

TECHNICAL SPECIFICATIONS

ITEM 4

SEWER SYSTEM

1. General: This item includes the construction of both gravity sewers and force mains. Insofar as possible sewer systems shall consist of gravity lines and the use of lift stations and force mains shall be avoided. Design of sewer systems shall conform to the requirements of the Texas Department of Health. Design Criteria for Sewer Systems Construction shall conform to the requirements of these specifications. The Developer shall provide with his plat plans and profiles for review of all sewer line work proposed and shall construct the sewer system in accordance with the approved plans.
2. Alignment and Grades: Sewers shall be laid in straight alignment where possible and a uniform grade between manholes where possible. Where horizontal curves are required, curves may be made not to exceed the maximum allowable for type of joint and size of pipe as recommended by the manufacturer of the pipe. The pipe will bend without using extra fittings (45's, 90's). If fittings have to be used a manhole must be placed for access. All lines shall be located a minimum of nine (9) feet horizontally from water lines, and where sewers cross water lines, they shall be constructed of pressure pipe for a distance of nine (9) feet on either side of the water line. Crossings shall be under water lines where possible. Minimum grades, as per Texas Department of Health requirements shall be:

Pipe I.D. in Inches	Fall in Feet Per 100 Ft.
6"	0.50
8"	0.33
10"	0.25
12"	0.20
15"	0.15
18"	0.11

3. Materials:
 - A. Gravity Pipe: Gravity sewer pipe shall be one of the following materials. All gravity sewer pipe shall be so manufactured that the completed sewer shall have a maximum infiltration or exfiltration of two hundred (200) gallons per inch of internal diameter, per mile of pipe, per twenty-four (24) hours, where the maximum hydrostatic head at the center line of the pipe does not exceed twenty-five (25) feet.
 - (1) SDR 26-P.V.C. Gravity Sewer Pipe: PVC sewer pipe and fittings shall conform to the requirements of current ASTM Specification D- 3034-SDR 26, and shall be equipped with joints meeting the requirements of current ASTM Specification D-3212.
 - (2) Ultra-Rib P.V.C. Gravity Sewer Pipe: Ultra-Rib sewer pipe shall conform to ASTM F 79 and Uni-Bell Specification UNI-B-9 when pipe is approved for use by City Engineer.
 - B. Pressure Pipe for force mains and water line crossings shall be:

- (1) Cast Iron Pipe and fittings shall conform to the requirements for Class 150 pipe for water lines as specified under Item 3, Water System Specifications.
 - (2) PVC Pressure Pipe and fittings shall be Class 160, SDR 26, pipe conforming to ASTM Designations D1784 and D2241.
- C. Concrete shall conform to the requirements of Item 2, Concrete, of these specifications.
- D. Manholes shall be forty-eight (48) inch inside diameter reinforced concrete, precast or monolithic cast-in-place, or when so approved, may be preformed fiberglass.
- (1) Precast Concrete manholes shall consist of precast riser, concentric cones, and grade rings supported on a cast-in-place concrete base. For water containment construction, precast reinforced concrete manhole sections shall be of the bell and spigot or tongue and groove design meeting the requirements of ASTM C-478, having a wall thickness equal to that of ASTM C-76 wall "B", using a trapped type preformed O-Ring rubber gasket conforming to the requirements of ASTM C-443. Risers shall be in standard lengths of one (1) through six (6) feet in increments of one (1) foot. Manhole steps shall be installed by the pipe manufacturer where attention shall be given to a safe structural tie. Vertical center line of steps shall be marked on the outside of each manhole section.
 - (2) Monolithic Manholes: Monolithic concrete manholes shall be poured on the job site in forms as approved by the Engineer. These manholes shall be poured from Class "F" (4000#) concrete to provide a formed wall thickness of at least six (6) inches.
 - (3) Fiberglass Manholes shall consist of a preformed riser with an integral cone supported on a reinforced cast-in-place concrete base. They shall be manufactured in accordance with ASTM Specification X-23.2.10 or the latest draft thereof, and shall be designed for H-20 wheel load.
- E. Manhole Frames and Covers: Grey iron manhole frames and covers shall be McKinley Iron Works, Type No. A24AM, Neenah Type B, No. 1415, or approved equal. Covers shall be provided with pick slots for those manholes equipped with twenty-four (24) inch diameter cover. The word "Sewer" shall be cast in each cover.
- F. Non-Metal Manhole Steps: Non-metal steps shall be of solid glass fiber or other non-corrosive manhole steps. Only non-metallic manhole steps will be used in sanitary sewer manholes.
- G. Cleanouts: Cleanouts shall be standard castings with covers, Bass and Hays Pattern No. 339, McKinley Iron Works, Type SC2, or an approved equal.
4. Excavation, Trenching and Backfilling shall conform to the requirements of Item 1 of these specifications.
5. Pipe Laying: All pipe shall be lowered into the trench by suitable mechanical equipment; no pipe shall be rolled or dumped into the trench. All dirt and trash shall be removed from the pipe while suspended. Previous to being lowered into the trench, each pipe shall be carefully inspected, and those not meeting specifications shall be rejected, and either destroyed or removed from the job. All pipe shall be laid to the line and grade shown on the plans.
- A. The pipe and specials shall be so laid in the trench that after the project is completed, the interior surface

shall conform accurately to the grade and alignment indicated on the plans. All pipe shall be carefully adjusted to fit snugly in cradling or embedment so that the entire length bears on cradling or embedment materials. Pipe shall be laid with the bell (or groove) end upgrade, unless otherwise approved by the Engineer.

- B. Before laying, the interior of the bell shall be carefully wiped smooth and clean and the annular space shall be kept free from dirt, stones, or water. All water must be kept out of the bell-hole during laying.
 - C. Pipe shall be installed and joints made up in complete conformance with the instructions and recommendations regarding proper installation and assembly furnished by the manufacturer.
 - D. Pipe shall be installed in accordance with the most current revision of ASTM Specification D-2321, "Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe", available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103. In addition, written recommendations of the pipe manufacturer shall be followed, where these recommendations do not conflict with ASTM D-2321.
 - E. When work is suspended on the line for any reason, the end of the line shall be properly plugged to prevent water, trash, dirt, or rodents from entering.
6. Service Connections: Unless otherwise shown or approved by the City Engineer, a sewer service connection shall be installed to serve each lot in the area served by the sewer main.

Standard sewer service connections shall be installed in trenches down to twelve (12) feet deep, and deep-cut service connections shall be installed in trenches greater than twelve (12) feet deep. Installation of sewer service connections will consist of such wyes, bends, etc., as may be required by the Standard Details. The four (4) inch tap on main for service line shall be a ninety (90) degree "T" or wye laid with the line, or it shall be made on pipe in place by installing a tapping saddle on the pipe over a four (4) inch hole cut in the pipe. Pipe saddles shall be completely encased in concrete. Wyes, forty-five (45) degree tapping saddle with direction of flow. No taps in manhole unless approved.

Service lines shall extend from the sanitary sewer lateral in the street to a point at least two (2) feet behind the curb, unless otherwise shown.

The end of the services shall be plugged with a precast plug or other suitable means, meeting the approval of the Engineer. The curb shall be marked by an imprinted letter "S", three (3) inches in height, at the point where the service pipe passes under the curb.

All completed service lines must have a clean-out.

7. Manhole Construction: Sewer line manholes shall be constructed in accordance with the plans, specifications, and standard details and approval of the Engineer. They shall be provided with cast iron manhole ring and covers. Noncorrosive manhole steps shall be installed as shown on the plans or as directed by the Engineer.

Sewer pipe shall be laid through the manhole where possible, prior to concreting floor slab, so that full depth of pipe is embedded in concrete to form the flow channel. Where pipe cannot be used through manholes due to direction of flow, the flow channel to top of pipe shall be formed with concrete and troweled with a steel

trowel to a smooth even finish. The slab shall be sloped one (1) inch per foot to flow channel and troweled to a smooth even finish. After concrete has set, the top half of the pipe between the walls of the manhole shall be broken out and the edges pointed up.

- A. Cast-In-Place Manholes: The walls and base of cast-in-place manholes shall be poured monolithically. The earthen pit shall be widened and deepened at the bottom to allow a sufficient spread of base concrete matching the dimensions shown on the detail in the plans. The walls shall be constructed using form sections which can be disconnected and removed both inside and outside after the concrete has cured.

Precast cover grade rings shall be used to bring the manhole to finish grade. The grade rings and cast iron frame and cover shall be mortared around the outside flush with the outside wall of the cast-in-place section.

- B. Precast Manholes: The Class "B" concrete base shall be poured around the sewer pipe to the shape and dimensions shown on the plans. The first section of reinforced precast concrete pipe shall be set on the base and grouted in place. The required sections of precast pipe shall be placed to bring the manhole up to grade. Precast pipe joints shall be "O" ring. The last section of precast pipe shall be a concentric manhole ring. Precast concrete grade rings shall be used to bring the manhole to finished grade. The grade rings and cast iron frame and cover shall be mortared around the outside flush with the outside wall of the precast manhole cone.
- C. Fiberglass Manholes shall be installed in accordance with the manufacturer's recommended procedures as found in Owens-Corning Fiberglass Publication No. 5-PS-6455-C, "Fiberglass Flowtite Manholes".
- D. Drop Manholes: Drop manholes shall be constructed with cast iron pipe drops in locations as shown and as shown in the standard details.

8. Connection to Existing Lines: Where possible, connection to an existing line shall be made without interruption of flow of sewage in the existing line.
9. Bypassing of Sewage: Sewage shall not be bypassed from existing lines unless absolutely necessary. Before any sewage may be bypassed from an existing sanitary sewer to accomplish any of the work required on the project, written permission to make such bypass must be obtained from the City's Engineer. A request for permission to effect such bypass shall be made in writing at least two (2) days prior to the time needed. The request shall contain full details as to the manner in which bypassing is to be accomplished, and the minimum and maximum time bypass is to remain in service. In general, bypassing will not be approved unless it is absolutely essential to accomplish the work, and all costs incurred by the City in taking proper health and sanitation precautions as a result of an approved bypass shall be paid by the Contractor.
10. Testing: All PVC sewer pipe shall be tested for deflection. The deflection test for PVC sewer pipe shall consist of passing a prefabricated plug designed for deflection testing through the pipe a minimum of seven (7) days and no later than one (1) year after installation. The prefabricated plug shall have an outside diameter of ninety-five (95) per cent of the inside diameter of the pipe being tested. If during the test, the plug hangs and cannot be pulled completely through a section of the sewer line between two (2) access points, i.e., two (2) manholes, or a manhole and a cleanout, all or a part of that section of pipe shall, at the discretion of the Engineer, be removed and replaced. A deflection test shall be performed on the replaced section of pipe in the prescribed time range as stated above. A completed section of sewer line will not be

accepted until it has passed the deflection test.

When, in the opinion of the City Engineer, an excessive amount of infiltration, or leakage, is indicated in a newly installed line prior to acceptance, an exfiltration test may be required to be performed by the Contractor. This test may be performed by either of the following methods:

- A. This method may be used in lieu of B. The influents to the manholes at the upper and lower ends of the new line shall be plugged with an inflatable rubber pipe stopper. The line shall be filled by introducing water into the manhole and filling it to ground level.

After the water has remained in the line twenty-four (24) hours, the water level is again brought up to ground elevation. After one (1) hour the water level is measured from the starting point and the quantity of leakage computed.

- B. This method may be used in lieu of A. The effluents to the manhole at the upper end of the new line and the influent to the manhole at the lower end of the line shall be plugged with a plumber's plug. The plug at the upper end of the new line shall be watertight and shall be so constructed as to permit the introduction of water into the sewer through a hose. The end of the hose shall be connected to a barrel which will permit variation of the hydrostatic pressure by elevating the barrel. The line shall be filled by introducing water through the hose until the line and barrel are full. After the water has remained in the line twenty-four (24) hours, the water level is again brought up to ground elevation. After one (1) hour the water level is measured from the starting point and the quantity of leakage computed. Any line, or segment of line which has exfiltration in excess of two hundred (200) gallons per inch of internal diameter, per mile of pipe, per twenty-four (24) hours, where the maximum hydrostatic head at the center line of the pipe does not exceed twenty-five (25) feet will not be considered to be acceptable.