 persons per unit</li> </ul>
Town Home	<ul style="list-style-type: none"> <li>• 100 gallons per person per day</li> <li>• 10 units per acre</li> <li>• 3.5 persons per unit</li> </ul>

**Table 1b: Commercial Design Flows**

Land Use	Design Flow Rate
Hospital	• 200 gallons per day per bed
Nursing Home	• 90 gallons per day per bed
Office/Commercial	• 0.1 gallons per sf per day
Restaurant	• 1 gallon per sf per day
School	• 15 gallons per student per day
Hotel/Motel	• 150 gallons per day per room
Medical Office	• 0.2 gallons per sf per day

Note: Infiltration shall be 650 gallons per acre per day (GPAD). For eight-inch (8"), ten-inch (10"), and twelve-inch (12"), the daily peak factor shall be 3, for fifteen-inch (15"), eighteen-inch (18"), and twenty-one-inch (21"), the daily peak factor shall be 2 and for twenty-four-inch (24") and larger, the daily peak factor shall be 1.

Calculation: Design flow rate\*units\*peak factor + infiltration rate\*area = Peak Wet Weather Flow

Example Residential Calculation: 56 acres of single family residential  
 $(100 \times 4.5 \times 3) \times 56 \text{ acres} \times 3 + 650 \times 56 = 263,200$  gallons per day

Example Commercial Calculation: 10,000 sf retail store on 1 acre lot  
 $0.1 \times 10,000 \times 3 + 650 \times 1 = 3,650$  gallons per day

- B. The minimum acceptable "n" factor for use in design of wastewater mains shall be 0.013. Mains should be placed on such a grade that the velocity is not less than 2 fps or more than 10 fps. Minimum grades based on n = 0.013 shall be as follows:

**TABLE 2: Minimum and Maximum Grades for Wastewater Mains**

<u>Size of Pipe (Inches)</u>	<u>Minimum Slope in (Percent)</u>	<u>Horizontal Curve (Percent)</u>	<u>Maximum Slope in (Percent)</u>
8	0.33	0.35	8.40
10	0.25	0.27	6.23
12	0.20	0.22	4.88
15	0.15	0.17	3.62
18	0.11	0.13	2.83
21	0.09	0.10	2.30
24	0.08	0.09	1.93
27	0.06	0.07	1.65
30	0.055	0.065	1.43
33	0.05	0.06	1.26
36	0.045	0.055	1.12
39	0.04	0.05	1.01
>39	*		*

Note: For lines larger than thirty-nine inches (39") in diameter, the slope shall be determined using the following equation to maintain a minimum velocity of two feet per second (2 fps) and a maximum velocity of ten feet per second (10 fps).

$$V = (1.486/n) \cdot (R^{2/3}) \cdot (S^{1/2})$$

- Where:
- V = Velocity of flow in conduit in feet per second.
  - n = Roughness coefficient of the conduit, dimensionless.
  - R = Hydraulic radius of the conduit in feet, which is the area of the flow divided by the wetted perimeter (R=A/P).
  - S = Slope of the hydraulic gradient in feet per foot.

**V. WASTEWATER CONSTRUCTION:**

- A. Line and grade stakes for construction of all mains and laterals shall be furnished by the developer's Engineer or their designated representative. Property lines and corners must be properly staked to ensure correct alignment. The town will not be liable for improper alignment or delay of any kind caused by improper or inadequate surveys by the developer or by interference of other utilities.
- B. All wastewater mains shall be tested for infiltration and exfiltration in accordance with standard specifications and as shown on the plans. Video camera inspections, low pressure air testing, vacuum testing of the manholes and mandrel testing are required on all sewer lines. In addition, all residential and commercial wastewater services shall have video camera inspections. All video camera inspections shall include an inclination study. All testing shall be completed, reviewed and approved by the Town of Addison prior to any final inspections or issue of certificate of occupancy.

**VI. TRENCH REQUIREMENTS:**

- A. Minimum cover shall be four feet (4'). In general, the minimum depth for wastewater mains to serve given residential property with a four-inch (4") lateral shall be three feet (3') plus 2% times the length of the house lateral (the distance from the sewer to the center of the house). Thus, for a house one hundred thirty-five feet (135') from the sewer, the depth would be three feet (3') plus 2% x one hundred thirty-five feet (135') = 3.0 + 2.7 = five and seven-tenths feet (5.7'). The depth of the flow line of the sewer should then be at least five and seven-tenths feet (5.7') below the elevation of the ground at the point where the service enters the house. Profiles of the ground line twenty feet (20') past the building line will be required to verify that this criterion is met.

VII. MANHOLES:

The sizes and locations of manholes, wyes, bends, tap connections, etc., shall be approved by the Town Engineer. In general, manholes shall be placed at all four (4) way connections and three (3) way connections, changes in grade and direction, and the maximum spacing five hundred feet (500').

- A. In order to provide access to wastewater mains for cleaning, manholes shall be located such that two hundred fifty feet (250') of rod can reach any point in the line. Manholes shall be located at the end of the line or on a line that may be extended in the future.
- B. Manholes shall have a 400lbs traffic bearing frame and cover with a design strength of 4000 psi at twenty-eight (28) days.
- C. Drop manholes shall be required when the inflow elevation is more than twenty-four inches (24") above the outflow elevation.
- D. The diameter of a manhole constructed over the center of a wastewater main should vary with the size of the main. For eight-inch (8"), ten-inch (10"), and twelve-inch (12"), the manhole shall be four-foot (4') minimum diameter, for fifteen-inch (15"), eighteen-inch (18"), twenty-one-inch (21"), twenty-four-inch (24") and twenty-seven-inch (27") shall be five-foot (5') minimum diameter; thirty-inch (30") and thirty-six-inch (36") shall be six-foot (6') minimum diameter. Manholes deeper than fifteen feet (15') shall be a minimum of five-foot (5') diameter.
- E. In Flood Plains, sealed manholes "Type S" shall be used to prevent the entrance of storm water. Coating in manhole where more than three manholes in sequence are to be bolted and gasketed, every third manhole shall be vented two feet (2') above the one hundred (100) year floodplain elevation or ten feet (10') above the adjacent ground line, whichever is higher. The Engineer shall provide the elevation of the one hundred (100) year flood. Sealed manholes shall also be used in all areas subject to carrying drainage flow or in drainage ways.
- F. Where pipes enter a manhole there shall be a minimum of one-tenth of a foot (0.1') drop between inlet and outlet inverts. Where unequal size pipes enter a manhole, crown of pipes should be at the same elevation.
- G. Manholes shall have inflow protection inserts, minimum thickness of one-eighth inch (1/8"), made of HDPE meeting ASTM D 1248 Class A, Category 5, Type 111. Insert shall include a lift strap as manufactured by Knutson Manhole Inserts or approved other.
- H. Construct manholes at each end of mains that are installed by other than open cut and at each end of aerial crossing lines.
- I. Manhole vent stacks shall be placed on all manholes within 1000 feet of an outfall from a force main.

VIII. WASTEWATER MAIN CURVATURE:

- B. No vertical curves shall be allowed.
- C. 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.
- D. When pipe flexure is used, the minimum radius of curvature shall be equal to that recommended by the pipe manufacturer or  $300 \cdot D_o$ , where  $D_o$  is the average outside diameter of the pipe in inches,

which ever is greater. The Engineer shall note on the plans that, when using pipe flexure, all joints are to remain fully seated.

- E. If joint deflection will be used to provide horizontal curvature, the allowable deflection shall be 80% of the Manufacturer's recommended maximum joint deflection, or eighty percent (80%) of the National Reference Standard ASTM criteria maximum recommended joint deflection or by TCEQ Criteria, whichever is less. In no case shall the radius be less than two hundred feet (200').
- F. Horizontal curves for wastewater mains running parallel with public right-of-ways shall match change in street direction as near as possible. Horizontal curves will not be allowed across residential single family and duplex lots, without prior approval from the Town Engineer.
- G. Manholes on curved wastewater mains shall be located at the P.C. or P.T. of the curve and a maximum spacing of four hundred feet (400') along the curve.

IX. LATERALS:

The sizes and locations of laterals shall be designated as follows unless otherwise directed by the Town Engineer:

- A. In general, for single-family dwellings, the lateral size shall be a four-inch (4") minimum. House laterals shall be installed ten feet (10') downstream from the center of the lot and shall have a ten-foot (10') separation from the water service. All residential sewer services shall be extended to a point ten feet (10') from the back of the property line at a maximum depth of five feet (5'). The service shall then be extended at a forty-five degree (45°) angle to four feet (4') above the finished grade and capped.
- B. Multiple units, apartments, local retail and commercial – six-inch (6") minimum.
- C. Manufacturing and industrial - eight-inch (8") minimum or larger as required.
- D. Manholes will be required on six-inch (6") and larger laterals where they connect to the main line.
- E. Manholes will be required where wastewater laterals intersect wastewater mains that are deeper than twelve feet (12'). Deep cut or drop connections shall not be permitted.
- F. A double cleanout shall be installed on the lateral at the right-of-way or easement line. Fittings are not permitted on laterals between the wye and the double cleanout.
- G. A minimum of one (1) lateral per building shall be required. Also, a minimum of one (1) lateral per residential lot shall be required. Shared laterals are not permitted unless otherwise approved by the Public Works Department.
- H. All mains installed in future developed areas shall install laterals; the use of boots will not be permitted.
- I. All sewer laterals crossing water mains shall conform to the requirements of the Texas Commission on Environmental Quality (TCEQ) Chapter 217 (Design Criteria for Domestic Wastewater Systems), latest revision.

X. SANITARY SEWER EASEMENTS:

The following minimum width exclusive wastewater easements are required when facilities are not

located within public rights-of-way or easements:

- A. Wastewater mains are to be located within the center of a fifteen-foot (15') wastewater easement.
- B. In residential developments, wastewater mains shall not cross residential lots unless specifically approved by the Town Engineer, in which case the easement shall be located within a single lot.
- C. For wastewater mains deeper than ten feet (10'), the easement width shall be equal to 1.5 times the depth of the line rounded up to the nearest five feet (5'). Thus, for a sanitary sewer line twelve feet (12') deep, the sanitary sewer easement would be  $1.5 \times 12 = 18$  feet (18'), rounded up to the nearest five feet (5') = twenty feet (20').