

WASTEWATER SYSTEM DESIGN STANDARDS

The Town of



Public Works & Engineering Services

16801 Westgrove Road
Addison, TX 75001

Revised January 2022

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THIS DOCUMENT PROVIDES GUIDANCE to developers, engineers, and contractors desiring to install additions to the Town of Addison public wastewater system. The criteria laid out herein are the set minimum standards, more stringent obligations may be required at the direction of the Public Works & Engineering Services.

I. GENERAL

- A. Design criteria for all wastewater systems shall comply with the latest version of Texas Commission on Environmental Quality (TCEQ) Chapter 217 (Design Criteria for Domestic Wastewater Systems).
- B. Unless otherwise specified in these design standards, the design engineer and/or contractor shall meet/reference North Central Texas Council of Governments (NCTCOG) wastewater design standards and specifications.
- C. All plans shall be prepared by a Professional Civil Engineer licensed in the State of Texas.
- D. Wastewater mains (exclusive of laterals & force mains) shall be a minimum of eight inches (8") in diameter. Where applicable, line sizes shall be determined by the largest of the following:
 - 1. Size required by the latest revision of the *Town of Addison Wastewater Collection System Master Plan*.
 - 2. Size required by capacity calculations for proposed development.
 - 3. Size required by system improvement recommendations within a current Town wastewater system study/report.
 - 4. Size otherwise required by the Director of Public Works & Engineering Services.
- E. 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.
- F. Wastewater mains eight inches (8") and larger, and all force mains, shall be profiled.
- G. All grades shall be shown to the nearest one-hundredth of a foot (0.01').
- H. Approved permits from agencies/municipalities other than the Town must be submitted to the Town prior to construction plan approval.

II. WASTEWATER MAIN LOCATION

- A. Wastewater mains in public ROW shall be installed in the street, within the following zones:
 - 1. On the opposite side of the street from any water mains, where possible.
 - 2. In the center of the outermost lane.
 - 3. In unique circumstances, non-standard placement may be considered.

- B. No public wastewater main shall be located within five feet (5') from the dripline of any tree or within ten feet (10') of the edge of a structure unless approved by the Public Works & Engineering Services.
- C. In public ROW/easements, all wastewater mains, force mains, and laterals are to have a minimum cover of four (4) feet from the top of the pipe to the top of ground or proposed pavement. In addition, at the lateral connection, the depth of the flow line of the sewer should be at least five and seven-tenths feet (5.7') below the elevation of the ground at the point where the lateral enters the building. Profiles of the ground line twenty feet (20') past the building line will be required to verify that this criterion is met.
- D. Where a new non-pressure rated wastewater main or lateral crosses under any 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 and laterals shall be in green in color. PVC fittings may be either green or white in color.
 - 1. Four-inch (4") to fifteen-inch (15") mains shall be PVC SDR 26 (ASTM D3034).
 - 2. Eighteen-inch (18") and larger mains shall be PVC ASTM F679.
- B. PVC pipe used for force mains shall be white in color.
 - 1. Twelve-inch (12") and smaller mains shall be ASTM 2241 SDR 21.
 - 2. Mains larger than twelve-inch (12") shall be C905 DR25.
- C. For wastewater mains installed by bore, rust resistant steel casing (min. one (1) pipe size larger than proposed main, minimum one-fourth inch (1/4") thick or thicker if deemed necessary by the design engineer or Town Engineer, shall be used with Raci patented casing spacers, or approved equal. No wood skids will be permitted.
- D. Profile wall pipe (HDPE) shall not be permitted in the Town of Addison.

IV. WASTEWATER MAIN SIZING

A. Wastewater flows shall be computed in accordance with Tables 1a and 1b, or per current TCEQ flow rate standards, whichever results in larger calculated flows, with exceptions as allowed by the Director of Public Works & Engineering Services .

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

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

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

$$\text{Peak Wet Weather Flow} = (\text{Design Flow Rate} * \# \text{ Units} * \text{Peak Factor}) + (\text{Infiltration Rate} * \text{Area})$$

4. Example:

a. Residential Calculation: 56 acres of single family residential

$$(100 * 4.5 * 3) * 56 \text{ acres} * 3 + 650 * 56 = 263,200 \text{ gallons per day}$$

b. Commercial Calculation: 10,000 sf retail store on 1 acre lot

$$0.1 * 10,000 * 3 + 650 * 1 = 3,650 \text{ gallons per day}$$

B. Wastewater main grades (minimum & maximum) shall be designed in accordance TCEQ standards, and as follows:

1. The minimum acceptable “n” factor for use in design of wastewater mains shall be 0.013.
2. Mains should be placed on such a grade that the velocity is not less than 2 fps or more than 10 fps. For lines larger than thirty-nine inches (39”) in diameter, the slope shall be determined using the following equation:

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

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 MAIN CURVATURE

A. VERTICAL CURVES are not allowed in wastewater mains.

B. HORIZONTAL CURVES

1. Horizontal curvature may be achieved by joint deflection or pipe flexure but not both. The design engineer must specify on the plans the method of deflection allowed and the allowable radius or joint deflection for each pipe size.
 - a. When pipe flexure is used, the minimum radius of curvature shall be equal to that recommended by the pipe manufacturer or $300 \times D_o$, where D_o , is the average outside diameter of the pipe in inches, whichever is greater. The design engineer shall note on the plans that, when using pipe flexure, all joints are to remain fully seated.
 - b. When joint deflection is used, 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. Reference Table IV.3.
2. In no case shall the centerline radius of horizontal curvature be less than two hundred feet (200').
3. For wastewater mains running parallel with public rights-of-way shall match the 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.

VI. WASTEWATER MANHOLES

The sizes and locations of manholes and access chambers shall be as follows unless otherwise directed or approved by the Director of Public Works & Engineering Services. Manholes and access chambers shall be always accessible to the Public Works & Engineering Services.

- A. MANHOLE LOCATION - In general, manholes or access chambers shall be placed in the following locations:
1. Three (3) way and four (4) way connections of wastewater mains.
 2. Changes in grade and direction.
 3. Wastewater main pipe size changes.
 4. Wastewater main pipe material changes.
 5. Six inch (6") or larger lateral connections.
 6. At a maximum spacing five hundred feet (500').
 7. On curved wastewater mains, at the P.C. or P.T. of the curve and at a maximum spacing of four hundred feet (400') along the curve.
 8. The end of the line or on a line that may be extended in the future.
 9. Each end of mains that are installed by other than open cut.
 10. Each end of aerial crossings.
 11. Where wastewater laterals intersect wastewater mains that are deeper than twelve feet (12'). Deep cut connections shall not be permitted. Drop manholes may be required.
- B. DROP MANHOLES:
1. Shall be considered where velocities greater than 10 ft/sec are attained, to reduce steep slopes and limit the velocities in pipes between manholes.
 2. Shall be required a line entering a manhole at an elevation of twenty-four inches (24") or more above the manhole invert.
 3. Drop manholes require a minimum six foot (6') diameter and must be inside drop - exterior drops may be considered upon approval from the Director of Public Works & Engineering Services.
- C. SIZES
1. The diameter of a manhole constructed over the center of a wastewater main should vary with the size and depth of the main.
 2. For eight-inch (8"), ten-inch (10"), and twelve-inch (12") mains, the manhole shall be four-foot (4') minimum diameter.
 3. For fifteen-inch (15"), eighteen-inch (18"), twenty-one-inch (21"), twenty-four-inch (24") and twenty-seven-inch (27") mains, the manhole shall be five-foot (5') minimum diameter.
 4. For thirty- inch (30") and thirty-six-inch (36") mains, the manhole shall be six-foot (6') minimum diameter.
 5. Manholes deeper than fifteen feet (15') shall be a minimum of five-foot (5') diameter.
- D. PLACEMENT IN FLOODPLAINS & FLOODWAYS
1. Sealed manholes, "Type S," shall be used to prevent the entrance of storm water.
 2. 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.
3. The design engineer shall provide the elevation of the one hundred (100) year flood.
 4. Sealed manholes shall also be used in all areas subject to carrying drainage flow or in drainage ways.
- E. Manholes shall have an HS20-rated traffic bearing frame and cover, with a design strength of 4000 psi at twenty-eight (28) days.
- 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.
- 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. Manhole vent stacks shall be placed on all manholes within 1000 feet of an outfall from a force main.
- I. Finished floors shall be set a minimum of one half foot (0.5') above the rim elevation of the upstream manhole.

VII. WASTEWATER LATERALS

The size, number, and location of wastewater laterals shall be designated as follows unless otherwise directed or approved by the Director of Public Works & Engineering Services.

- 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. A single cleanout towards the main 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.
- E. Owner occupied units are required to have a minimum of one (1) service lateral per unit.
- F. All mains installed in future developed areas shall install laterals; the use of boots will not be permitted.
- G. All sewer laterals crossing water mains shall conform to the requirements of the latest version of Texas Commission on Environmental Quality (TCEQ) Chapter 217 (Design Criteria for Domestic Wastewater Systems).

VIII. WASTEWATER 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') wide wastewater easement. Additional width will be required when multiple lines are located in the same 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') (bottom of pipe), 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 wastewater line twelve feet (12') deep, the wastewater easement would be $1.5 \times \text{twelve feet (12')} = 1.5 \times 12 = \text{eighteen feet (18')}$, rounded up to the nearest five feet (5') = twenty feet (20').

IX. WASTEWATER SYSTEM CONSTRUCTION

A. CONSTRUCTION METHODS

- 1. All wastewater mains to be installed under existing roadway, culverts, creeks, and railroads should be installed by bore and steel encased unless otherwise approved by the Town Engineer.
- 2. For wastewater mains installed by trench construction:
 - a. Trench width shall be twenty-four inches (24") plus pipe outside diameter.

- b. Unless otherwise indicated, all pipe embedment shall be NCTCOG Class "B+" or "B-2".
 - c. Cement stabilized sand shall be used in pressure rated wastewater main or lateral bedding applications. It shall have a minimum of ten percent (10%) cement per cubic yard of cement stabilized sand mixture, based on dry weight (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 sand mixture.
 - d. Finish backfill shall be native soil free of any rocks or clods greater than three inches (3") in diameter and compacted from eight inch (8") loose lifts to 95% Standard Proctor Density at zero to three percent (0-3%) of optimum moisture. If native material is determined to be unsuitable or insufficient, a select fill approved by the Public Works & Engineering Services may be substituted.
 - e. Trenches under pavement may be backfilled with Flowable fill with a minimum compressive strength of 250 psi to a maximum strength of 400 psi, to the level indicated by the pavement thickness, with the prior approval of the Public Works & Engineering Services. A batch design shall be submitted for any flowable fill used within the Public ROW.
3. Alternative methods of trenchless construction may be considered by the Public Works & Engineering Services. Method(s) must be submitted to the Town Engineer for approval during construction plan review.

B. MATERIAL SUBMITTALS

The design engineer or contractor shall provide material submittals for all materials to be installed in/added to the public wastewater system to the Public Works & Engineering Services for review and approval prior to installation. The submittals shall include the manufacturer's information

C. WASTEWATER SYSTEM INSTALLATION

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.

D. WASTEWATER SYSTEM ABANDONMENT

1. Removal vs abandonment shall be decided by the Director of Public Works & Engineering Services.
2. Abandoned-in-place wastewater mains shall be plugged and grouted with an adequate quantity of flowable fill per NCTCOG standards to form a tight closure.

3. Wastewater manholes shall be abandoned per Town standard detail.

E. TESTING & REPORTS

1. All wastewater mains shall be tested for infiltration and exfiltration in accordance with standard specifications and as shown on the plans.
2. Testing shall include, but is not limited to, video camera inspections, low pressure air testing, vacuum testing of the manholes and mandrel testing on all wastewater lines. All residential and commercial wastewater services shall have video camera inspections. All video camera inspections shall include an inclination study. All reports are to be in NASSCO coding.
3. All backfill shall be placed in 8" lifts and compacted to 95% standard proctor density, with testing results provided to the Public Works & Engineering Services.
4. Additional site or job-specific testing may be required by the design engineer, or at the Public Works & Engineering Services' request to ensure the quality and functionality of the work.
5. All required testing shall be completed by the contractor and copies of testing reports/videos shall be submitted for review and approval to the Public Works & Engineering Services throughout the course of construction, and prior to any final inspections or issuance of Certificate of Occupancy.
6. A record of all project contributions to the Town of Addison public wastewater system (materials, quantities, and costs) shall be submitted to the Public Works & Engineering Services prior to infrastructure acceptance.

X. VARIANCE FROM STANDARDS

Any proposed variation from these standards must be submitted for review and approval by the Public Works & Engineering Services prior to submittal of civil construction plans.