

SECTION 7.0

MATERIAL SPECIFICATIONS FOR WATER SYSTEM EXTENSIONS

7.1 GENERAL

The materials used for the construction of water mains and all accessories and appurtenances thereof shall be new, free of defects in product and workmanship and of the highest quality available in the industry. Materials not specified but deemed equal to those specified may be approved for use provided the documentation and samples necessary for approval are provided to the Commission thirty (30) days prior to the ordering of said materials. WRITTEN APPROVAL must be issued by the Commission before such material may be used in construction. Current specifications (latest revisions) shall apply in all cases where materials are described by reference to published standards such as ASTM, AWWA, ANSI., etc.

7.2 WATER MAIN AND FITTINGS

Water mains shall be constructed of polyvinyl chloride (PVC) or ductile iron pipe (DIP) at the option of the Developer or Engineer, except in instances where the Manual or the Commission specifically requires a particular pipe material be utilized for an installation. All plastic pipe shall bear the seal of the National Sanitation Foundation.

7.2.1 PVC water main four inches and larger shall be manufactured in accordance with AWWA Standard C-900. The pipe shall have push-on type joints with elastomeric gaskets. The pipe shall be pressure rated at 150 psi with a dimension ratio of 18 for both bell and pipe thickness. Pipe shall be furnished in nominal twenty-foot (20') lengths.

7.2.2 PVC water main of two-inch (2") size shall be Class 200 SDR 21 conforming to ASTM D1784 and ASTM D2241 with "push-on" joints. Fittings shall be Schedule 80 PVC with solvent weld joints and shall bear the NSF seal. Pipe shall be furnished in nominal twenty-foot (20') lengths.

7.2.3 Tees, elbows and other fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron unless otherwise permitted or required by the Commission. Standard dimension fittings or compact fittings may be used in accordance with the requirements of this Section.

- 7.2.3.1 The interior of all fittings shall be cement mortar lined with an asphaltic coating in accordance with AWWA Standard C-104 (ANSI 21.4). The exterior of all fittings shall have a one (1) mil bituminous coating in accordance with AWWA Standard C-110 (ANSI A21.10).
- 7.2.3.2 Compact fittings shall be ductile iron with either push-on or mechanical joints in accordance with ANSI/AWWA C153/A21.53-84. Cement lining and asphaltic coating shall be provided in accordance with ANSI/AWWA C104/A21.4.
- 7.2.3.3 Standard dimension fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron with either "push-on" or mechanical joints (See Section 3.4.6.5). The fittings shall comply with all requirements of AWWA Standard C-110 (ANSI A21.10) and shall be designed for a minimum working pressure of 150 psi plus 100 psi surge pressure.
- 7.2.4 Ductile iron pipe for water mains shall be manufactured in conformance with AWWA C-151 and shall be cement-mortar lined with an asphaltic coating in accordance with AWWA C-104. The exterior of the pipe shall be bituminous coated in accordance with AWWA C-151. The minimum thickness Class of pipe shall be Class 50. Pipe shall be furnished in nominal 18 or 20 foot lengths. Pipe joints for ductile iron pipe shall be "push-on" unless the additional pipe deflection allowed by mechanical joints is necessary or other considerations dictate the use of mechanical joints (See Section 3.4.6.5). The joints for ductile iron pipe shall conform to AWWA Standard C-111 revision (ANSI, A21.11).
 - 7.2.4.1 Polyethylene encasement shall be applied to all underground ductile iron pipe and fitting installations. Materials and installation procedures shall be in accordance with ANSI/AWWA C-105/A21.5-88.
- 7.2.5 Detectable marking tape shall be installed in accordance with Section 3.4.7.6. Tape shall be three (3) inches in width with a minimum thickness of 0.5 millimeters (minimum solid center foil thickness of 0.35 millimeters). Color of the tape shall be blue meeting the American Water Works Association color code. Tape shall read: "Caution – Buried Water Line Below". Tape shall be manufactured by Lineguard, Inc., Pro-Line Safety Products Co., Empire Level Mfg. Corp., or approved equal.
- 7.2.6 Restraint Devices

- 7.2.6.1 Restraint devices for use on ductile iron and C-900 PVC “push-on” joints shall be constructed of high strength ductile iron, ASTM A536, Grade 65-45-12 and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength, low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Block Buster Series 1390-C, Star Pipe Products Allgrip series 3600 and Pipe Restrainers Series 1200S, or approved equal.
- 7.2.6.2 Restraint devices for use on mechanical joint to C-900 PVC, shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1500, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc GripRing or approved equal.
- 7.2.6.3 Restraint devices for use on mechanical joint ductile iron, shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1300-C, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc. GripRing or approved equal.

- 7.2.6.4 Locked hydrant tees and fittings for fire hydrants shall meet the requirements of AWWA Standard C-111 (ANSI A21-11). Locked tees shall be as manufactured by American Cast Iron Pipe Company, Clow, U.S. Pipe, or approved equal.
- 7.2.6.5 Bolted Couplings for PVC C-900 pipe and ductile iron pipe shall be constructed of a center sleeve and end rings of ductile iron in accordance with ASTM A536. Bolts and nuts shall be of high strength, low alloy steel per ASTM A242 and AWWA C-111. Center sleeve and end rings shall have a paint finish coat. Couplings shall be Ford Style FC1, Romac 501 Series, Smith Blair 441, or JCM 201.

7.3 MAIN VALVES AND BOXES

7.3.1 General

Main line valves for 12-inch nominal diameter mains and smaller shall be resilient-seated gate valves. All larger water main valves shall be rubber seated butterfly valves. Valve boxes shall be cast iron with traffic bearing capability.

7.3.2 Gate Valves

Gate valves shall conform to the requirements of the latest revision of AWWA Specification C-509/C-515 for resilient-seated gate valves.

- 7.3.2.1 The valve body shall be ASTM A-126 Class B cast iron or ductile iron and shall conform to ASTM A395 or ASTM A536. In addition, ductile iron shall contain no more than 0.08 percent phosphorus.
- 7.3.2.2 All interior valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating.
- 7.3.2.3 The valves shall open counterclockwise and have non-rising stem operation with 2-inch square operating nuts. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two.

- 7.3.2.4 The stem shall be of corrosion resistant material and have "O" ring seals.
- 7.3.2.5 Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow.
- 7.3.2.6 Valves shall have flange connections conforming to ANSI B16.1 Class 125 or mechanical joints conforming to AWWA C-111.
- 7.3.2.7 Valves shall be manufactured by Clow, American Flow Control or Mueller.

7.3.3 Butterfly Valves

Butterfly valves shall be rubber seated manufactured in conformance with AWWA C-504.

- 7.3.3.1 The valve body shall be ASTM A-126 Class B cast iron.
- 7.3.3.2 All interior valve parts and surfaces shall be of corrosion resistant materials or have a suitable epoxy coating recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating.
- 7.3.3.3 The shaft shall be of sufficient diameter and strength to comply with the requirements for maximum operating torque set forth in AWWA C 504 for Class 150 B.
- 7.3.3.4 Operation shall be by way of a geared actuator suitable for direct bury installations. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two. Access to the operating nut shall be provided by standard telescoping cast iron valve box in compliance with Section 7.3.4.
- 7.3.3.5 Valves shall provide a bubble tight seal with a pressure differential of 150 psi in either direction of line flow.

7.3.3.6 Valves shall have flange connections conforming to ANSI B16.1 Class 125 or mechanical joints conforming to AWWA C-111.

7.3.3.7 Valves shall be manufactured by Clow, American Flow Control, Mueller, or Pratt.

7.3.4 Valve Boxes

7.3.4.1 Valves 2" through 10" - Valve boxes shall be of cast iron suitable for H-20 loading. The manufacturer's name and part number shall be cast into each component of the box. The box shall be of the telescoping (slip) type consisting of a base section, center extensions as necessary, and a top section with a cover marked "WATER". Sections shall be selected and installed such that a minimum of four inches (4") of future adjustment (upward and downward) is possible without section removal or replacement and without the use of adapters. Valve boxes and extensions shall be either of the following:

- East Jordan Iron Works Global Cast: G-8472 Slip-Type Valve Box Series

Valve boxes shall be installed in accordance with the Standard Details.

7.3.4.2 Valves 12" and Larger – Valve box shall consist of an East Jordan Iron Works – 157801 frame and cover with a valve box bottom and extensions, as needed in accordance with Section 7.3.4.1. Installation shall be in accordance with the Standard Details.

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7.4 HYDRANTS

7.4.1 Fire Hydrants

7.4.1.1 Fire hydrants shall be in accordance with AWWA Standard C-502, latest revision thereof, suitable for an operating pressure of not less than 150 pounds per square inch and shall have a traffic breakable feature (safety flange and stem coupling), dry top, sealed lubrication reservoir and a main valve which is held closed with pressure. The hydrant body shall be of cast iron with "O" ring seals and bronze threads on the seat ring and drain ring, and shall have two (2) 2-1/2-inch nozzles with caps having National Standard threads and one (1) 5-inch nozzle with a factory fitted Storz connection and cap. The hydrant main valve shall be a minimum of 5-1/4 inches in diameter. All continuously wetted hydrant parts and surfaces shall be of corrosion resistant materials or be epoxy coated with epoxy recognized by AWWA for potable water use. The epoxy coating shall be of a color other than black (unless the word "epoxy" is stenciled on the base) to permit distinction between standard and epoxy coatings to be made easily. Hydrants shall be American Flow Control B-84-B-5, Clow Medallion or Mueller A-423.

7.4.1.2 The inlet shoe for a fire hydrant shall have a six-inch (6") inside diameter and shall be cast or ductile iron with mechanical joint fittings in accordance with AWWA Standard C-110.

7.4.2 Hydrants for Blow-Offs

7.4.2.1 Blow-offs as provided for in Section 3.2.10.1 of the Manual shall be standard fire hydrants meeting the requirements of Section 7.4.1(above).

7.4.2.2 Blow-offs as required by Sections 3.2.10.2 and 3.2.10.3 of the Manual shall be as shown in the Standard Details.

7.5 WATER SERVICE MATERIALS

7.5.1 Materials for ¾" and 1" Services

The materials for ¾" and 1" services are identical except for the meter which is installed by the Commission. Also, materials for 1-1/2" and 2" services are identical except for the meter vault which is installed by the Commission.

7.5.1.1 Service saddles shall be made of materials conforming to AWWA copper alloy No. C83600 with 1" (AWWA) CC outlet thread and an O-Ring cemented in a confined groove. Service saddles shall be only those listed below.

TYPE MAIN	DIA	APPROVED SADDLE MFS & MOD #
PVC (IPS)	2"	Ford S70-204, Hayes 527A.0400 Series, Mueller H-13420, A Y McDonald Style 3801
ACP/DIP/CIP	4"-12"	Ford Style 202B, AY McDonald #3825 Mueller BR 2 B Series
PVC (C-900)	4"-12"	Ford S90 Series, Hayes 529 Series, Mueller H-13440 through H-13444 Series, A Y McDonald Style 3805
PVC (Sch 40 & IPS) Steel Pipe	4"-12"	Ford S70 Series, Hayes 527 Series, Mueller H-13428 through H-13435 Series, A Y McDonald Style 3801

7.5.1.2 One inch (1") corporation stops shall be bronze body with (AWWA) CC tapered threaded inlet and compression connection outlet. Stops shall be Hayes 4400CJ, Mueller P-15008, Ford F1000-4, A Y McDonald 4701-22, or approved equal.

7.5.1.3 Service tubing shall be one inch (1") diameter seamless copper type K suitable for underground water services. Materials shall be supplied in conformance with ASTM B88, type K.

7.5.1.4 One inch (1") angle ball valve meter stops shall be bronze body with compression seal inlet connection and threaded outlet for meter connection. Stops shall be Ford BA43-444W, Hayes 2520CJ, A Y McDonald 4602B-22, Mueller P-24258 or approved equal.

7.5.1.5 Service Couplings for 1" water services shall be bronze body with compression seal inlet connections with a stainless steel set screw. Couplings shall be Ford C44-44, Hayes 5615CJ, A Y McDonald 4758-22, Mueller P-15403, or approved equal.

7.5.1.6 Water meter boxes shall be manufactured of Class 30 cast iron in conformance with ASTM-A48 (latest revision thereof). The manufacturer's name and part number shall be cast into each component and the words "water meter" shall be cast into the cover. Boxes shall be Vulcan Foundry G8404-1 Frame with G-8404 lid, Sigma MB 382 or Capitol Foundry MBX-1.

7.5.2 Materials for 1-1/2" and 2" Services

7.5.2.1 Service saddles shall be made of materials conforming to AWWA copper alloy No. C83600 with 2" (NPT) FIP outlet thread and an O-Ring cemented in a confined groove. Service saddles shall be only those listed below.

TYPE MAIN	DIA	APPROVED SADDLE MFS & MOD #
PVC (IPS & Sch 40)	4"-12"	Ford S71 Series, Hayes 527P Series, A Y McDonald Style 3802
ACP/DIP/CIP	4"-12"	Ford Style 202B, AY McDonald #3826 Mueller BR 2 B Series
PVC (C-900)	4"-12"	Ford S91Series, Hayes 529P Series, Mueller H-13490 through H-13494 Series, A Y McDonald Style 3806

7.5.2.2 Ball valves shall be bronze body with tee head. The turn required to travel from fully closed to fully open position shall be 90 degrees. Ball valves shall incorporate a check allowing a maximum turn of 90°. Ball valves shall be Hayes 4300, Ford B11-777 A Y McDonald 6101, Mueller B-20283 or approved equal.

7.5.2.3 Service pipe shall be PVC Class 200 (IPS) conforming to the latest revisions of ASTM D1784 and ASTM D2241. The pipe joints shall be of the integral bell type with rubber gaskets conforming to ASTM D3139 and F477.

The pipe shall be SDR 21 and shall bear the National Sanitation Foundation seal for potable water. Fittings shall be schedule 80 PVC with solvent weld joints.

7.5.3 Materials for Services Larger Than 2"

The materials for services larger than 2" shall be identical to those required for water mains.

7.6 BACKFLOW PREVENTION ASSEMBLIES

Control assemblies such as reduced pressure principal assemblies, double check valve assemblies and double detector check valve assemblies shall be limited to those approved by the Commission and the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California. Devices shall be utilized where required by Section 18 of the Terms and Conditions.

7.7 TAPPING SLEEVES

Tapping sleeves shall be all stainless steel body and flange with a full circumferential gasket, or ductile iron body, mechanical joint designed to accommodate a minimum operating pressure of 150 pounds per square inch. All tapping sleeves shall be pressure tested prior to tapping the main. Stainless steel tapping sleeves shall be Ford Model FAST, JCM Model 432, Mueller Model H304 or Romac Model SST. Ductile iron body, mechanical joint sleeves shall meet the requirements of Section 7.2.3 of this Manual.

7.7.1 Tapping Valves

Tapping valves shall conform to the requirements of the latest revision of AWWA Specification C-509 for resilient-seated gate valves. The valve body shall be ASTM A-126 Class B cast iron. All internal valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating. The valves shall open counterclockwise and have non-rising stem operation with a two-inch square operating nut. The maximum number of

turns required to fully open or close the valve shall equal three times the pipe diameter plus two.

The stem shall be of corrosion resistant material and have O-ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall have a flange connection conforming to ANSI B16.1 Class 125 and a mechanical joint conforming to AWWA C-111. Valves shall be manufactured by Mueller, Clow or American Flow Control. Tapping valves shall be installed and pressure tested prior to tapping the water line.

7.8 AIR RELEASE VALVES

Air release valves shall be manually operated valves unless otherwise required by the Commission.

7.8.1 Manual Air Release Valves

Manual air relief valves shall be of materials identical to those of a one-inch (1") service with the exception that 1) a service saddle or clamp is required (no direct tapping is permitted), and 2) the tap shall be made at the top (crown) of the main.

7.8.2 Automatic Air Release Valves

Automatic air release valves shall be small orifice valves designed for the working pressure which will exist in the main at the point of placement. The design and selection of automatic air release valves shall be in accordance with the direction of the Commission and shall be handled on a case by case basis.

7.9 STEEL ENCASEMENT PIPE

7.9.1 Steel encasement pipe shall be spiral welded or smooth wall seamless, consisting of grade "B" steel with a minimum yield strength of 35,000 psi and manufactured in accordance with ASTM A139 and A283. The pipe thickness shall be in accordance with the requirements of the right-of-way owner, but in no case less than that shown in the following table. The ends shall be beveled and prepared for field welding at the circumferential joints.

MINIMUM WALL THICKNESS FOR STEEL ENCASEMENT PIPE

Nominal Diameter in inches	Minimum Thickness in inches
4-12 3/4	0.188
14	0.219
16-18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28-30	0.406
32	0.438
34-36	0.469
38-42	0.500

- 7.9.2 The encasement pipe shall be uncoated inside and out unless required otherwise by the right-of-way owner or the Commission.
- 7.9.3 Encasement pipe and joints shall be of leak proof construction, capable of withstanding design loading. The inside diameter of the encasement pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and larger in diameter. In general, to determine the casing size you should double the size of the carrier pipe, i.e., a 6" carrier pipe requires a 12" casing pipe. The engineer shall verify the clearance is sufficient to allow the carrier pipe to be removed without disturbing the casing pipe.