

DIVISION 4 - SANITARY SEWER DESIGN REQUIREMENTS

- 4.1 General**
- 4.2 Sewer Design and Materials**
- 4.3 Location of Sanitary Sewers**
- 4.4 Design Requirements**
- 4.5 Appurtenances**
- 4.6 Service Connections**
- 4.7 Non-sewered Building Site**

4.1 General

- 4.1.1 Sanitary sewers within the City of Webster jurisdiction shall allow for orderly expansion of the system and shall conform with the comprehensive water and sewer plan for the City of Webster.
- 4.1.2 Sewers shall be sized based on the minimum requirements set out in this standard and the standard wastewater flow rates as established by the City of Webster.
- 4.1.3 All sewers shall conform to the minimum requirements of the Texas Department of Health, "Design Criteria for Sewerage Systems".
- 4.1.4 Sewers shall be separated from water lines by a minimum of nine feet (9'). Where the minimum separation is not maintained, refer to Section 3.4 for allowable clearances. Sewers crossing utilities other than water, a minimum of six inches (6") of clearance must be maintained.
- 4.1.5 The public sanitary sewer, as maintained by the City of Webster, shall be defined as all sewers, including stacks and service leads that serve more than one sewer connection, that are located in public easements or street rights-of-way, and that are installed in accordance with these Standards.
- 4.1.6 Design shall conform to the City of Webster Construction Details.

4.2 Sewer Design and Materials

- 4.2.1 Minimum design criteria for determining the size of a sewer shall be as follows:
 - A. Wastewater flows shall be based on the current, approved utility phasing plan for the area. The average day flow for the design of sanitary sewers shall be based on a minimum set by the plan in gallons per day per single family connection for residential areas. Commercial, industrial, and office areas shall be designed for an average daily flow that can be anticipated from the contributing area.
 - B. The peak design flow for sewers shall be four (4) times the average day flow of the fully developed service area. Sewers larger than eighteen-inch (18") may be sized using a peaking

factor of less than four (4) with approval of the Public Works and Engineering Department. The minimum allowable values for the design peak factor are presented in Appendix C of these Standards.

- C. Minimum size public sewer shall be eight-inch (8").
- D. Minimum size sewer service lead shall be six-inch (6") and shall not serve more than two (2) residential services.
- E. Commercial sewer service lead shall be six-inch (6") pipe or larger and shall not serve more than one (1) commercial connection. Specific approval shall be required for lines less than six inches (6").

4.2.2 Sewers will be constructed of materials approved by the Public Works and Engineering Department.

4.2.3 Cement Stabilized Sand for Bedding and Backfill:

- A. Portland Cement, Type I, ASTM C150.
- B. Clean, durable sand, with less than 0.5 percent clay lumps, ASTM C142; with less than 0.5 percent lightweight pieces, ASTM C123; with organic impurities, ASTM C40, not showing a color darker than standard color and a plasticity index of less than six (6) when tested in accordance with ASTM D423 and ASTM D424.
- C. Compact to ninety-five percent (95%) Standard Proctor Density (ASTM D2922-78 and ASTM D3017-78) in lifts of eight inches (8") thick. Actual testing may be required as deemed necessary by the Public Works and Engineering Department.
- D. The cement-sand mixture shall consist of at least one and one-half (1-1/2) sacks of cement per cubic yard of sand. The cement-sand mixture shall have a minimum unconfined compressive strength of one hundred pounds per square inch (100 psi) in forty-eight (48) hours, when compacted to ninety-five percent (95%) of Standard Proctor Density (ASTM D2922-78 and ASTM D3017-78), without additional moisture control, cured and tested in accordance with ASTM C31

4.3 Location of Sanitary Sewers

4.3.1 Street Right-of-Way

Sanitary sewers with a maximum depth of ten feet (10'), measured from finished grade, shall be placed within the right-of-way at least five feet (5') from the right-of-way line, except as provided herein. All sewers that are deeper than ten feet (10') shall be centered in an exclusive easement parallel and adjoining the right-of-way or as required by Public Works and Engineering Department. Where required in accordance with Section 2.4.5, additional easement shall be provided adjoining the right-of-way to provide required clearances.

4.3.2 Easements

- A. Sanitary sewers placed in easements shall conform to the requirements of Section 2.4.5.
- B. The maximum depth of sewer in a rear yard public utility easement shall be eight feet (8'). All sanitary sewers in easements shall conform to the requirements in Section 2.4.5.

4.4 Design Requirements

4.4.1 Allowable Depths

Sewers shall be designed to meet or exceed the pipe manufacturer's recommendations for depth.

4.4.2 Minimum depth of a sewer shall be four feet (4') below finished grade or top of curb, whichever is lower.

4.4.3 Sewer bedding will be cement stabilized sand, as required in Section 4.2.3, or approved granular material. Bedding shall be compacted to ninety-five percent (95%) Standard Proctor Density to the spring line on sewer lines shallower than eight feet (8') and six inches (6") over pipe for sewer lines eight feet (8') deep and greater, prior to backfilling the trench. In water bearing sand, washed shell or other approved granular material will be required. Black poly wrap will be required for water bearing soil as shown in the City of Webster Construction Details. When water-bearing sands are encountered, the City of Webster shall be notified immediately.

4.4.4 A mandrel test shall be performed prior to acceptance of all installed P.V.C. pipe. The initial mandrel test shall be performed thirty (30) days after the trench has been backfilled. The mandrel must move freely inside the pipe and will be pulled by hand from the upstream end of the pipe to the downstream end. Test equipment shall conform to the requirements set out in Appendix D. A second mandrel test, after settlement has occurred, may be required by the Public Works and Engineering Department to determine long term deflections. Deflections in P.V.C. pipe shall not exceed five percent (5%).

4.4.5 Hydraulic Requirements

- A. Design velocity in a gravity sewer flowing full shall be a minimum of two feet (2') per second. Where sewers are anticipated to flow less than one-half full, consideration should be given to increasing the slope of sewer to provide two feet (2') per second velocity in the pipe for the anticipated flow rate.

B. Minimum acceptable slopes in sewers shall be:

Size of Pipe (Inches)	Fall in Feet <u>Per 100 Feet of Sewer</u>
6	0.5
8	0.40
10	0.25
12	0.20
15	0.15
18	0.11
21	0.09
24	0.08

C. Sewers are to be designed so that the crowns of the pipes are matched at manholes. The upstream sewer may be designed so that the flow line of the upstream sewer is higher than the flow line of the downstream sewer. When the flow line of the upstream sewer is raised more than three feet (3') above the flow line of the downstream sewer, a drop manhole connection is required, except as specifically approved by the City Engineer.

D. Sanitary sewer service leads shall be laid at seven-tenths percent (0.7%) slope.

4.4.6 Alignment

A. Sewers should be laid in a straight alignment, where possible. Curved sewers may be allowed with specific approval of the City Engineer.

4.5 Appurtenances

4.5.1 Manholes

A. Manholes should be placed at points of changes in alignment (except along a curved sewer), grade, or size of sewers, at the intersection of sewers and at the end of all sewers. Clean-outs will not be permitted on public lines.

- B. Manholes should be spaced at a maximum distance of four hundred feet (400') apart.
- C. Manholes at the end of sewers in rear lot easements should be placed in street rights-of-way.
- D. Sewers laid in easements shall have a manhole in each street crossing.
- E. Manholes should be located to eliminate the inflow of storm water into the sanitary sewer. The top of manhole rim elevation shall be shown on the plans for all sanitary manholes, except in the paved area. Sealed manholes may be permitted, within the 100-year flood plain, when specifically approved by the City Engineer.
- F. Manholes shall be constructed in accordance with the City of Webster Construction Details.
- G. A drop manhole should be constructed for any sewer twelve-inch (12") diameter or less that enters a manhole of greater than thirty-six inches (36") above the invert of the manhole. Sewers larger than twelve inches (12") shall be designed to accommodate a drop at the manhole using standard pipefittings.
- H. Steps in manholes will not be permitted.
- I. Manhole covers shall be cast iron, traffic bearing type ring and cover with the words "City of Webster - Sanitary Sewer" cast into the cover.
- J. All manhole adjustments shall be made with pre-cast concrete rings.

4.5.2 Stacks

Stacks shall be constructed for connections to sewers that are more than eight feet (8') below finished grade. Stacks shall be provided during the initial construction of the sewer.

4.5.3 Lift Stations

Lift stations shall be designed in conformance with the "Texas Department of Health Design Criteria for Sewerage Systems". Lift stations should be considered only when a gravity system cannot be achieved. All lift stations shall be specifically approved by the City Engineer. The Design Engineer shall provide design requirements and pertinent data with construction plans for review. A preliminary design meeting is recommended. Lift stations shall be designed as follows:

- A. Pumps shall be sized to operate at optimum efficiency. Minimum acceptable efficiency at the operating point will be sixty percent (60%), unless specifically approved by City Engineer.

- B. Operation and maintenance should be considered in the design of the station and the location of the station.
- C. Wet well working volume should be sized to allow for the recommended pump cycle time of six (6) minutes for each pump.
- D. Controls and equipment shall be approved by the City Engineer. Pumps shall be manufactured by Gorman Rupp or equal. Pump controls shall be from a manufacturer approved by City Engineer.
- E. Emergency operations should be considered. Provide fittings and a blind flange that will be readily accessible for emergency bypass pumping. Back up power generators must be included with the lift station sized to operate all pumps and controls.
- F. All new lift stations shall have a means of emergency back up operation, i.e. diesel powered generators or pumps.

4.6 Service Connections

- 4.6.1 Sewer service leads shall not exceed one hundred feet (100') in length. Near side double sewer service leads shall not exceed five feet (5') in length and shall be located within a public right-of-way or easement.
- 4.6.2 Single-Family Residential Lots
 - A. Far side service connections shall be installed at the time of construction of the sewer. Double sewer service leads shall be located within a public right-of-way or easement.
 - B. Service connections shall be constructed of materials as described in Section 4.2.2.
 - C. Service connections should be installed at a manhole, when possible.
- 4.6.3 Multi-Family Residential, Commercial, and Office Development
 - A. Service connections shall be made at a manhole. Long service connections should be installed at the time of construction of the sewer.
 - B. Service connections shall be constructed of materials as described in Section 4.2.2.
- 4.6.4 Service Connections at Manholes
 - A. When a service connection stub-out is not provided, an opening shall be neatly cut out of the manhole at the required elevation. The service connection shall be extended into the manhole.
 - B. Service connection at a concrete manhole shall be grouted in place using non-shrink grout, Fosroc Preco-Patch, or equal.

When a hole for a service connection in a brick manhole exceeds eighteen inches (18"), the manhole shall be rebuilt above the disturbed area.

- C. Service connections at fiberglass manholes shall be drilled, uniformly, through the manhole wall. A neoprene gasket shall be installed around the pipe to provide a water-tight seal through the wall. Where required, fiberglass mat and resin shall be used, in accordance with the manufacturer's recommendations, to repair wall openings.
- D. Service connections entering a manhole three feet (3') or more above the flow line of the manhole shall include a drop pipe with fittings outside the manhole. The drop shall be installed adjoining and anchored to the wall of the manhole, unless specifically approved otherwise.

4.6.5 Provide adequate markings on site and accurate as built locations, so that the service connection stub-out can be recovered at the time that the connection to the service is made.

4.6.6 All connections to the public sewer system shall be approved by the City Engineer prior to construction. Actual connections to the public sewer system shall be inspected by a representative of the Public Works Department.

4.6.7 Service connections that are installed after initial construction of a sewer shall be constructed using a P.V.C. saddle with gasket and stainless steel straps as approved by the Public Works and Engineering Department.

4.7 Non-sewered Building Site

Sanitary sewer shall be extended to all building sites prior to development. Septic systems are not allowed, except as specifically approved by the City Engineer.