

SECTION VII

WATER

VII-1. DESIGN GUIDELINES

Water pipelines and appurtenant structures within the jurisdiction of the 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

Water pipelines shall be designed such that water supply can be adequately delivered under maximum day demand plus fire-flow conditions. Minimum fire flow shall be provided as required in the 2007 California Fire Code (CFC) Appendix BB, Table BB105.1. Minimum number of fire hydrants and their location shall be as required by 2007 CFC Appendix C.

B. Distribution System

The distribution system, wherever possible, shall be in loop/grid form to increase fire-flow capability, improve water quality, reduce maintenance costs, and better conserve water resources by reducing system-flushing requirements. If a dead end is unavoidable, mains shall meet the criteria specified in Paragraph D below and shall not exceed 1,000 lineal feet. If an opportunity exists to create a looped system by extending main, the loop must be made. Dead-end mains must terminate with a standard fire hydrant. The design and installation of the water system must be compatible to serve the ultimate service area in accordance with the General Plan.

Water distribution systems shall be designed to maintain normal operating pressures of not less than 40 psig at the service connection during peak system demand. If 40 psig cannot be obtained, a City-approved booster pump/station with backflow prevention is required.

Concrete anchor and thrust blocks shall be provided at all discontinuities in accordance with **Standard Details G-7.1 and G-7.2.**

C. Regulations Relating to Cross Connections

Reference is also made to Title 17, Chapter V, Sections 7583-7622 inclusive of the California Administrative Code, regulating the construction of cross connections between drinking water systems and other sources of water. All industrial, commercial, multi-story buildings and landscape connections shall be equipped with an RP type backflow device located within 10-feet of the water meter. Under no circumstances are any connections allowed between the backflow device and the service meter. All construction shall be in strict compliance with said regulations.

Residential fire sprinkler systems must be “passive purge”. Passive-purge fire sprinkler systems serve a single commonly used toilet in addition to the fire sprinklers. The toilet shall be on a remote portion of the sprinkler system or the system shall be designed as a loop so that the water moves through a majority of the fire sprinkler system piping when the toilet is flushed. All other residential sprinkler systems must have an RP-type backflow device located within 10 feet of the water meter and requires prior approval of the Fire Chief and Water Manager.

D. Minimum size

In general, the minimum size pipe shall be not less than 8 inches inside diameter with the following exceptions:

1. Dead-end mains require special approval of the City Engineer, Fire, and Public Works departments. The minimum size for dead-end mains is to be determined based on pipeline length, fire-flow requirements, normal system pressures, anticipated demands, and the number of dwelling units served and must also satisfy the following:
 - 4-inch mains must be less than 150-feet long and serve fewer than 10 dwelling units.
 - 6-inch mains must be less than 350 feet and serve less than 25 dwelling units.

E. Location and Depths

All water mains shall be located in public streets, typically six feet north or west of the centerline of the right-of-way. Where a public road is not available a water main may be located in an easement specifically dedicated to the City for the purposes of construction, operation and maintenance of a water main. The minimum width of the easement shall be 20 feet, or 30 feet if located between two structures. A 12-foot wide all-weather aggregate base access road capable of supporting 60,000 lbs of equipment must be provided in the easement. No fences or other obstacles are to be placed around or within the easement that might limit access.

Water mains shall be installed at a depth which will provide a minimum cover of 36 inches over the top of the pipe measured from the finished grade. Mains 12 inches and larger, or any water main not located in a public street, shall have minimum cover of 48 inches. All new mains are to have a minimum clearance of 18 inches between all adjacent utilities.

Where water mains are constructed in close proximity to sewer 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 criterion is outlined on **City Standard Detail G-13**.

F. Water Services

Water services and meters shall be placed a minimum of five feet from any property line and 10-feet from any sewer lateral. Service lines shall normally be installed at the time the main is constructed to avoid frequent cutting of the street. Services are to be sized according to the meter being installed at the time water service begins.

G. Valves

Gate valves shall be attached by flange on all legs of tees and crosses. In-line valves should be installed at increments of 600 feet on continuous lines without main intersections and connect to the main with mechanical joint (MJ) fittings. Valves should also be spaced so that not more than two fire hydrants should be out of service at any one time. Valves 12-inches and larger shall be butterfly type.

H. Fire Hydrants

Fire hydrants shall be placed at street intersections whenever possible, and should be located to minimize the hazard of damage by traffic. The average spacing between hydrants should not exceed that required by the 2007 CFC Appendix C or otherwise specified by the City's Fire Chief. All joints and fittings between the main and the hydrant shall have thrust restraint. The minimum size main serving the fire hydrant shall be 6-inch with a gate valve installed at the main and all as shown on **City Standard Detail No. G-1**.

I. Air and Vacuum Release Valves

Air and vacuum release valves shall be installed in accordance with **City Standard Detail No. G-8** at all high points along a main where it is likely that air pockets may form. All valves shall be designed for a minimum of 150 PSI operating pressure. A gate valve (for connections greater than 2-inch in diameter) or corporation stop (for connections equal to or less than 2 inches) shall be installed at the connection to the main to provide a positive closure between the main pipeline and the air and vacuum release valve. The air and vacuum release vent outlet shall be installed above ground in such manner as to preclude back-flow.

J. Blow-offs

Blow-offs (BOs) shall be installed in accordance with **City Standard Detail No. G-9** at all low points along the main to provide for adequate flushing, draining and maintenance. Four-inch BOs are to be installed on pipeline sizes 14-inches and smaller and 6-inch BOs are to be installed on pipelines 16-inches and larger.

VII-2. MATERIALS

A. Pipe

Pipe used in the construction of water distribution systems shall be either ductile iron or PVC and shall meet the standards of the American Water Works Association (A.W.W.A.) where applicable. The City Engineer may specify which types shall be used in any instance.

1. PVC pipe shall be a minimum of D. R. 18 and shall conform to and meet the requirements of AWWA Specification C900 for sizes 4-inches through 10-inches.
2. Ductile iron must be pressure class 350 for 12-inches diameter and shall conform to AWWA C151.
3. Locator wire (insulated AWG 12) must be installed and taped to the top of all new pipes. All locator wire connections are to be made with water/weather tight connectors.

B. Fittings

Bends, elbows, tees, crosses, and special fittings shall be cast iron or ductile iron, and shall conform to and meet requirements of AWWA Specification C110. At connections to adjacent pipe, the fittings shall have rubber gasket joints conforming to AWWA Specification C111 with the exception of push-on joints. Push-on fittings and push-on joints adjacent to valves and fittings are not permitted.

C. Bolts and Nuts for Flanges

Bolts and nuts for all flanges shall be Type 304 or 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.

Provide washers for each nut. Washers shall be of the same material as the nuts. Provide Lubricant for Stainless Steel Bolts and Nuts. Lubricant shall be chloride free and shall be RAMCO TG-50, Anti-Seize by RAMCO, Specialty Lubricants Corporation Husky™ Lube O'Seal, or equal.

D. Valves and Valve Boxes

Valve boxes shall be installed in accordance with **City Standard Detail No. G-6**. Valves shall have a 2-inch square operating nut, be resilient wedge, epoxy lined, open in counter-clockwise direction and meet the requirements of AWWA Specifications C509 for gate valves. The cover shall be marked "WATER". When the depth from finish grade to the operating nut of the valve is 4 feet or greater the valve operating nut shall be extended to within 6 inches of finished surface using a Fiberplas valve stem extension or approved equal.

Butterfly valves are required on mains larger than 12-inches in diameter and require approval by the City Engineer, and Water Resources Manager.

E. Water Service Connections

Service lines shall have a 1-inch copper-tube-size (CTS) polyethylene (PE) for domestic single family residential services serving 3/4 or 1-inch meters, and 2-inch PE CTS service lines shall be installed for 1.5 and 2 inch meters. Commercial, industrial, or irrigation service line sizes are to be as shown on the plans and approved by the City Engineer. Water service connections shall be installed in accordance with **City Standard Drawing Nos. G – 2 and G –3.**

VII-3. CONSTRUCTION GUIDELINES

A. Connection to Existing Mains

The City Water Division shall be provided not less than 72 hours notice before connection is made to any existing main. Notification shall include arrangement of a meeting at the site to discuss materials and operations associated with the connection.

The Water Division shall coordinate and perform all shutdowns of City water facilities. Shut downs may occur only when inconvenience to existing customers is minimized. Connections shall be made only after complete and satisfactory preparation for such work has been made, in order that the shutdown may be as short as possible. The City Water Division will be responsible for all main valve operation.

Connections of fire lines and new water mains to existing water mains shall be accomplished by the installation of new tees and valves. Hot taps will occur only in circumstances specially approved by the Water Division Manager.

In-line valves shall be placed prior to construction of the new connection where existing in-line valves do not meet the design guidelines in Section VII-I; where the installation of in-line valves will significantly reduce the number of customers affected by interruption of service or where existing critical connections would otherwise be affected including schools or buildings with a high number of tenants.

B. Excavation for Water Lines

The minimum trench width shall be the nominal diameter of the pipe plus eighteen (18) inches, and be ample to permit the proper installation of the pipe and appurtenances. (see **City Standard Detail No. U – 2**)

Excavated material shall be piled in such a manner that it will not endanger the work and will offer minimum obstruction to traffic. Open trenches and waste piles shall be adequately barricaded and lighted.

All safety orders, rules, or recommendations of the occupational Safety and Health Administration (OSHA) and the Division of Industrial Safety of the Department of Industrial Relations of the State of California applicable to this work shall be complied with.

C. Laying of Pipe

1. The pipe shall be laid true to line, with no visible change in alignment at any joint, unless curved alignment is shown on the plans. Full-length pipe sections are to be used wherever possible.
2. PVC pressure pipe (C900) may accommodate longitudinal bending with the following limitations: (1) The constructor shall block or brace pipe joints to ensure that bending of PVC pressure pipe does not result in axial deflection in the gasketed or mechanical joints. (2) The longitudinal bending in the PVC pipe barrel shall not result in a bending radius less than the minimum limits established in the Table below. (3) The bending of PVC pipe barrels larger than 12-inch nominal diameter is not permitted.

Minimum Allowable Bending Radius for PVC Pressure Pipe

Nominal Size (Inches)	Minimum Allowable Bending Radius (Feet)
4	250
6	360
8	470
10	580
12	690

3. Deflection at fittings and couplings that allow angular joint offset may also be used to achieve gradual alignment changes. If permitted by the pipe/fitting manufacturer, the maximum allowable deflection at any joint shall not exceed the 80% manufacturer's recommendation for the type of pipe and joint being used.
4. Place the specified thickness of pipe base material over the full width of trench. Grade the top of the pipe base ahead of the pipelaying to provide firm, continuous, uniform support along the full length of pipe, and compact to the relative compaction specified herein. Before laying each section of the pipe, check the grade and correct any irregularities.
5. After pipe has been bedded, place pipe zone material simultaneously on both sides of the pipe, in maximum 8-inch lifts, keeping the level of backfill the same

on each side. Carefully place the material around the pipe so that the pipe barrel is completely supported and no voids or uncompacted areas are left beneath the pipe. Use particular care in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling.

6. Thrust and Anchor Blocks shall be placed in accordance with **City Standard Details No. G7.1 and G7.2** at bends of 11 1/4, 22 1/2, 45 or 90 degrees; at the end of plugged mains; behind each tee and cross and at the back of fire hydrants. The thrust block shall extend from the fitting to undisturbed soil, shall be kept clear of the joints, and shall be of such bearing area as to assure adequate resistance to the water pressure force to be encountered.
7. Compact each lift to the relative compaction specified per **City Standard Details No. U2**
8. Each section of pipe and each fitting shall be thoroughly cleaned before it is installed. All pipe, fittings, valves, etc., shall be carefully lowered into the trench by suitable tools or equipment, in such manner as to prevent damage to the pipe, lining, coating, fitting or other appurtenances. Under no circumstances shall pipe or accessories be dropped into the trench.
9. Push the backfill material carefully onto the backfill previously placed in the pipe zone. Do not permit free-fall of the material until at least 2 feet of cover is provided over the top of the pipe.
10. Do not operate heavy equipment or a sheepsfoot wheel mounted on a backhoe over the pipe until at least 2 feet of compacted fill has been placed over the pipe.
11. Keep the trench dry until the pipelaying and jointing are complete
12. Whenever pipe placement is discontinued for short periods, or when work is stopped at the end of the day, the open ends of all mains shall be closed with water-tight plugs or bulkheads. The plug or bulkhead shall not be removed unless or until the trench is dry.
13. Valves shall be set plumb, supported on a concrete base and properly fitted to the adjacent sections of the main. A valve box shall be installed over each valve.
City Standard Details No. G6

D. Trench Backfill

All the requirements for backfilling of sewer line trenches set forth in **Section VI-3E** shall apply to backfill of water main trenches.

VII-4. TESTING

A. Testing

Each section of the pipe shall be tested in accordance with following procedures. The pipe shall be slowly filled with water, and all air shall be expelled from the pipe. The release of the air can be accomplished by opening hydrants and service line cocks at the high points of the system and the blow-offs at all dead-end. After the system has been filled with water and all air expelled, all the valves controlling the section to be tested shall be closed, and the line be allowed to set for a period of not less than 24 hours. All line filling and valve operation shall be done by the City Water Division.

Final cleaning and testing of water lines shall take place after all construction work is completed, with the exception of final paving. Cleaning and testing shall be performed in the presence of the Public Works Inspector.

The pipe shall then be refilled, if necessary, and subjected to a pressure of not less than 200 PSI or 50 PSI over the pipe class being installed, whichever is greater, for a period of not less than two hours.

Any leaks, cracks or defective pipe, fittings, valves, hydrants or other appurtenances discovered during the test shall be removed and replaced with sound material, and the test repeated until the system is proved satisfactory.

The allowable make-up water used to maintain test pressure within 5 psi in the test section shall not exceed 50 gallons per mile per 24 hours per diameter of pipe tested.

Example: L = 3240 ft of 8-inch pipe for 2 hour test

$$50 \text{ gallons} \times \frac{3,240 \text{ ft}}{5,280 \text{ ft/mile}} \times \frac{2 \text{ hours}}{24 \text{ hours}} \times 0.67 \text{ ft (diameter)} = 1.713 \text{ gallons allowable make-up water}$$

B. Flushing and Disinfecting

After the pressure test, the system shall be thoroughly flushed out and disinfected in accordance with AWWA Standards and/or the requirements of the County Health Department.

C. Replacement of Road Surfaces

Paving shall not proceed until all testing, flushing and disinfecting have been performed to the satisfaction of the City Engineer.