

## **SECTION 3**

### **MATERIALS**

#### **3-1 GENERAL REQUIREMENTS**

This section discusses the materials involved in water pipeline systems and associated construction activities. The materials selected have been chosen for their strength, durability, and ease of maintenance. All materials, unless specifically approved otherwise, shall be new.

Where applicable, AWWA or other standards have been referenced and it shall be the responsibility of the applicant/engineer/contractor to be familiar with those standards to insure compliance. Titles corresponding to the specific numbers are given in the reference section of the standards.

A list of approved materials is included as an appendix to these standards. Other products may also be in accordance with the requirements of the City, but prior to acceptance, must be first approved in writing by the Public Works Department. One factor that will be considered by the Public Works Department in any consideration of other products is the need for some degree of standardization.

If at any time the Public Works Department believes that the use of a specific product must either be discontinued or changed, the proposed change shall be authorized by the City Engineer and/or the Water Division Supervisor. Their decision will be based upon an engineering or maintenance performance evaluation.

#### **3-2 TESTING AND FINAL ACCEPTABILITY OF MATERIAL**

The Public Works Department shall require such tests and certifications as deemed necessary to show that the specified materials have been employed. Notwithstanding prior factory or yard inspections, Public Works inspectors shall have the right to reject any damaged or defective materials found on the job which will affect the durability or performance of the installation and order its removal from the site.

#### **3-3 MAIN LINE PIPE MATERIALS**

Generally accepted main line pipe materials consist of either polyvinyl chloride (PVC), cement mortar lined and coated steel pipe (CML&C), or ductile iron pipe

(DIP) as described in this section. Asbestos cement (AC) pipe is no longer allowed for either the construction or repair of water lines.

3-3.1 PVC Pipe: PVC pipe shall be in accordance with the quality, strength, and marking requirements of AWWA C900, which covers PVC pipe in sizes 4 to 12 inches.

3-3.1.1 Pipe Thickness: Determination of pipe thickness is based on internal operating pressures.

3-3.1.2 Joint Mechanisms: Elastomeric-gasket bell ends and lubricants shall be in accordance with the requirements of AWWA C900.

PVC solvent cement joints are not allowed.

3-3.1.3 Couplings and Fittings: Where PVC couplings are used, they shall be supplied with an elastomeric-gasket at each end and shall be in accordance with the requirements of AWWA C900.

PVC push-on fittings are not allowed. Ductile iron fittings, mechanical joint or flanged, shall be used with PVC pipe.

3-3.1.4 Physical Test Requirements: All test requirements shall be in accordance with the requirements of AWWA C900.

3-3.2 Steel Pipe: Electrically butt-welded, straight seam or spiral seam steel pipe 6 inches and larger shall be in accordance with the quality, strength, and testing requirements of AWWA C200.

3-3.2.1 Pipe Thickness: Determination of pipe thickness is based on internal operating pressures, external loads, and other special considerations and is determined based on the design requirements of AWWA C200 and AWWA Manual 11.

3-3.2.2 Pipe Ends: Various end treatments and tolerances can be supplied as discussed in AWWA C200, and as approved by the Public Works Director.

3-3.2.3 Lining and Coating: Unless otherwise approved, all steel pipe shall have a shop-applied cement mortar protective lining and coating (CML&C) and shall be in accordance with the requirements of AWWA C205. Cement for mortar shall be in accordance with the requirements of ASTM C150 Type II.

3-3.2.4 Field Joints: The material requirements and application procedures recommended for the application of cement-mortar field joints shall be in accordance with the requirements of AWWA C205.

3-3.2.5 Factory Tests and Inspection: All materials shall be inspected and tested in a normal air-dry condition by the manufacturer prior to shipment for conformance to the stated requirements. The Public Works Department shall at all times have the right to inspect the work and materials in the course of manufacture and to make or witness such tests as required in these specifications, or as deemed advisable. In lieu of the preceding, the manufacturer shall, upon request, submit a certificate certifying that the materials are in accordance with the requirements of this specification. All testing will be done in recognized testing laboratories within the State of California approved by the Director.

3-3.3 Ductile Iron Pipe: Ductile Iron pipe shall be in accordance with the quality, strength, and testing requirements of AWWA C151.

3-3.3.1 Pipe Thickness: Determination of pipe thickness is based on internal operating pressures, external loads, and other special considerations and is determined based on the design requirements of AWWA C150 and C151.

3-3.3.2 Joints: These shall be of the rubber gasket push-on or mechanical joint type and shall be in accordance with the requirements of AWWA C111 and being of the "Tyton" type.

3-3.3.3 Fittings: All fittings shall be mechanical joint or flange ductile iron, and shall be in accordance with the requirements of AWWA C110.

3-3.3.4 Lining and Coating: Unless otherwise approved, the internal surfaces of pipes and fittings shall be lined with a uniform thickness of cement mortar and shall be in accordance with the requirements of AWWA C104.

The outside surface shall be protected with a polyethylene encasement furnished and installed and shall be in accordance with the requirements of AWWA C105.

### 3-4 MAIN LINE FITTINGS

- 3-4.1 Bends: These fittings shall be gray-iron or ductile iron fittings, and shall be in accordance with the requirements of AWWA C110. All fittings shall be rated for 250 psi. Fittings shall be mechanical joint or flange, push joint fittings are not allowed. Ductile iron compact fittings in accordance with the requirements of AWWA C153, are allowed.

Exterior and interior surfaces of fittings shall be coated with an asphaltic material and shall be in accordance with the requirements of AWWA C110.

In addition to the bitumastic coating, all exterior surfaces including nuts and bolts shall be encased with an 8-mil thick polyethylene plastic film wrap and secured with a 10-mil thick corrosion protection tape.

- 3-4.1.1 Flange Fittings: Flanges shall be standard steel hub Class E and shall be in accordance with the requirements of AWWA C207. Bolts and nuts shall be Type 316 Stainless Steel. Gaskets shall be of the drop-in gasket type, 1/8 inch thick.

- 3-4.1.2 Mechanical Joint Fittings: Mechanical joints have standardized dimensions and use the basic principal of the stuffing box and gland, with a rubber gasket being compressed by the gland. Mechanical joints shall be in accordance with the requirements of AWWA C111, which also covers the gaskets and bolts.

- 3-4.2 Flexible Couplings: Designed to connect plain end pipes with a mechanical compression joint to provide a stress relieving, flexible, leak proof joint. They can be ordered in steel or cast iron pipe sizes (C900 PVC pipe has the same O.D. as cast iron).

- 3-4.3 Transition Couplings: Designed to connect pipes of the same nominal size but different materials. AC, steel and PVC pipes can be connected to one another using a transition coupling.

- 3-4.4 Flanged Coupling Adapters: Designed to connect plain end pipe to flanged valves, pumps, meters, etc. Flanged coupling adapters eliminate the need for both a flanged spool and coupling. Generally, they are available in sizes through 12 inches.

- 3-4.5 Insulating Couplings: These are used to stop the flow of electric current across the joint by means of an insulating boot.

3-4.6 Special Steel Pipe Fittings: AWWA C208 covers special fittings such as elbows, tees, crosses, reducers, etc., and should be consulted for a specific application.

### 3-5 SERVICE LINE MATERIALS AND FITTINGS

The materials covered in this section include the service line pipe, corporation stop or gate valve, saddles, meter boxes as well as the valves inside the meter box for service lines from 1 to 2 inches and shall be in accordance with the requirements of AWWA C800.

3-5.1 Copper Pipe: Type K Copper pipe material is approved for all service lines from 1 to 2 inches. Solder fittings shall be soldered with lead-free solder only.

3-5.2 Corporation Stops: Corporation stops shall be used for 1 inch services.

3-5.3 Resilient Wedge Gate Valve: Resilient Wedge gate valves shall be used for 2 inch services.

3-5.4 Polyethylene Sleeve: All copper pipe must be encased in a continuous 6-mil thick polyethylene sleeve.

3-5.5 Corrosion Protection: All copper pipe service lines must be protected against corrosion by the installation of a prepackaged zinc anode. The weight and size of the anode shall be as specified on the plans. Anode lead wire shall be AWG No. 12 insulated stranded copper wire. Anode shall be in accordance with the requirements of ASTM B-418-95 Type II, and shall be a prepackaged zinc alloy ingot having a chemical composition not exceeding the following limits:

Aluminum	0.005 % Max.
Cadmium	0.003 % Max.
Iron	0.0014 % Max.
Lead	0.003 % Max.
Copper	0.002 % Max.
Zinc	Remainder

### 3-6 WATER METERS

Water meter types and manufacturers shall be selected and installed by the Public Works Department. Water meter sizes are the responsibility of the applicant.

### 3-7 MAIN LINE VALVES

- 3-7.1 Butterfly Valves: Butterfly valves shall be in accordance with the requirements of AWWA C504, Class 150B.
- 3-7.1.1 Valve Body: Shall be cast iron with integrally cast mechanical joint or flanged ends.
- 3-7.1.2 Valve Operators: Shall be of the manual traveling nut design. Operators shall be equipped with a 2 inch AWWA square operating nut and shall turn in a counter-clockwise direction to open the valve. They shall be sealed and gasketed and lubricated for underground service and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 foot-pounds against the stop.
- 3-7.1.3 Painting: Interior and exterior surfaces shall be coated and shall be in accordance with the requirements of AWWA C504.
- 3-7.1.4 Plastic Wrap: The entire exterior surface including nuts and bolts shall be encased with an 8-mil thick polyethylene plastic film wrap and secured with a 10-mil thick corrosion protection tape.
- 3-7.2 Resilient-Wedge Gate Valves: Resilient-Wedge gate valves shall be in accordance with the requirements of AWWA C509.
- 3-7.2.1 Valve Body: Shall be ductile iron with integrally cast mechanical joint or flanged ends.
- 3-7.2.2 Stem: Shall be nonrising stem type made of grade E bronze, and grade A bronze for the stem nut. O-rings shall be used for stem sealing. Stem shall be equipped with a 2 inch AWWA square operating nut and shall turn in a counter-clockwise direction to open the valve.
- 3-7.2.3 Coating: Interior and exterior surfaces shall be in accordance with the requirements of AWWA C509.
- 3-7.2.4 Plastic Wrap: The entire exterior surface including nuts and bolts shall be encased with an 8-mil thick polyethylene plastic

film wrap and secured with a 10-mil thick corrosion protection tape.

3-7.3 Tapping Sleeves and Valves: Tapping sleeves shall be made of stainless steel, including the bolts, nuts and washers, and shall be in accordance with the requirements of AWWA C223.

3-7.3.1 Tapping Valve: Tapping valves shall be a resilient-wedge gate valve in accordance with the requirements under Section 3-7.2 of these Standards.

3-7.3.2 Plastic Wrap: The entire exterior surface of the tapping sleeve including the valve shall be encased with an 8-mil thick polyethylene plastic film wrap and secured with a 10-mil thick corrosion protection tape.

3-7.4 Valve Stacks and Covers: Valve covers shall be traffic rated, long body, designated "WATER", color coded and painted as follows:

2" Service Line Valve	Blue
Fire Hydrant Valve	Yellow
In-Line Valve	White
Zone Valve	Red

Valve stacks shall be a two piece telescoping type consisting of an 8 inch PVC C900, SDR 35 or Schedule 40 lower section. The top section shall be an 8 inch 10-gage galvanized split steel pipe.

### 3-8 COMBINATION AIR RELEASE AND VACUUM ASSEMBLIES

3-8.1 Mechanical Assembly: Combination air release and vacuum assembly shall be made of a cast iron single body and stainless steel internal parts and shall be in accordance with the requirements of AWWA C512.

3-8.2 Enclosure: Enclosures shall be one piece construction made of durable polyethylene.

### 3-9 BLOWOFF ASSEMBLIES

3-9.1 2 Inch Blowoff: Materials for a 2 inch blowoff shall be in accordance with the requirements under Section 3-5, and as detailed on the Standard Plates.

- 3-9.2 4 and 6 Inch Blowoff: Materials for a 4 or 6 inch blowoff shall be in accordance with requirements as detailed on the Standard Plates.

### **3-10 FIRE HYDRANT ASSEMBLIES**

- 3-10.1 Hydrant Type: Fire hydrants shall be 6 inch wet barrel type and shall be in accordance with the requirements of AWWA C503.
- 3-10.2 Coating: The interior and exterior coating of fire hydrants and shall be in accordance with the coating requirements of AWWA C503. Two coats of primer are required prior to the application of the final coat. The final coat shall be of the color and manufacturer as specified in the "List of Approved Materials". After the final coat has been applied a final clear sealer shall be applied.
- 3-10.3 Outlet Configuration: The number and size of outlets shall be determined by the Ventura Fire Protection District. However, the City's minimum outlet configuration for residential fire hydrants is one 2-1/2" and one 4" outlet, and for multi-family, commercial, and industrial fire hydrants the minimum is two 2-1/2 inch and one 4 inch outlet. For projects requiring flows in excess of 3,000 gpm the minimum is one 2-1/2 inch and two 4 inch outlets.
- 3-10.4 Break-Off Check Valves: Such valves shall be utilized where there are overhead power lines directly above or proximate to the proposed fire hydrant, and in high traffic areas where the possibility of getting hit is high, or as directed by the City.
- 3-10.5 Fire Hydrant Break-Away Spool: Ductile or cast-iron spool with integrally cast flanges and machined or cast exterior grooves. Spools 12 inches or longer shall have grooves 3 inches from each flange. Spools shorter than 12 inches shall have one groove centered between the flanges. Grooves shall be  $3/16 \pm 1/16$  inch deep and  $1/4 \pm 1/16$  inch wide.
- The break-away spool shall be connected to the fire hydrant with  $3/4$ " x  $3-1/4$ " hex head machine break-away bolts. Bolts shall incorporate a  $31/64$ " x  $1-7/8$ " hole drilled in the bolt shaft and filled with silicone sealant. Bolts and nuts shall be Grade 316 Stainless Steel.
- 3-10.6 Fire Hydrant Bury: Hydrant bury shall be 6 inches inside diameter made of ASTM A536 ductile iron. The bury shall be one piece with the top having a flange drilled with 6 holes to receive the extension spool or fire hydrant. The bottom shall have a 90° bend with a mechanical joint fitting.



### 3-11 PIPE TRENCH MATERIALS

3-11.1 Pipe Zone: The pipe zone extends from the bottom of the trench to 12 inches above the top of the pipe. The material within this zone shall be a clean, well graded imported fill sand with a minimum sand equivalency (SE) of 40, and with sizes within the following ranges:

SIEVE SIZE	PERCENT PASSING
No. 4	100
No. 8	80 - 95
No. 200	0 - 10

3-11.2 Trench Zone: The materials used for backfill within the trench zone shall be clean soil, free from organic material, trash, debris, rubbish, broken portland cement concrete, bituminous materials, large rocks, or other objectionable substances.

3-11.3 Special Slurry Backfill: When pipelines are laid in an existing paved street, or as directed by the City, the trench backfill within the trench zone shall be a cement/sand slurry mix in lieu of compacted soil backfill.

### 3-12 ROADWAY MATERIALS

Pavement materials for resurfacing of trenches cut into existing pavement shall comply with the requirements of the City of Thousand Oaks Road Design and Construction Standards.

### 3-13 CONCRETE MATERIAL

Approved concrete material shall consist of portland cement, concrete aggregates, and water. Concrete shall be chosen according to the following table showing its intended use:

Type of Construction	Concrete Class (SSPWC)	Maximum Slump
Reinforced Structural Pipe Encasement	560-C-3250	5"
Thrust Blocks, Non-Reinforced Pipe Encasement, Non-Structural Use	520-C-2500	3"
Trench Backfill and Fill for Pipeline Abandonment	100-E-100	-

### 3-14 REINFORCING STEEL

3-14.1 Bar Reinforcement: Concrete reinforcing bars shall be Grade 40 minimum deformed bars in accordance with the requirements of ASTM A615, accurately and securely placed in position. Where bars are used as tie-downs in anchor or thrust blocks, they shall be coated with a bitumastic coal tar epoxy coating.

3-14.2 Mesh Reinforcement: Mesh reinforcement shall be in accordance with the requirements of ASTM A185; wire gauge and mesh dimensions will be as shown on the plans.

### 3-15 PAINTING

All paint colors and manufacturers shall be as specified in the "List of Approved Materials" appended to these Standards, or as selected by the Public Works Department. Paints shall be delivered to the job site in original, unopened cans or packages bearing the brand name and manufacturer's name.

### 3-16 GUARD/MARKER POSTS

In easements or where required on the plans, marker or guard posts shall be installed. Where no vehicular traffic is anticipated, the posts shall be 4" x 4" x 5'-6" dense structural grade redwood surfaced on all four sides and chamfered on the top. They shall be set into the ground 2'-6".

Where vehicular traffic could disturb the post or where its primary function is as a guard post, the material shall be galvanized A-120 steel pipe 4 inches in diameter and a minimum 1/4 inch wall thickness.

Unless otherwise approved, guard posts shall be painted the same color as fire hydrants.