

S-75

**STANDARD SPECIFICATIONS FOR MATERIALS
AND THE INSTALLATION OF WATER MAINS
IN CITY OF SANTA MARIA, CALIFORNIA**

SECTION 1. GENERAL REQUIREMENTS

The specifications shall apply to all materials and work of construction of water lines for the domestic water system of the City of Santa Maria constructed pursuant to the requirements of a contract, local ordinances, subdivision or other agreements, and to other work as may be required as a condition of any permit. All work, methods and materials shall be in compliance with the applicable AWWA (American Water Works Association) Standards and AWWA Manual No. M23 (PVC) as last revised, State of California Department of Health Services criteria as well as any other State and National laws; and City or County ordinances where applicable, and shall fully comply with the provisions of such laws and ordinances.

The work herein provided for is to be done in accordance with the plans, profiles, cross-sections and the general and special provisions on file with the City Engineer of the City of Santa Maria and these specifications which are intended to cover all items necessary for the installation and construction of water mains for domestic water supply and fire protection and appurtenances thereto. Public Improvement Plans shall be in accordance with City Policy and may not be used for construction unless signed by the City Engineer.

Water mains that serve the water supply and/or fire protection of a single parcel and are not necessary for the service of other parcels shall be private and connected to the public water supply by way of an approved backflow device.

SECTION 2. MATERIAL REQUIREMENTS

A. GENERAL

Polyvinyl Chloride pressure pipe shall be used and shall conform to AWWA C900 American Water Works Association (AWWA) Standards as last revised. PVC pipe sizes 4" thru 12", AWWA C900 shall be of Class 150, DR 18, and withstand a working pressure of not less than 150 psi. PVC water transmission pipe sizes 14" thru 36", AWWA C905 shall be DR 25 with a pressure rating (PR) of 165 psi.

B. PIPE

The finished pipe shall be such that it may be cut, drilled or tapped. The standard length of pipe shall be twenty feet (20'). A tolerance of plus or minus one inch (1") shall be allowed on the length of individual pipe. A maximum of fifteen percent (15%) of each pipe size may be furnished in random lengths of not less than ten

feet (10') each. Any lot shorter than standard lengths must be in multiples of six inches (6").

C. HYDRAULIC TESTS

Each and every length of pipe and each coupling sleeve shall, before shipment, be tested under an internal hydrostatic pressure of 600 psi for AWWA C900, (Section 3.3.) and 330 psi for AWWA C905 (Section 4.6), and shall be stamped by manufacturer with marking requirements per AWWA standards. Each pipe length shall bear the Underwriter's Laboratory label. The water pressure shall be applied gradually and be maintained for at least 5 seconds. Any pipe or coupling sleeve showing any leakage, sweating or other defect shall be rejected.

D. FITTINGS

All changes of direction of PVC pipe shall be made with ductile iron fittings meeting AWWA Specification ANSI/AWWA C110 and/or C153.

The interior and exterior of all fittings shall be coated with a petroleum asphaltic material applied in compliance with AWWA Specification C110, Section 10-9 and/or C153, Section 53-10. Care shall be taken in handling so as not to injure the coating.

All fittings shall be ductile-iron and marked in compliance with Section 10-10 and/or Section 53-11 of the above specifications. The rated working pressure of all C110 fittings shall be 250 psi and all C153 fittings shall be 350 psi, which shall be cast on the fitting body. In lieu of the casting requirement, a certificate of compliance from the manufacturer shall be provided for the C110 fittings (working pressure rating at 250 psi) and for C153 fittings (working pressure rating of 350 psi). Gaskets shall be rubber (ring type) in accordance with AWWA C111.

Flanged fittings shall conform to the requirements of ANSI B16.1, Class 125 dimensions and drilling. Flange gaskets shall be rubber (ring type) in accordance with AWWA C110. Bolts shall be the appropriate diameter and length for each fitting, and all bolts shall be high tensile carbon steel meeting ASTM Specification A307 and shall be electro-galvanized.

E. VALVES

1. Line/Fitting Valves

a. Resilient-Seated Gate Valves, AWWA C509

All valve sizes from 4" thru 12" shall be iron body "Resilient-seated Gate Valves". The valves shall be Clow, Waterous, AVK, M&H C509 or approved equal.

b. Rubber-Seated Butterfly Valves, AWWA C504

All valve sizes 14" and above shall be ductile iron body "Rubber-seated Butterfly Valves" and designed for direct burial operation. The valves shall be Mueller Brand Lineseal III Epoxy lined I.D., AWWA C504 or approved equal. Wafer valves may not be used. Body seats shall be stainless steel with mating rubber disc seats.

c. All valve sizes smaller than 4" shall be one-piece ball valve-locking style.

The number of valves required at a junction is the number of legs less one except for transmission lines which require a valve at every leg of tee or cross.

All valves shall have end flanges conforming to ANSI B16.1, Class 125 dimensions and drilling and shall meet all requirements of ANSI/AWWA Specification C509 and C504.

All valves shall have a two-inch (2") square operating nut. If the operating nut is over forty-eight inches (48") beneath finish grade, a one-inch (1") diameter solid steel extension shaft shall be provided and installed with another two-inch (2") operating nut and a two-inch (2") socket in compliance with City Standard Drawing (Valve Stem Extension).

All valves shall be marked and proof tested in compliance with ANSI/AWWA Specification C504 and C509. The marking shall include valve size, name of manufacturer, class of valve, and date of manufacture. The test will require certified copies from the manufacturer of results of the performance, leakage and/or hydrostatic tests.

2. Fire Hydrant and Fire System Valves

Resilient-seated gate valves shall be used for fire hydrants and fire systems. Valves for fire hydrants shall be Clow, M & H, Waterous, AVK, AWWA C509 or approved equal.

F. FIRE HYDRANTS

Fire hydrants shall be the "East Bay" California type as manufactured by Mueller Model No. A-450, Long Beach Iron Works Model 611 EB, Clow-Rich Model No. 5, AVK Wet Barrel Model No. 2470, Jones Model No. JJ4040, or approved equal with 6-bolt pattern only. The body shall be of cast iron six inches (6") in diameter, and shall have one of the following outlet configurations.

(1) 4½" x (1) 2½"	Single-family residential development
(1) 4½" x (2) 2½"	Multi-family residential and commercial development
(2) 4½" x (1) 2½"	Special case subject to Fire Department approval

All outlet valves, stems and packing glands shall be bronze. Fire hydrants shall be fitted with cast iron bury with flange with 6 bolt pattern only and mechanical joint end of the proper size to receive the squared-off end of the PVC water pipe. A cast iron break off spool (where required) shall be installed between the flange and the fire hydrant with approved galvanized or cadmium plated break-away bolts. A break off check valve (AVK Flowgard II) or approved equal (where required) shall be installed immediately below the fire hydrant with solid bolts with a concrete pad per manufacturer's specs. The pipe between the fire hydrant and water main shall be at least six inches (6") in diameter and shall have a valve conforming with these specifications. Fire hydrants shall be installed in accordance with the City Standards in relation to the height above and distance from the curb, and in accordance with City Standard Drawing (Fire Hydrant Installation). Hydrants not installed behind curbs shall be protected by the installation of City Standard Drawing (Fire Hydrant Protection Assembly).

Threads on 4-1/2" and 2-1/2" outlets shall be lubricated with "Never Seez" anti-seize and lubricating compound as manufactured by Never Seez Compound Corp. or approved equal.

Fire hydrants to be painted with two coats of "Fire Hydrant Green" (Frazee Paint ARO Plate) a special paint for fire hydrants.

The interior and exterior of cast iron buries are to be coated with petroleum asphaltic material in compliance with AWWA C110-87.

G. WATER SERVICES

Domestic water service lines shall be installed from the main to the property line. This line shall be PVC Schedule 80, Type "K" soft copper or type 'K' hard copper for 1" water service and PVC Schedule 80 or Type "K" hard copper for 2" water service. Water service lines for 4" services shall be 4" PVC Class 150 AWWA C900. Water service lines for 6" and 8" services shall be 6" or 8" PVC Class 150 AWWA C900.

Refer to section 8 – 10.02 of the City of Santa Maria municipal code for information regarding water meters. In addition, submetering is required for some multifamily residential developments per California Senate Bill 7.

Approved brass valves shall be used. The service shall include a saddle and corporation cock, water service line, angle stop and meter box. The City of Santa Maria will furnish and install the meters when connection fees are paid, unless otherwise specified. Saddles shall be brass for AC Pipe and Stainless Steel for PVC pipe.

Water service installations shall comply with City Standard Drawings: Smaller services (less than 1") are not permitted and larger services (greater than 8") are subject to design approval by the City Engineer.

See Water Service and Water Meter Box Std. Dwgs.

H. VALVE BOXES AND RISERS

Every valve shall receive a valve box, cover and 8" dia. PVC-SDR 35 riser installed in compliance with City Standard Drawing (Valve Box and Riser). Boxes shall be Christy No. G-5 or approved equal.

I. CONCRETE

All concrete used in conjunction with water main installations shall be either five sack Class C or six sack Class A as required in compliance with City Standard Specifications for Materials and the Construction of Concrete Structures.

J. BACKFLOW-PREVENTION ASSEMBLIES

All backflow and cross-connection prevention shall be in accordance with the State Department of Health Services Title 17 of the California Code of Regulations, which specifies that the water supplier shall protect the public water supply from contamination by implementation of a cross-connection control program and that all backflow preventers shall have passed laboratory and field evaluation tests performed by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California or an entity with equivalent testing requirements which has demonstrated their competency to perform such tests to the satisfaction of the California Department of Health Services.

The type of protection that shall be provided to prevent backflow into the public water supply shall be commensurate with the degree of hazard that exists on the consumer's premises. Listed in increasing levels of protection, these include: Double Check Valve Assembly – (DC), Double Check Valve Assembly with Detector Check – (DCDA), Reduced Pressure Principle Backflow Prevention Device – (RP), and an Air-gap Separation - (AG). The water user may choose a higher level of protection than required by the water supplier, but never a lesser.

Please contact the City Utilities Department, (805) 925-0951, Ext. 7270 for guidance in selecting, locating, and sizing approved backflow preventer(s) for specific projects.

K. PRIVATE FIRE PROTECTION

Private fire protection lines for sprinklers or private hydrants, valve boxes and covers, and detector check with by-pass meter shall be installed per City Standard Drawing WA-27. Detector check with by-pass meter shall read in cubic feet and shall conform with the list of approved backflow prevention assemblies produced by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California.

L. BLOW OFF ASSEMBLIES

Each and every line installed with a dead end shall be provided with a standard one inch (1") blow off assembly as shown on City Standard Drawing (Blow Off 1" and 1 ½").

M. TAPPING SLEEVES

Prior to installation, a submittal shall be made to the City Engineer for any and all tapping sleeve materials to be used. All tapping sleeves shall have a positive seal around each end of the sleeve. Tapping sleeves that only seal around the opening in the pipe are not acceptable.

Cast Iron or Ductile Iron Mechanical Joint Tapping Sleeves for attaching to AC, CI, or PVC mains. The following manufactures are acceptable:

- Clow
- Waterous
- Mueller
- JCM

Stainless Steel Tapping Sleeves for attaching to AC, DI, PVC. The following manufactures are acceptable:

- Ford, Fast Style
- JCM
- Romac, SST Series

SECTION 3. CONSTRUCTION METHODS

A. TRENCHING

Trenching may be done either by machine or hand labor. Care shall be used to avoid excavating below the level required to provide earth mounds for the pipe in accordance with the manufacturer's specifications for placing PVC pipe. Trench widths shall be held between the maximum and minimum shown on City Standard Drawings (Trench Repair) and (Water Main Layout with Fitting Details) for minimum cover of pipe.

All excavations made in paved streets shall require saw cutting of the pavement in a neat and uniform manner either prior to trenching or immediately prior to repaving. All broken edges shall be saw cut to undisturbed paving.

Suitable shoring shall be utilized to protect the excavation when necessary in accordance with the State of California, Division of Industrial Safety (Cal-OSHA), Trench Construction Safety Orders. Shoring shall not be permitted to extend below the level of the bottom of the pipe.

Any damage resulting from the failure to provide shoring shall be repaired by the Contractor at his own expense.

All shoring shall be removed from the trench prior to backfilling.

B. PLACING PVC PIPE

PVC pipe shall be connected by the use of couplings and rubber rings as provided by the manufacturer. The laying of PVC pipe shall be done strictly in accordance with the instructions furnished by the manufacturer. At no time may the maximum deflection recommended by the manufacturer be exceeded.

Pipe shall be laid on two earth mounds located at the fifth points (as indicated by stencil marks on the pipe). These mounds shall be high and firm enough to provide two inch (2") clearance between the couplings and the trench bottom. The backfill shall be hand tamped under the pipe and up to a minimum of twelve inches (12") over the top of the pipe.

All changes of direction (at tees and bends), changes in size (as at reducers, some crosses and tees), and stops or dead ends shall be made with fittings as heretofore specified and secured by concrete thrust blocks.

Thrust blocks shall rest against undisturbed earth in all locations and be of the size as shown on City Standard Drawing (Thrust Block and Details). This section is applicable to all sizes and types of water pipe. A polyvinylchloride 6 mil membrane shall be used to separate concrete from the fitting.

All mains shall have a tracer wire installed along with them. Tracer wire shall be #10 AWG solid wire with a THHN/THWN insulation rating. Wire shall begin and end at valve boxes with a minimum of 1' exposed wire. Wire shall wrap around valve bodies a minimum of two turns and run up the outside of the valve riser with a one foot (1') loop inside valve riser [see City Standard Drawing (Valve Box and Riser)].

C. TESTS

After the pipe has been laid in any isolated section and after the trench has been backfilled and tamped sufficiently and after thrust blocks have set for a minimum of 24 hours, the pipe line shall be slowly filled with water.

All air must be expelled from the pipeline during filling. If hydrants, blow offs, or air/vacuum release valves are not available for expelling air, taps shall be made at points of highest elevation before any tests are made. After tests have been completed, brass plugs shall be inserted in the pipe openings. After filling, the pipeline shall be subjected to a two hundred twenty-five pounds per square inch (225 p.s.i.) and held within ten pounds per square inch (p.s.i.) of this pressure for at least two (2) hours.

After all visible leaks have been satisfactorily repaired, a test for leakage shall be made at one hundred fifty pounds per square inch (150 p.s.i.) and held for four (4) hours. No pipe installation shall be accepted until the leakage is less than the number of gallons as determined by the following table:

Allowable Leakage Per 50 Joints in U.S. Gallons for Various Pipe Diameter					
Test Pressure 150 psi	6"	8"	10"	12"	Inches Diameter
	.50	.66	.83	.99	Gallons per hr.

The allowable leakage for a pipeline is calculated by multiplying the leakage per hour per 50 joints at the test pressure and for the diameter of pipe tested as obtained from the above table, by the duration of the test in hours and the total number of joints in the line divided by 100. If the section under test contains joints of various diameters, the allowable leakage will be the sum of the computed leakage for each size joint. Leakage allowances for other sizes shall be computed from the manufacturer's installation guide.

Test pressure of the filled section of the line shall be maintained through a 5/8" x 3/4" meter so that any leakage may be measured. City shall furnish meter for test purposes.

Any cracked or defective pipes, fittings, valves, hydrants or consumer water services discovered during these tests shall be removed and replaced with sound material and the tests repeated until satisfactory.

All consumer water service pipes and fittings, up to and including the stopcocks but not the water meter, shall be installed prior to and be included in these tests.

Fire hydrants, blow-offs and miscellaneous services shall also be included in these tests.

Tests may be made against existing valves only upon approval of the City of Santa Maria Engineering Division. The only circumstance that would allow testing against existing valves would be that there is no possibility of contamination of water lines in use. End caps shall be provided and installed with thrust protection as required, or as directed by the City Engineer for all tests.

D. STERILIZATION OF WATER FACILITIES

Prior to pressure testing and prior to acceptance of work, the entire pipeline, including all valves, fittings, hydrants, service laterals and other accessories shall be sterilized in accordance with AWWA Specification C651 which provides detail specifications for:

1. Limiting contaminated materials from entering the water mains during construction or repair;
2. Removing, by flushing, contaminating materials that may have entered the water main during construction or repair;

3. Disinfecting any residual contamination that may remain after cleaning;
4. Determining the bacteriologic quality of fresh water in the main after disinfecting the main.

All mains shall be flushed with potable water after completion of construction and prior to disinfection. The Contractor shall provide a sufficient number of suitable outlets at the end(s) of the line(s) being sterilized in addition to those required by the Plans, to permit the main to be flushed with water at a velocity of at least five and one-half (5.5) feet per second over its entire length. The outlets provided shall meet the requirements for fittings as specified for the type of main constructed. Temporary blow-offs may be installed during the sterilization and flushing to satisfy those requirements. Drainage facilities shall be constructed such that the water lines cannot be contaminated through flushing outlets.

After flushing, chlorine gas or chlorine compound solution made with liquid chlorine, calcium hypochlorite in solution or sodium hypochlorite solution shall be water mixed and introduced into the mains to form a chlorine concentration of approximately 100 parts per million (ppm) or that which will provide a minimum residual of 50 ppm in all parts of the line after twenty-four (24) hours have elapsed. During the sterilization process, all valves, hydrants and other accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply.

The placing of HTH capsules or tablets in pipe sections during the laying process will be considered as an acceptable method of introducing chlorine for the test.

The chlorine water solutions shall be diluted to a chlorine concentration of not more than 100 ppm and not less than 50 ppm measured in the water lines. The Contractor shall keep adequate chlorine residual testing and indicating apparatus available on the site during the entire sterilization period.

After final flushing, the flushing fittings shall be plugged with devices intended for this purpose, at the pressure class of the pipe. Where water main is coated, plugs and outlets shall be similarly coated.

Bacteriologic samples of water for the specified bacteriologic test shall be taken from each end of the sterilized main (located downstream of the point of introduction of chlorine disinfectant), and at other locations as determined necessary by the City Engineer. When an entire water main is to be tested, it shall be completely isolated from the existing system. Bacteriologic samples shall be taken a minimum of forty-eight (48) hours after the mains have been flushed of all chlorine. Such samples shall be obtained by the City using pipe and fittings supplied by the Contractor as directed by the City Engineer. Bacteriologic samples shall be obtained in the following manner:

At corporation stops, risers shall be installed that will discharge water directly

downward towards the ground. The discharge point of the risers shall be a minimum of 2 feet (2') above the ground. Risers shall include the necessary bends to accomplish the foregoing and shall be equipped with in-line valves near the discharge points to regulate the flow. The Contractor shall provide and supply these hookups; full compensation therefore to be included in the amount bid for the various water main bid items.

For mains over thirteen hundred feet (1,300') in length with no services, samples in addition to those obtained at each end shall be taken at intermediate points in such a manner that at least one sample is taken for each seven hundred feet (700') of main.

The recommended procedure of sterilizing and testing water mains is as follows:

1. Chlorine residual of between 50 and 100 ppm is introduced into the water mains;
2. Twenty-four (24) hours later, treated water is flushed from the water mains;
3. Forty-eight (48) hours after flushing, water samples are taken for bacteriologic test;
4. Ninety-six (96) hours after samples are taken, results of Water samples are reported to the contractor;
5. If the bacteriologic tests show a coliform M.P.N./100 ML water of 2.2 or less on all samples, the water facilities tested will be considered clear. In the event the coliform number is above 2.2, the sterilization procedures shall be commenced again within twenty-four (24) hours of notice by the City that the bacteriologic tests failed.

Should the end of any of the foregoing periods fall on a City non-working day, the order of procedure will be continued to the next regular City working day.

During construction, all lines shall be sealed at the end of each day's work with a positive water tight mechanical type end caps as Smith-Blair 602 or approved equal. Failure of any seal or failure to place the seal shall be cause for rejection of that entire portion of line until it has been cleaned by swabbing in compliance with AWWA Specification C651, latest revision.

E. WATER TIE-INS

No operating water line will be tied into, shut down, turned on, or otherwise interfered with without the prior written permission of the City Engineer, per City Municipal Code Sec. 8-10.19.

Water main tie-ins for pipe whose diameter is smaller than the existing pipe shall be accomplished without water main shutdown, provided the valve configuration meets the requirements of Section 2 E of this specification. Tapping sleeves (hot

taps) as specified herein, shall be utilized to make such new connections to existing water mains. Water main tie-ins of the same diameter shall be installed per standard drawings WA-11 and WA-12.

All valves will be operated only by or under the direction of City, Water Utility personnel.

Prior to any tie-ins, a schedule showing all work to be done, location of pertinent valves, etc., shall be submitted by the Contractor for approval by the City Engineer. All material must be on the site before permission will be granted to start the tie-in. This schedule must be submitted at least three working days prior to time of tie-in.

In the event of accidental breakage of water lines or interruption of water service in any manner, immediately notify the City Engineer or the Santa Maria Police Department giving location and all available details. (Police Department will pass this information to the proper personnel).

F. UTILITY LOCATIONS AND DAMAGES

The City will provide the best known information relative to utility interference; however, should unforeseen or unknown interferences be encountered which create construction delays, the City shall not be held financially liable, nor will the Contractor press any claim for such unpredictable interferences and delays.

The fact that any underground facility is not shown on the plans shall not relieve the Contractor of full responsibility for damage he causes, and such damaged facilities shall be immediately repaired to a condition equal to or better than that which existed before damage.

G. METHOD OF ABANDONING RETIRED LINES

Water lines shown or indicated to be abandoned may be abandoned in place except that lines interfering with the conduct of the work shall be removed by the contractor at no cost to the City. Abandoned lines, if severed or broken, shall be plugged and sealed in placed with neat cement grout.

The live ends of lines shown to be abandoned shall be capped off at their source with ductile iron blind flanges or caps with thrust blocks or as directed to eliminate any dead end lines.

H. PUBLIC CONVENIENCE AND SAFETY

The Contractor's operation shall cause no unnecessary inconvenience and the travel rights of the public shall be maintained at all times.

The Contractor shall furnish, install and maintain all traffic control devices in compliance with California Department of Transportation requirements. The Contractor is to prepare and submit for approval a traffic control plan covering all

job sites prior to commencing work.

The cost of furnishing and installing such signs, lights, flares, barricades and other facilities and the cost of providing and stationing such flagmen, all for the convenience and direction of public traffic, shall be borne solely by the Contractor.

Failure of the Contractor to maintain all facilities and/or appurtenance utilized for the traffic control will result in the City performing the work. Payment to the Contractor will be reduced by the cost to the City to perform all traffic control which is the Contractor's responsibility in accordance with the Plans and Specifications.

I. BACKFILL AND COMPACTION

Backfill of all trenching shall comply with Section 19 of State of California, Department of Transportation Standard Specifications, as last revised. If the backfill is within an existing or future roadway, backfill material must have a sand equivalent of 20, or qualifying material shall be imported. Backfill shall be placed in eight-inch (8") layers, compacted to ninety-five percent (95%) minimum relative compaction in uniform horizontal layers.

If the backfill is not within an existing or future roadway or paved area, the optional method of Section 19-3.06 may be utilized.

J. REPAVING

All trenching in paved areas shall require saw cutting, as previously described, and the existing pavement will be precisely replaced with like kind of material or two-inch (2") Asphaltic Concrete on six-inch (6") Aggregate Base (whichever is greater) in accordance with the original specifications for the improvement. All Portland Cement Concrete pavement shall be replaced in like kind. The determination shall be made from plans on file in the Office of the City Engineer. The minimum paving shall be in accordance with City Standard Drawing (Trench Repair).

The Contractor shall apply one inch (1") of temporary asphalt surfacing material until such time as he completes the structural section. It is the intent of these specifications to make the street reusable without dust or nuisance in as short a time as possible after the pipe laying operation. If the Contractor elects to use temporary paving materials, then he shall maintain such until the job is completed.

Either permanent or temporary paving shall immediately follow the chlorination and testing. If construction delays make immediate permanent paving impossible, the City Engineer shall order temporary paving.

All trenching repair work shall comply with City Standard Drawing (Trench Repair).

K. STANDARD DRAWINGS

City Standard Drawings for water mains and appurtenances must be complied with and are a part of these specifications. They can be obtained at the Engineering Division office at 110 S. Pine Street, Suite 221 (mail: Suite 101), Santa Maria, CA 93458-5082 or web site: www.ci.santa-maria.ca.us.

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