
SECTION 6 WASTEWATER DESIGN REQUIREMENTS

6.1 General

- 6.1.1 General Design Criteria – It is the responsibility of the Engineer to ensure that all wastewater construction plans are in conformance with the current edition of the following:
- 6.1.1.A Texas Commission on Environmental Quality (TCEQ) Rules and Regulations;
 - 6.1.1.B 30 Texas Administrative Code (TAC) Chapter 290 – Public Drinking Water Subchapter D: Rules and Regulations for Public Water Systems;
 - 6.1.1.C 30 TAC Chapter 217 – Design Criteria for Domestic Wastewater Systems Subchapter C: Conventional Collection Systems;
 - 6.1.1.D American Water Works Association (AWWA) Standards.
- 6.1.2 All wastewater system designs are to meet the requirements set forth in adopted ordinances and City of Midland (COM) utility standards.
- 6.1.3 Wastewater System Design – All components of the wastewater system will be designed as specific in the City of Midland Standard Specifications.
- 6.1.4 Wastewater Plan Requirements – Construction plans are required for all wastewater mains. A profile is required for all wastewater mains. A profile is not required for wastewater service laterals.
- 6.1.5 Public wastewater mains are to be extended across the full limits of all platted property.
- 6.1.6 The developer will construct all wastewater mains and appurtenances, including major distribution facilities, necessary to connect the development with the approved wastewater collection and disposal system.
- 6.1.7 No other utilities are ever to be installed in the same ditch as public utilities.
- 6.1.8 All new NON-METALLIC buried public utility mains must have both locator (i.e. detector) tape and wire installed over and parallel to the pipe.
- 6.1.9 All New METTALIC buried public utility mains must have locator (i.e. detector) tape installed over and parallel to the pipe.
- 6.1.10 The required accuracy for utility Global Positioning System (GPS) coordinates will be within 1" to 3" of the actual locations. GPS coordinates are required on all as-built drawings at all manholes, valves, taps, appurtenances, and at no less than 50' intervals along all public mains.
- 6.1.11 Residential lots are to only have one (1) domestic water and one (1) wastewater tap unless written justification is provided to and accepted by The Utilities Director or their designee. The domestic water tap will also be used for irrigation.
- 6.1.12 Commercial lots are to only have one (1) domestic water, one (1) irrigation, and one (1) wastewater tap unless written justification is provided to and accepted by The Utilities Director or their designee. The domestic water and irrigation taps must be separately metered taps.
- 6.1.13 Domestic, irrigation, fire, and wastewater laterals as well as meters, vaults, and cleanouts must all be shown on construction drawing set submittals, including those for both building permits and subdivisions. Cleanouts are private, not public, and are required at building permit.

- 6.1.14 Underground public infrastructure such as water, wastewater, and storm drains must be designed and sized for the ultimate needs of the region they provide service to.
- 6.1.15 Adequate public facilities policy. The land proposed for subdivision must be served adequately by essential public facilities and services. Land will not be approved for platting unless and until adequate public facilities exist or provision has been made for water facilities, wastewater facilities, drainage facilities and transportation facilities in the manner required by Section 11 - 2-4, which are necessary to serve the development proposed, whether or not such facilities are to be located within the property being platted or off-site. This policy may be defined further and supplemented by other ordinances adopted by the City.
- 6.1.15.A Conformance to plans and regulations. Proposed public improvements will conform to and be properly related to the City's Capital Improvements Plan and to all requirements of these subdivision regulations.
- 6.1.15.B Utilities
- 6.1.15.B.i Accessible public water supply and wastewater facilities. Wastewater mains will be installed to serve all lots within the proposed subdivision and will be extended to the property to be platted in accordance with the water and wastewater extension provisions of Section 11-2-5(E) and (F), provided that water and wastewater mains are reasonably accessible.
- 6.1.15.B.ii Nonaccessible wastewater system. In a proposed subdivision where public wastewater facilities are not currently accessible but are expected to be extended to the property in the future, the subdivider will be required to install wastewater lines and a disposal system in accordance with specifications of the City health department pending access to wastewater facilities. Alternatively, the plat may be denied pending connection to such wastewater facilities system. Where connection to a public wastewater facilities system is not to be made immediately, final plat approval will be conditioned on approval of plans for future installation of a wastewater collection system to service each lot, and a development agreement will be executed in the manner provided in Section 11-2-4. Those parts of such system which will be in the portion of streets and alleys intended for vehicular traffic will be installed. All plans and construction will be subject to the approval of the Engineering and Development and Utilities Departments. In circumstances where the City health department has determined that there is sufficient area for each platted lot to permit installation of an individual disposal device in accordance with specifications of the department, and it is not anticipated that the wastewater main will be accessible in the foreseeable future, the City may permit the subdivider to install such individual disposal systems for each lot in the subdivision in lieu of future provision for connection to public wastewater facilities.
- 6.1.15.B.iii All subdivisions within any area of special flood hazard as defined in this Title, including manufactured home subdivisions and any containing or intended to contain a manufactured home park, will have public utilities and facilities such as wastewater, and water systems located and constructed to minimize or eliminate flood damage.

6.1.16 Odor Control Units – The Utilities Director or designee may require the installation of odor control units at force mains and lift stations. Odor control units must be designed in accordance with requirements as determined by the Utilities Director or designee and be compatible with existing odor control units within the City.

6.1.17 Inverted Siphons – Inverted siphons will not be allowed.

6.2 Design Flow

6.2.1 Wastewater Demand and Supply – Residential development submittals will include the total number of units and the total acres of the proposed development. Non-residential development submittals will include estimated wastewater use records showing the minimum hourly demand, maximum hourly demand, maximum daily demand, total building square footage, and the total acres for the proposed development. The projected maximum daily demand and maximum hourly demand will be calculated and shown in million gallons per day (MGD).

6.3 Pipe Sizing and Spacing

6.3.1 Wastewater Main Sizing – The wastewater main size will be determined by the Design Engineer and approved by the Utilities Director or designee. The sizing of the proposed wastewater main should consider future extensions to serve the entire wastewater collection basin. The Utilities Director or designee may require capacity calculations from the Developer to verify main sizing and adequate capacity prior to approval of the construction plans or building permits. Refer to the Engineer Design Manual for pipe sizes.

6.3.1.A Minimum and Maximum Velocity – Wastewater mains must obtain a minimum cleansing velocity of 2' per second (fps) with maximum design flows. Wastewater main maximum velocity will not exceed 10 fps when pipe is full.

6.3.1.B Minimum and Maximum Slopes – In accordance with the TCEQ requirements, maximum design flow velocity will be determined using the Manning's Equation.

6.3.1.B.i Manning's coefficient for design purposes will be $n=0.013$ for all sizing calculations regardless of pipe material.

Manning's Equation

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

Where:

- V = Velocity (fps)
- n = Manning's roughness coefficient ($n = 0.013$)
- R = Hydraulic radius of the conduit ($R = A/P$) (feet)
- A = Cross section flow area (square feet)
- P = Wetted perimeter (feet)
- S = Slope (feet per foot)

6.3.1.C Minimum and maximum slopes allowed for wastewater mains, per 30 TAC Chapter 217, are shown in Table 6-1. Increasing the main diameter to obtain a flatter slope will not be allowed unless the maximum design flows will fill the main greater than half-full.

Table 6-1. Minimum and Maximum Velocity and Slopes

Size of Main (Inches)	Minimum Slope (Percent)	Maximum Slope (Percent)
6	0.50	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.115	2.83
21	0.095	2.30
24	0.08	1.93
27	0.07	1.65
30	0.06	1.43
33	0.055	1.26
36	0.045	1.12
39	0.04	1.01
> 39	*	*

* For pipes larger than 39 inches in diameter, the slope is determined by Manning’s formula to maintain a velocity greater than 2.0 feet per second and less than 10.0 feet per second when flowing full.

- 6.3.2 Wastewater main pipes must be the same pipe size and laid with uniform slope from manhole to manhole.
- 6.3.3 The minimum size for wastewater main pipe is 6" in diameter.
- 6.3.4 Laterals connecting to public wastewater manholes must be at least 6" diameter and installed within the public Right-of-Way (ROW) to the same standards as a public wastewater main.
- 6.3.5 Wastewater service laterals are not to connect to 15" or larger wastewater mains unless there is no other option and written permission is first given by The Utilities Director or their designee. Such connections must be made at a wastewater manhole.
- 6.3.6 Unless the ultimate end of a public gravity main is known at the time of design, the public gravity main must be designed and built as deep as possible to ensure it can be extended as far as possible to support future development.
- 6.3.7 Whenever possible wastewater laterals are to connect to wastewater mains at 90° angles.

6.4 *Pipe Materials*

- 6.4.1 Pipe Materials – Pipe materials are to meet the requirements of the City’s *Standard Details and Standard Specifications* unless the design Engineer determines that the needs of the specific project exceed the typical City standards, in which case it is the responsibility of the Design Engineer to submit alternate pipe material specifications meeting the needs of the specific project to the Utilities Director for their designee for approval.
- 6.4.2 Wastewater main pipes must be the same pipe material and have straight alignment from manhole to manhole.

- 6.4.3 The minimum pipe wall thickness for wastewater mains deeper than 15' must meet or exceed SDR26 ASTM D3034 pipe. It is the responsibility of the design engineer to determine if a higher rated (thick wall) pipe than SDR26 ASTM D3034 is required for the conditions of a specific project.

6.5 Manholes

- 6.5.1 Manhole Locations – Manholes will be placed at all points of change in alignment, grade, size, pipe material, or inside diameter of the wastewater main. In addition, manholes will be placed at an intersection of two or more wastewater mains, at the end of the main (after the last service), and any locations required to provide accessibility for maintenance. Manholes will not be located within a residential driveway or access point. Manhole location should not be within the wheel path. Manhole rings and covers should be designed so they do not project into curb lines, sidewalks, retaining walls, guardrails, or other facilities sharing the same ROW or easement.
- 6.5.2 Manhole Spacing – Manhole are to have a maximum separation distance of 500'.
- 6.5.3 Manhole Sizing– In accordance with the City's *Standard Details*.
- 6.5.4 Drop Manholes – Drop Manholes will be installed if there is an incoming main with a vertical drop of more than 24" measured from flowline to flowline. New wastewater mains connecting no more than 24" above the flowline invert of a manhole don't have to provide a drop structure.
- 6.5.4.A Drop connections to new manholes will always be external drop connections. External drop connections to existing manholes are to be used unless a variance is approved by the Director of Utilities.
- 6.5.5 Vertical Drops Across Manholes - To maintain proper flow, manholes for all wastewater mains will be designed with a vertical drop matching the slope of the downstream pipe connected to the manhole.
- 6.5.6 Manhole Surface Elevation – The top of a manhole located within the 100-year floodplain will be required to have a minimum elevation of 1' above the ultimate 100-year water surface elevation and a watertight manhole cover. The tops of all other manholes will be set to the grade of adjacent land or paving. Manholes will have a concrete apron constructed at grade around all manholes in floodplain.
- 6.5.7 Manhole at the End of a Main – In accordance with 30 TAC Chapter 217, all wastewater mains that may be extended at a future date, and laterals, will end (highest point) with a manhole. The manhole should be placed after the last service.
- 6.5.8 Connection Spacing – To preserve the structural integrity of the manhole, all connections to manholes should provide a minimum 1' outside separation between wastewater mains/service lines entering a manhole. All residential service line connections to wastewater mains must maintain a minimum 5' separation from the outside edge of any manhole.
- 6.5.9 Manholes with Pipe of Different Sizes – In manholes with pipes of different sizes (diameters), the pipe inverts (flow lines) will be placed at the same elevation.

6.6 Cleanouts

6.6.1 Cleanouts are required at the property line for all residential lots tying into the public wastewater system. Cleanouts are to be constructed as part of the building permit by the property owner.

6.7 Wastewater Services

6.7.1 General – Wastewater services and service markers will be designed and constructed in accordance with the City Standard Details and Specifications.

6.7.2 Connections to a Manhole – Wastewater service laterals that connect to public manholes must be no less than 6" diameter and constructed in the public ROW, to the same standards as a public wastewater main.

6.7.3 Private Wastewater Services – Private wastewater service lines will be designed, permitted and inspected per the International Plumbing Code. Delineate on the construction plans which segments will be City maintained and which segments will be maintained by the private property owner.

6.7.4 Single-Family Residential Service Line Size – 4" minimum diameter service lines are required for all single-family residential services. Each residence will be served by an individual service.

6.8 Typical Layout

6.8.1 General – Refer to the City Standard Details for typical wastewater main, service line, appurtenance locations, and depths.

6.8.2 Horizontal Curves – Horizontal curves will be allowed as long as the curve does not exceed 50% of the manufacturers' recommendation for the pipe joint deflection. Manholes will be located at the point of curvature (PC) and point of tangency (PT) of horizontal curve. Vertical curves are not allowed. No bending of pipe is allowed.

6.8.3 Depth of Cover - The design engineer is responsible for ensuring that sufficient depth and grade is maintained for all wastewater mains to serve all necessary tracts and parcels upstream in the drainage area, and in accordance with the City's Standard Details and Standard Specifications. The minimum cover required at the end of a dead-end wastewater main is to be no less than 30", i.e. 2.5'.

6.8.4 A minimum vertical separation of 2.0' is to be maintained for all crossings with public utilities unless written approval for a variance is first obtained from The Utilities Director or their designee.

6.8.5 Wastewater lines will be located under water mains.

6.9 Separation of Wastewater Main from Water Mains

6.9.1 Minimum Separation of Wastewater Mains from Water Mains – Minimum horizontal and vertical clearances will be in accordance with TCEQ and City Standard Details.

6.9.2 TCEQ Requirements – When the minimum separation distance cannot be achieved, water mains and wastewater mains will be separated per TCEQ Rules and Regulations and City's Standard Details. Refer to the following:

6.9.2.A 30 TAC Chapter 290 – Public Drinking Water Subchapter D: Rules and Regulations for Public Water Systems; and,

6.9.2.B 30 TAC Chapter 217 – Design Criteria for Domestic Wastewater Systems Subchapter C: Conventional Collection Systems.

6.10 *Trenching and Bedding*

- 6.10.1 General – Refer to the City Standard Details for typical wastewater main pipe embedment requirements.
- 6.10.2 Trench walls for new utilities must maintain at least 2' horizontal separation from existing utility trench walls.

6.11 *Removal for Abandonment of Wastewater Infrastructure*

- 6.11.1 General – Any existing wastewater main, manholes, service laterals, or other infrastructure that are to be replaced within the City will be removed unless approved by the Utilities Director or designee.
- 6.11.2 Removal of Existing Wastewater Mains and Laterals – All existing wastewater mains and laterals that are to be removed are to be removed in their entirety. Any existing wastewater mains that dead-end as a result of the existing wastewater main being removed are to be plugged. Any existing infrastructure the removed wastewater main or lateral connected to that will remain is to be replaced or repaired as need to City standards.
- 6.11.3 Abandonment of Existing Wastewater Mains and Laterals – All existing wastewater mains and laterals that are to be abandoned are to be abandoned in place, filled with flowable fill 2-sack (2-sack = 188 lbs Portland Cement / cubic yards of concrete), and plugged. Any existing wastewater mains that dead-end as a result of the existing wastewater main being removed are to be plugged. Any existing infrastructure that abandoned wastewater main or lateral connected to that will remain is to be replaced or repaired as needed to City standards.
- 6.11.4 Removal of Existing Wastewater Manholes – All exiting wastewater manholes that are to be removed are to be removed in their entirety. Any existing infrastructure the removed wastewater manholes connected to that will remain is to be replaced and repaired as needed to City standards.
- 6.11.5 Abandonment of Existing Wastewater Manholes – Existing wastewater manholes are never to be abandoned in place, only removed.

6.12 *Easements*

- 6.12.1 Utility Easements – See Section 1, Sub-Section 1.12 of the Engineering Design Manual for easement information. Utility easements are required for all public utilities as follows.

6.13 *Trenchless Requirements*

- 6.13.1 Design Requirements – Engineers are to design all trenchless utility installations, rehabilitations, replacements, etc., including all pipe-bursting, slip lining, cured-in-place, tunneling, jacking, boring, etc. in compliance with all applicable standards and requirements, including City's *Standard Details* and *Standards Specifications*. The design and specification submittal requirements for trenchless installations, rehabilitations, and replacements are the same as for open trench design submittal, including plan and profile sheets, design for boring and receiving pits, etc.

- 6.13.2 Trenchless Installation for New Pipe – Trenchless installations for new pipe are to only be utilized for straight pipe alignments with no horizontal or vertical deviations. When crossing a ROW, easement, street, utility, etc. the crossing is to be as close as possible to ninety degrees (90).
 - 6.13.3 Trenchless Replacement or Rehabilitation of Existing Pipe – Trenchless replacement or rehabilitation of existing pipe are to match the existing pipe alignment.
 - 6.13.4 Boring and Receiving Pits – Whenever possible boring and receiving pits are to be located behind the back-of-curb or, where curb does not exist, behind the edge-of-pavement. Additional setback distances may be required for public and construction crew safety as well as to maintain the integrity of any existing street or alley being crossed.
 - 6.13.5 Trenchless Casing Pipe – Casing pipe is required for all trenchless installations for new pipe installed by tunneling, jacking, or boring per the City's Standard Details.
- 6.14 *Wastewater Lift Stations*
- 6.14.1 It is the intent of the City to provide wastewater service by main extensions. In the rare occasion that a wastewater main extension is not a feasible service alternative, the City may require design and construction of a lift station and force main to serve a development. Lift stations and force mains are discouraged due to their higher risk of causing a wastewater overflow and increased maintenance costs. If service by a gravity wastewater main and all other design alternatives have been evaluated and determined to be unfeasible by the Utilities Director or designee, lift stations and force mains will be designed with the criteria described in the following sections.
 - 6.14.2 Design Considerations – Lift stations and force mains must be designed in accordance with TCEQ requirements and requirements as determined by the Utilities Director or designee. The following will be considered in the design of a lift station:
 - 6.14.2.A Site selection;
 - 6.14.2.B Wet well and valve vault design;
 - 6.14.2.C Pumps, lift station piping, and valves;
 - 6.14.2.D Force mains;
 - 6.14.2.E Electrical requirements; and,
 - 6.14.2.F Emergency provisions.
 - 6.14.3 Emergency Provisions – In accordance with 30 TAC Chapter 217, a lift station must include an audiovisual alarm system. The audiovisual alarm system must transmit alarm conditions through use of an auto-dialer system, or telemetering system connected to a continuously monitored location. At a minimum, the alarm system must automatically activate to give warnings for power outages, pump failures, and high-water levels. Audiovisual alarms are not required if the SCADA system alerts the operator about communication loss, in addition to the alarm conditions.
 - 6.14.4 All pipes used within lift stations are to be true-flanged pipe. Flanged fittings will not be accepted as an alternative.

- 6.14.5 Any public lift station must include a concrete pad at the lift station, an asphalt or concrete paved vehicle access path to the lift station, and a security fence and gate around the lift station. All lift stations must come with a water spigot.
- 6.14.6 List station concrete pad must be located minimum 1' above either the Base Flood Elevation (BFE) or the 100-year storm event, whichever has the higher elevation.

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