

SECTION VI

SANITARY SEWERS

VI-1. DESIGN GUIDELINES

Sewer collection lines and appurtenant structures within the jurisdiction of City of Paso Robles shall be constructed in accordance with plans prepared by a Professional Civil Engineer, consistent with these specifications and as approved by the City Engineer.

A. Design Flow

Typically, the minimum size sewer pipe shall be not less than 8 inches inside diameter. Six inch diameter pipe may be used on terminal branch lines, less than 200 feet in length. An average flow of 100 gallons per person per day for residential developments shall be used for design purposes, with the peak flow double the average flow. Pipes shall be sized to handle peak flows with pipe flowing half full.

Sizing of pipes shall include consideration of the ultimate upstream development in accordance with density established in the Land Use Element of the General Plan, the City Sewer Master Plan or as determined by the City Engineer.

B. Gradient

The following table indicates the minimum slopes acceptable for the design of sewer lines in the City of Paso Robles. Lesser slopes may be approved by the City Engineer where topographic features preclude the use of the table below (It is not acceptable practice to increase pipe sizes for the purpose of reducing the slope criteria to meet minimum standards without regard to the volume of flow. See minimum flow rates below).

<u>Diameter</u>	<u>Slope in Feet/Foot (Minimum Acceptable)</u>
6"	.0100
8"	.0050
10"	.0025
12"	.0020

Special provisions for erosion protection shall be provided where design velocities for sanitary sewer pipelines exceed ten feet per second. Where sufficient flow exists, design velocities should exceed two feet per second. The maximum design discharge rate shall not exceed the critical flow rate. Sanitary sewer pipe should not be designed for flow conditions at critical slope and velocity.

C. Location

All sanitary sewer mains shall be located in public streets. In new streets the sewer main shall be typically located six feet south or east of the centerline of the right-of-way. Where a public road is not available a sewer main may be located in an easement specifically dedicated to the City for the purposes of construction, operation and maintenance of a sanitary sewer main. The minimum width of the easement shall be 20 feet. A minimum 12-foot wide all weather aggregate base access road must be provided in the easement.

No sanitary sewer shall be located within fifty feet of a City water well.

Where sewer mains are constructed in close proximity to water mains the design of these lines shall conform to special construction requirements as outlined by the State Department of Health Services in their "Criteria for the Separation of Water Mains and Sanitary Sewers". This design criteria is outlined on **City Standard Detail F-6**.

D. Alignment

Sewer pipelines shall typically be designed in straight alignments between manholes. Curved sewer lines will be allowed where the minimum radius conforms to the pipe manufacturers recommendations. In no case shall the radius be less than 240 feet.

The alignment between any two manholes may consist of one curve and one tangent section. A manhole must be placed at the beginning or end of any curve. Reverse curves are not allowed between manholes.

E. Depth

The minimum design depth of a sanitary sewer system shall be six feet. It is desirable to obtain a cover of 48 inches for the service lateral at the property line. Under topographic constraints, lesser depths may be approved by the City Engineer.

F. Manholes

Maximum spacing for manholes shall be 500 feet. Manholes shall be designed and constructed in accordance with **Standard Detail F-1**.

Drop manholes may be constructed in accordance with **Standard Detail F-2** where the vertical distance between incoming and discharge sides of the manhole exceeds 24 inches.

G. Sewer Clean-out

A clean-out may be used in lieu of a manhole on any branch line with a length of 200 feet or less. Any branch line more than 200 feet in length shall have a manhole at the end.

H. Private Laterals

Each private property shall have its own separate and distinct sanitary sewer lateral connection to the City main. All sewer laterals must be connected downstream of a sewer manhole or sewer clean-out. In no case shall a sewer lateral be connected directly to a sewer manhole.

In all new subdivision work, the house service laterals from the sewer to the property line shall be installed at the time the sewer is constructed. Each house service line shall be referenced to the plan stationing. The lateral shall be placed a minimum of five feet from any property line and from any water service.

The minimum size of a lateral shall be four inches (4") inside diameter. Laterals larger than four inches shall be sized in accordance with Uniform Plumbing Code requirements. Commercial laterals shall be a minimum of six inches (6") inside diameter. Laterals greater than six inches shall be connected to the main with a manhole.

VI-2. MATERIALS

A. Pipe

All sanitary sewer PVC pipe must meet ASTM Standard 3034/SDR 35. Pipe used in construction of force mains shall be PVC Class 150 C900. Tracer wire shall be included with force main pipe.

B. Manholes

Manholes shall be watertight structures constructed by placing precast concrete sections on a pre-cast concrete base.

Where sewer mains are 12-inch diameter or larger, the inside wall of the manhole must be lined with a minimum 125 mils of Type B Polyurethane coating (Sancon 100 or approved equal).

VI-3. CONSTRUCTION GUIDELINES

A. Excavation for Sewers

Unless otherwise specified, the excavation for sewer pipe shall be an open trench, excavated to six inches below the bottom of the pipe. This undercutting shall be refilled with suitable bedding material.

Whenever the bottom of the trench is soft, yielding, or unsuitable as a foundation for the pipe, sufficient crushed rock or coarse, clean gravel shall be rammed into the soft material until, in the opinion of the observing Geotechnical Engineer a suitable condition is achieved. If such treatment does not provide a proper foundation, the unsuitable material shall be removed to a depth determined by the Geotechnical Engineer.

When water is encountered, the trench shall be kept dewatered until the laying and jointing of the pipe, and placing of the bedding material has been completed and observed by the City inspector. The Contractor shall place not less than six inches of 2-1/2" maximum size rock below the required bedding material, or otherwise dewater the trench in a manner which has received prior approval of the Engineer.

Temporary covers of 3/8" steel plate of sufficient size to adequately cover the opening shall be placed on manhole cones until the pavement is completed. Ribs shall be welded to the underside of the cover to hold it in place during the grading and paving operations.

The total depth of the manhole throat measured from the top of the frame shall not exceed 18 inches. Manhole frames and lids shall be placed a minimum of 12" above natural ground or high water when placed in easements outside of un-paved areas.

B. Safety

All work shall be performed in accordance with the requirements of the State of California Division of Industrial Safety.

The Contractor shall conform to the permit requirements of the Division of Industrial Safety and shall obtain a trenching permit directly from said State Office prior to such activity.

The Contractor's attention is directed to the provisions of the State Labor Code concerning trench excavation safety plans. (Note: Contractors are hereby advised that the independent monitoring regulations of OSHA, as enforced by CAL OSHA officers, is to be complied with at all times).

C. Bracing and Shoring

As required by the "Trench Construction Safety Orders" of the California State Industrial Accident Commission, sufficient bracing, shoring and access equipment shall be installed in trenches to insure the safety of workmen, and to protect and facilitate the work. Where practical, all such bracing and shoring shall be removed from the trench as the backfilling proceeds.

D. Laying of Sewer Pipe

Pipe shall be laid in conformity to the lines and grades established on the approved plans. Pipe shall be laid continuously upgrade with the bell of the pipe forward. Each length of pipe shall be laid on a firm bed and shall have a true bearing for the entire length. No wedging or blocking up of the pipe will be permitted.

Both bell and spigot shall be clean and lubricated before the joint is made. Care shall be taken that nothing but the joint-making material enters the joints. At the end of each work day the end of the pipe must be sealed to preclude infiltration of water, dirt or debris.

E. Trench Backfill

Bedding material meeting the minimum standards listed below, shall be deposited and compacted to 90% relative compaction in the trench uniformly on both sides of the pipe for the full width of the trench and to a depth of 12 inches over the top of the pipe (**Standard Detail U-2**).

Sand Equivalent 20

<u>Sieve Size</u>	<u>Percentage Passing Sieve</u>
1"	100
No. 4	80-100
No. 200	0-15

The balance of the backfill shall contain no rock or boulders in excess of 2 inches and shall be free from all deleterious matter. Backfill shall be compacted to a relative compaction of 90%. The top 12 inches shall be brought to 95% compaction. The backfill under and around any and all pipes shall be thoroughly consolidated before any additional material is placed. Compaction methods must be carried out so no damage or displacement of the pipe occurs.

F. Connection to Existing Manholes

Connection to existing manholes shall be made by carefully core-drilling an opening in the wall of the manhole. The pipe shall be inserted with elastomeric ring-seal through the opening flush with the inside wall. The opening around the pipe shall be

packed with a stiff mix of cement mortar, thoroughly compacted to form a watertight connection. The mortar shall be finished smooth and flush with the interior surface of the manhole. Channelizing of the flow through the manhole shall conform to the details shown on the standard Drawings for new manholes.

The Contractor shall notify the City Engineer 72 hours in advance before any connection is made to existing structures. Work shall be scheduled so that interruption of flow is held to a minimum.

VI-4. TESTING

Prior to acceptance all sewer lines shall be cleaned, tested for leakage by a standard low pressure air or water test, tested for deflection with a mandrel, and inspected by video. All testing shall be performed prior to street paving and after all backfill and compaction procedures are complete, streets have been graded and the sub-grade of structural street sections has been compacted and prepared appropriately.

Leakage test is by internal air pressure or water. Infiltration test is by measurement of rate of flow of water. Each section of pipe between manholes, along with the manholes, shall be tested. Use the air test where the difference in elevation between the invert of the upper structure and the invert of the lower structure is more than 10 feet.

Testing procedures shall be as outlined here:

A. Air Test Procedure

Each section of sanitary sewer between two successive manholes shall be tested by plugging all pipe outlets with inflatable and expandable test plugs. Pressure-relief valves shall be set to limit the internal pipe test pressure to five pounds per square inch gauge pressure (5 psig). Air shall be slowly added until the internal pressure is raised to 4.0 psig. Care shall be taken to guard against the sudden expulsion of a poorly installed plug or a plug that is partially deflated.

The internal pressure of 4 psig shall be maintained for at least two minutes to allow the air temperature to stabilize after which the air supply shall be disconnected and the pressure allowed to decrease to 3.5 psig. The Table below provides the minimum time requirements for a pressure drop to occur from 3.5 psig to 3.0 psig.

Should the test disclose an air loss rate greater than permitted, the contractor shall, at his own expense, locate and repair the defective joints or pipe sections. After the repairs are completed, the line shall be retested until the air loss rate is less than specified below.

Timetable:

<u>Pipe Size</u>	<u>Time</u>
6"	4 minutes
8"	5 minutes
10"	6 minutes 30 seconds
12"	7 minutes 30 seconds

B. Water Test Procedure

Test each section of pipe between two successive structures by closing the lower end of the pipe to be tested and the inlet pipe of the upper structure with plugs or stoppers. Fill the pipe and structure with water to a point 4 feet above the invert of the open pipe in the upper structure or to a height of 10 feet above the invert of the sewer in the lower structure, whichever gives the least hydrostatic pressure on the lower structure.

The total leakage shall be the decrease in volume of water in the upper structure. The leakage shall not exceed 0.025 gpm per inch of nominal diameter of pipe per 1,000 feet of pipe being tested.

If the leakage is greater than allowed, overhaul the pipe and, if necessary, replace and re-lay until the joints and pipe comply with this test. Complete tests before trench is paved.

C. Test for Infiltration

If, in the construction of a section of the sewer between structures, excessive groundwater is encountered, close the end of the pipe at the upper structure sufficiently to prevent the entrance of water. Discontinue pumping groundwater for at least three days. Then test the section for infiltration. The infiltration shall not exceed 0.025 gpm per inch of diameter per 1,000 feet of main line pipe being tested.

Where infiltration exceeds the maximum acceptable, immediately uncover the pipe and reduce the infiltration to within the maximum acceptable by replacing, re-laying, or encasing the pipe in concrete.

D. Test Procedure - Force mains

See test procedures for water mains **Section VII-4.**

E. Test Procedure – Manholes

Water-tightness of manholes may be tested in connection with hydrostatic tests of the pipeline or at the time the manhole is completed and backfilled.

Fill the manhole with water to an elevation 1 foot below the bottom of the cone section with a maximum water depth of 20 feet. Plug inlets and outlets with stoppers or plugs and fill the manhole to the limits indicated above. The maximum allowable drop in the water surface shall be 1/2 inch for each 15-minute period of testing.

Even though the infiltration is less than the maximum acceptable, stop any individual leaks that may be observed.

F. Cleaning

The contractor shall clean all lines with a Wayne-type sewer cleaning ball under hydrostatic pressure and shall apply a mandrel to test for deformation. The mandrel shall be the 9-vane design and sized to 95% of the nominal internal diameter of the pipe.

G. Video

All new sewer main installations shall be observed by video and reviewed for acceptance by the Wastewater Division Manager. The video shall be DVD format and color quality. The video shall have a digital display with a date and pipeline footage as a minimum tape reference. The film must also be clear and legible with adequate lighting.

All videos shall include a written log. The log shall have a legible map and a North arrow. Manholes shall be marked respectively and directional arrows indicating flow shall be shown.

A gauge in front of the camera shall be used to measure the depth of debris or standing water. The maximum tolerance for the depth of standing water is 0.5 inches.

H. Placement and/or Replacement of Road Surfaces

Trench paving shall conform to **Standard Detail U-2**. New street paving shall conform to Section IV of these specifications.

All testing procedures outlined above must be completed prior to pavement replacement or new street paving. After street paving, all manholes shall be raised to grade and concrete collars shall be installed in accordance with **Standard Detail F-3**. The concrete collar shall be stamped to show flow direction of sewer lines connected to the manhole. Prior to acceptance of new sewer lines, the lines shall be thoroughly cleaned once again.