

DIVISION III

MATERIAL REQUIREMENTS

SECTION 1: DUCTILE IRON PIPE AND FITTINGS

1.01 Pipe Classification

- A. Ductile iron (push-on) pipe four (4) inches and six (6) inches in diameter shall be Class 51 in accordance with ANSI/AWWA C151/A21.51, latest revisions.
- B. Ductile iron (push-on) pipe eight (8) inches in diameter and larger shall be Class 50, unless noted otherwise, in accordance with ANSI/AWWA C151/A21.51, latest revisions.
- C. Ductile iron flanged pipe shall have a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C115/A21.15, latest revisions.
- D. Ductile iron restrained-joint pipe shall be of the flex-ring type having a welded bead lock ring or pipe fitted with a fast-grip type gasket having a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C151/A21.51, latest revisions.

1.02 Fitting Classification

- A. Ductile iron fittings for use with push-on joint pipe shall be standard mechanical with gland restraint, compact series, with a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C151/A21.51, latest revisions.
- B. Use of push-on joint type fittings and lugged restraining glands shall not be permitted, unless otherwise indicated.
- C. Ductile iron flanged fittings shall be in accordance with ANSI/AWWA C110/A21.10, latest revision. Flanged fittings up to twelve (12) inches in size shall have a minimum pressure rating of 350 psi. Flanged fittings over twelve (12) inches in size shall have a minimum pressure rating of 250 psi.
- D. Ductile iron restrained-joint fittings shall be of the flex-ring type or fitting fitted with a fast-grip type gasket having a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C153/A21.53, latest revisions.

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1.03 Gaskets and Bolted Connections

- A. Gaskets for push-on and standard mechanical joints shall be plain rubber (Styrene Butadiene Copolymer) in accordance with ANSI/AWWA C111/A21.11, latest revisions.
- B. Gaskets for restrained joints shall be plain rubber (Styrene Butadiene Copolymer) modified with ductile iron or stainless steel teeth in accordance with ANSI/AWWA C111/A21.11, latest revisions.
- C. Gaskets for flanged joints shall be 1/8-inch thick, full-faced, clothed reinforced rubber in accordance with ANSI/AWWA C110/A21.10 and C115/A21.15, latest revisions.
- D. Bolts and nuts used for standard mechanical connections shall be tee head type with heavy hex nut conforming to ASTM A563 in accordance with AWWA C111.
- E. Bolts and nuts used for flanged connections shall be hex type of low carbon steel, cadmium plated or zinc plated conforming to ASTM A307 in accordance with AWWA C110 and C115.

1.04 Coatings and Linings

- A. Ductile iron pipe and fittings placed on or beneath the ground surface shall have an exterior coating of asphalt (one mil) in accordance with ANSI/AWWA C151/A21.10, latest revisions.
- B. Ductile iron pipe and fittings placed above the ground surface shall have an exterior manufacturer applied universal phenolic primer (one mil) capable of accepting an epoxy coating. Finish coat shall be in accordance with Division III, Section 12.

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- C. Ductile iron pipe that crosses or runs parallel to a gas transmission main, which is or may be cathodically protected, shall be encased in polyethylene tubing, eight (8) mil minimum thickness, and taped in accordance with ANSI/AWWA C105/A21.5.
- D. Ductile iron pipe and fittings used in the distribution of potable water shall be cement lined in accordance with ANSI/AWWA C104/A21.4, latest revisions.
- E. Ductile iron pipe and fittings used in sanitary sewer systems shall be cement lined in accordance with ANSI/AWWA C104/A21.4, latest revision and cement lining sealed with asphalt in accordance with ANSI 21.10, latest revision and AWWA C110, C115, C151 or C153, latest revisions.
- F. Ductile iron fittings in lieu of an asphalt coating and cement lining may be coated and lined with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16. Fittings shall be listed by a certifying agency that the coating complies with ANSI/NSF 61.

1.05 Pipe Marking

The following information shall be cast in or stamped on each pipe.

- A. Weight, class or nominal thickness.
- B. Casting period.
- C. Manufacturer's identifying mark.
- D. Year the pipe was manufactured.
- E. The letters "DI" or "DUCTILE".

Acceptable Manufacturers

Ductile iron pipe and fittings shall be domestically manufactured.

1. American Cast Iron Pipe Company.
2. U.S. Pipe Company.
3. Other Approved.

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SECTION 2: STEEL PIPE AND FITTINGS

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2.01 Pipe Classification.

- A. Steel pipe shall have a minimum wall thickness of 0.25 inches and be in accordance with ASI standards.
- B. Wall thickness shall be increased as necessary to minimize deflection and deformation.

2.02 Coatings and Linings

- A. Steel pipe used for water distribution and sewer shall be coated and lined in accordance with Division III, Section 12.
- B. Steel pipe used as casing shall not require a coating or lining unless otherwise indicated.

Acceptable Manufacturers

Steel pipe shall be domestically manufactured.

1. As Approved.

DIVISION III
SECTION 3: COPPER PIPE AND FITTINGS

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3.01 Pipe Classification

- A. Buried service three-quarter ($\frac{3}{4}$) inches in diameter to one (1) inch in diameter shall be seamless, annealed copper tube conforming to the requirements of ASTM B-88, Type "K".
- B. Buried service greater than one (1) inch in diameter shall be hard-drawn copper tube conforming to the requirements of ASTM B-88, Type "L".
- C. All exposed or above-ground service shall be hard-drawn copper tube conforming to the requirements of ASTM B-88, Type "L".

3.02 Fittings

- A. Fittings for annealed copper tube, Type "K", shall be brass flared type conforming to ASTM B-16 or B-124.
- B. Fittings for hard-drawn copper tube, Type "L", shall be wrought copper conforming to ASTM B-75 and ANSI B16.22 for silver brazed joints. Lead free solder and flux shall be used in making connections.
- C. Meter couplings and tail pieces shall be cast brass threaded type.

Acceptable Manufacturers

Copper components shall be domestically manufactured.

1. As Approved.

DIVISION III
SECTION 4: PVC PIPE

MATERIAL REQUIREMENTS

4.01 Casing for Copper Pipe

- A. PVC pipe shall be used as a casing for copper water service lines that are to be installed under pavement.
- B. PVC pipe used as a casing shall be a minimum of Schedule 40, Class 200.
- C. PVC casing pipe shall have a minimum diameter of two (2) inches.

4.02 Sewer Pipe Classification

- A. PVC pipe used as sewer shall be SDR 26 push-on joint type with O-rings in accordance with ASTM 3034.
- B. Gaskets shall be plain rubber.

4.03 Sewer Pipe Fitting Classification

PVC fittings shall be in accordance with ASTM 3034.

Acceptable Manufacturers

PVC pipe shall be domestically manufactured.

1. As Approved.

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SECTION 5: VALVES

5.01 Gate Valve

- A. Gate valves three (3) inches in diameter and smaller shall be as follows.
 - 1. Valves shall be all brass or bronze construction.
 - 2. Valves shall have solid wedge gate, rising stem, and threaded bonnet.
 - 3. Valve end connections shall be compatible with pipe material in which valve is installed.

- B. Gate valves four (4) inches in diameter and larger shall be as follows.
 - 1. Water supply service shall be in accordance with AWWA 509 for resilient seated valves.
 - 2. Water supply service shall be in accordance with AWWA 515 for reduced wall thickness resilient seated valves.
 - 3. Valve body shall be ductile iron with all exterior surfaces coated with a fusion-bonded epoxy coating.
 - 4. Valves shall be bronze mounted, beveled geared, with a non-rising stem and O-ring stem seals.
 - 5. All exposed fasteners, nuts and bolts shall be stainless steel.
 - 6. Valves shall open in a counter-clockwise direction.
 - 7. Valve end connections shall be flanged or standard mechanical.
 - 8. Buried valves shall be nut operated; non-buried valves shall have hand-wheel operators.

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SECTION 5: VALVES

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- C. Gate valves used in conjunction with a tapping saddle shall be as follows:
1. Offset type that allows the tapping device to mount to the pipe and pass through the opened valve.
 2. End connection to the tapping sleeve shall be flanged. End connection to accept pipe shall be mechanical joint.
- D. Gate valves four (4) inches and larger shall be coated as follows.
1. Valve placed on or beneath the ground surface shall have an exterior coating of asphalt (one mil) in accordance with ANSI/AWWA C151/A21.10, latest revisions.
 2. Valve Ductile iron fittings in lieu of an asphalt coating may be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16. Fittings shall be listed by a certifying agency that the coating complies with ANSI/NSF 61.
- D. The following information shall be cast in or stamped on each gate valve.
1. Manufacturer's identifying mark.
 2. Pressure Class.
 3. The letters "DI" or DUCTILE.
 4. Place of Manufacturing.

Acceptable Manufacturers

Valves shall be by a domestic manufacturer that produces only ductile iron bodied valves.

1. American Darling.
2. U.S. Pipe Company.
3. Mueller Company – Ductile Iron Valves only.
4. M&H Valve Company – Ductile Iron Valves only.
5. Clow Valve Company.

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SECTION 5: VALVES

5.02 Butterfly Valve

- A. Valves shall be in accordance with AWWA C504.
- B. Materials used in the fabrication of the valve shall meet all related requirements of ASTM.
- C. Valve bodies shall be ductile iron with integrally cast flanged ends or standard mechanical ends. Flange drilling shall be in accordance with ANSI B16.1. Two trunnions for shaft bearings shall be integrally cast with valve body.
- D. Valves shall be bubble tight at rated pressures with flow in either direction and shall be capable of throttling service.
- E. Valve disc shall rotate 90° from full open position to tight shut position.
- F. Valves shall be tight closing, rubber seated with seats applied to the body or disc. Valve seats on 30 inch and larger diameter valves shall be field adjustable and replaceable without dismounting operator, disc or shaft and without removing valve from pipe. Mating seat shall be stainless steel or Monel.
- G. Valves shall be fitted with sleeve type bearings contained in hubs of valve body. Bearings shall be corrosion resistant and self-lubricating.
- H. Valve operators shall hold valve in any intermediate position between full open and full close without creeping or fluttering.
 - 1. Manual operators shall be worm gear or traveling nut type and shall be fully enclosed.
 - 2. Valves for buried service shall be furnished with a ground level valve position indicator unless otherwise approved by the WCW&SA Executive Director.
 - 3. Valves for above ground service shall be furnished with a valve position indicator arrow to give valve position at any point from full open to full close.

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4. Valves shall open when turning operator in a counter-clockwise direction.
- I. Valves shall be coated as follows.
 1. Valve placed on or beneath the ground surface shall have an exterior coating of asphalt (one mil) in accordance with ANSI/AWWA C151/A21.10, latest revisions.
 2. Valve in lieu of an asphalt coating may be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16.
 3. Valve placed above the ground surface shall have an exterior manufacturer applied universal phenolic primer (one mil) capable of accepting an epoxy coating. Finish coat shall be in accordance with Division III, Section 12.

Acceptable Manufacturers

1. M&H.
2. Pratt
3. Clow Valve Company
4. Other Approved.

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SECTION 5: VALVES

5.03 Double Check Valve

- A. Double check valves shall be in accordance with AWWA 506, ASSE 1013 and USC-FCCC. Check valves shall be UL listed and approved by FMR.
- B. Double check valves $\frac{3}{4}$ inch in diameter through two (2) inches in diameter shall be bronze bodied having corrosion resistant moving parts with bronze threaded unions on both sides of the device.
- C. Double check valves 2-1/2 inch in diameter and larger shall be bronze, cast iron or ductile iron bodied having corrosion resistant moving parts with flanged end connections.
- D. Double check valves with reduced pressure zone assemblies shall have a sufficient air gap at the relief port and discharge shall drain away from the assembly.
- E. Double check valve assemblies shall be equipped as standard with four (4) test cocks and two (2) resilient seated shut off valves.
- F. Valve may be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16.
- G. Valve may have an exterior manufacturer applied universal phenolic primer (one mil) capable of accepting an epoxy coating. Finish coat shall be in accordance with Division III, Section 12.

Acceptable Manufacturers – Product

- 1. Watts - Double Check (3/4" to 2"): U007QT.
- 2. Watts - Double Check (3" to 10"): 709 or 775 W/OSY Valves.
- 3. Wilkins - Double Check (3" to 10"): 350 or 950 W/OSY Valves.
- 4. Watts - Reduced Pressure Zone Check Valve (3/4" to 2"): 909S-QT.
- 5. Watts - Reduced Pressure Zone Check Valve (3" to 6"): 909 W/OSY Valves.
- 6. Wilkins - Reduced Pressure Zone Check Valve (3" to 6"): 375 or 975 W/OSY Valves.
- 7. Other Approved.

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SECTION 5: VALVES

5.04 Corporation Valve

- A. Corporation valves shall be of the ball valve type and manufactured of bronze in conformance with ASTM B61, ASTM B62 and NSF 61.
- B. Corporation valves shall withstand a working pressure of 150 psi.
- C. Corporation valves shall have crosscut threading, for direct tap into pipe, and a flared copper outlet.
- D. Corporation valves shall be $\frac{3}{4}$ inch or one (1) inch in size as required by the service.

Acceptable Manufacturers

Corporation valves shall be domestically manufactured.

- 1. Ford Meter Box Co.
- 2. Mueller Brass.
- 3. A.Y. McDonald Mfg.
- 4. Other Approved.

5.01 Curb Stop

- A. Curb stops shall be of the ball valve type and manufactured of bronze in conformance with ASTM B61, ASTM B62 and NSF 61.
- B. Curb stops shall withstand a working pressure of 150 psi.
- C. The internal ball shall be manufactured of low carbon steel coated with brass.
- D. Internal O-rings and seats shall be of Buna-N.
- E. Curb stops shall be fitted with iron pipe threads on the influent side and flared copper on the discharge side.

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- F. Curb stops shall be fitted with wing locks suitable to accept a keyed padlock.
- G. Curb stops shall be ¾ inch, one (1) inch or two (2) inches in size as required by the service.

Acceptable Manufacturers

Curb stops shall be domestically manufactured.

- 1. Ford Meter Box Co. for ¾ inch and 1 inch sizes.
- 2. Mueller Brass.
- 3. A.Y. McDonald Mfg.
- 4. Other Approved.

5.06 Valve Box

- A. Valve boxes shall be of the two-piece type and manufactured of cast iron.
- B. Valve boxes shall have an internal diameter of 5.25 inches.
- C. Valve boxes shall be fitted with a cast iron cover with the word “WATER” or “SEWER” integrally cast in the cover depending on the service.

Acceptable Manufacturers

- 1. Bingham-Taylor.
- 2. Other Approved.

DIVISION III
SECTION 6: TAPPING SLEEVES

MATERIAL REQUIREMENTS

6.01 Tapping Sleeve

- A. Tapping sleeves shall be of the split type and manufactured of ductile iron or stainless steel (preferred). Stainless steel sleeve shall be used when tapping cast iron pipe. Ductile iron shall conform with ANSI/AWWA standards. Stainless Steel shall be type 304 (18-8).
- B. Gaskets shall be virgin nitrile (Buna-N, NBR).
- C. Sleeve outlet shall be flanged or mechanical joint in accordance with ANSI/AWWA C110/A21.1.

Acceptable Manufacturers – Product

- 1. U.S. Pipe – T28 on ductile iron main only.
- 2. Power Seal– Part No. 3490 (stainless steel) on cast iron and ductile iron mains.
- 3. Smith Blair – Part No. 663 or 665 (stainless steel) on cast iron and ductile iron mains.
- 4. Ford Meter Box– FTSS (stainless steel).
- 5. Romac for 1-1/2 inch and 2 inch taps.
- 6. Other Approved.

6.02 Tapping Saddle

- A. Tapping saddles shall be stainless steel. Ductile iron shall conform with ANSI/AWWA standards. Stainless Steel shall be type 304 (18-8).
- B. Stainless steel saddles shall be used when tapping for 1-1/2 inch or 2 inch service lines.
- C. Tapping saddles shall seal with pipe by an O-ring gasket virgin nitrile (Buna-N, NBR).
- D. Saddle outlet to pipe shall be flanged or tapped with pipe threads.

Acceptable Manufacturers - Product

- 1. Smith Blair – 372 for pipe diameters 4 inches through 12 inches.
- 2. Powerseal – 3412AS for pipe diameters 3 inches through 12 inches.
- 3. Powerseal – 3416AS for pipe diameters 14 inches through 36 inches.
- 4. Ford Meter Box– FS 303.
- 5. Romac - 306 for pipe diameters 3 inches through 12 inches.
- 6. Romac - 305 for pipe diameters 14 inches through 24 inches.
- 7. Other Approved.

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SECTION 7: WATER METERS

7.01 Residential and Light Commercial

- A. Water meters shall be positive displacement type with oscillating piston or rotating disk having a magnetic drive conforming to AWWA C-700 and a sealed register conforming to AWWA C-707.
- B. Meters shall be capable of operating up to a working pressure of 150 psi and have an operating flow range shown on the following table.

SIZE (in)	OPERATING FLOW RANGE (gpm)	LOW FLOW REGISTRATION
3/4	0.75 to 35	97% at 3/8 gpm
1	1.25 to 70	95% at 3/4 gpm
1-1/2	2.5 to 120	95% at 1-1/4 gpm
2	2.5 to 170	95% at 2 1/2 gpm

- C. Meter outer case shall be constructed of Water Works bronze (minimum 75% copper content) and shall be split case. External fasteners shall be corrosion resistant.
- D. The size of the meter and a flow direction arrow shall be cast in raised figures on the outer casing. The manufacturer serial number shall be permanently affixed to the outer case and shall be visible from the topside.
- E. The sealed register shall be of the straight reading type and have a full test dial on the face. The register shall be fitted with an external or internal locking device so that the register can only be removed with specialized tools.
- F. Meters shall have a corrosion resistant strainer that is easily removed without the meter itself being disconnected from the service line.
- G. The register shall measure flow in gallons and shall be read by visual inspection and radio relay. The electronic register shall be provided to function with reading devices as manufactured by Itron, Inc.

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H. Meter connections to 3/4 inch and one (1) inch service lines shall be with a meter spud. Meter connections to 1-1/2 inch and two (2) inch service lines shall be with a two (2) bolt flange.

Acceptable Manufacturers

1. Neptune R-900 Meter
2. Other Approved.

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7.02 Commercial and Industrial

- A. Water meters shall be Class I or II turbine type with magnetic drive, reduction gearing and straightening vanes conforming to AWWA C-700 and the register shall be permanently hermetically sealed conforming to AWWA C-707.
- B. Meters shall be capable of operating up to a working pressure of 150 psi and have an operating flow range shown on the following table.

SIZE (in)	OPERATING FLOW RANGE (gpm)	LOW FLOW REGISTRATION
* 1-1/2	4 to 200	98.5% at 2.5 gpm
* 2	4 to 310	95% at 2.5 gpm
3	5 to 550	95% at 4 gpm
4	4 to 1,250	95% at 2.5 gpm
6	4 to 2,500	95% at 2.5 gpm
8	4 to 4,500	95% at 2.5 gpm
10	4 to 7,000	95% at 2.5 gpm

* For fire service in building and irrigation service only.

- C. Meter outer case shall be constructed of Water Works bronze (minimum 75% copper content) and shall be split case. External fasteners shall be corrosion resistant.
- D. The size and model of the meter and a flow direction arrow shall be cast in raised figures on both sides of the outer casing. The manufacturer serial number shall be permanently affixed to the outer case and shall be visible from the topside.
- E. Meters shall have a separate measuring chamber that shall be easily removable from the outer case. The measuring chamber shall be constructed of Water Works bronze (minimum 85% copper content).

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- F. The register shall be of the straight reading type and have a full test dial on the face. The register shall be fitted with an external or internal locking device so that the register can only be removed with specialized tools.

- G. The register shall measure flow in gallons and shall be read by visual inspection and radio relay. The electronic register shall be provided to function with reading devices as manufactured by Itron, Inc.

- H. The meter shall have internal straightening vanes installed on the meters inlet. The straightening vanes shall be easily removable. The straightening vanes shall not be cast as part of the main case or molded as part of the measuring chamber.

- I. The meter shall be equipped with either an internal or external strainer as shown in the following table and detailed in items “K” and “L”.

METER STRAINER SIZE (in)	STRAINER CONFIGURATION
1-1/2 to 4	Internal with Test Port
1-1/2 to 4	External Bronze
6 to 10	External Ductile Iron/Cast Iron

- J. Where meters are equipped with an internal strainer, the strainer shall be cast as part of the meter’s main case. The internal strainer screen and cover plate shall be located at the meter’s inlet between the inlet flange and measuring chamber. The internal strainer screen shall be of the V-shape design and externally accessible without disturbing the meter’s pipeline setting or measuring chamber assembly. A test port of adequate capacity shall be located on the meter’s main case adjacent to the outlet flange. The strainer shall be listed by UL and approved by FMR.

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- K. Where meters are equipped with an external strainer, the strainer and cover plate shall be located at the meter's inlet between the inlet flange and measuring chamber. The strainer screen shall be of the V-shape design and accessible without disturbing the meter's pipeline setting or measuring chamber assembly. The strainer shall be listed by UL and approved by FMR.

- L. Meter connection to the service line shall be flanged, Class 125# and conform to ANSI 16.1 for diameter, drilling pattern and thickness. Where companion flanges are required, flanges shall be cast iron and tapped with American Standard internal taper pipe threads. Bolts, nuts and gaskets associated with companion flanges shall be provided for connection to the meter only.

Acceptable Manufacturers

- 1. Neptune Radio Read Meter
- 2. Other Approved.

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SECTION 7: WATER METERS

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7.03 Fire Service

- A. Water meters shall be Class II turbine type with magnetic drive, reduction gearing and straightening vanes conforming to AWWA C-703 and the register shall be permanently hermetically sealed conforming to AWWA C-707.
- B. Meters shall be capable of operating up to a working pressure of 150 psi and have an operating flow range shown on the following table.

SIZE (in)	OPERATING FLOW RANGE (gpm)	LOW FLOW REGISTRATION
4	10 to 1,250	95% at 6 gpm
6	20 to 2,500	95% at 15 gpm
8	30 to 4,500	95% at 20 gpm
10	50 to 7,000	95% at 30 gpm

- C. Meter outer case shall be constructed of Water Works bronze (minimum 75% copper content) and shall be split case. External fasteners shall be corrosion resistant.
- D. The size and model of the meter and a flow direction arrow shall be cast in raised figures on both sides of the outer casing. The manufacturer serial number shall be permanently affixed to the outer case and shall be visible from the topside.
- E. Meters shall have a separate measuring chamber that shall be easily removable from the outer case. The measuring chamber shall be constructed of Water Works bronze (minimum 85% copper content).
- F. The register shall be of the straight reading type and have a full test dial on the face. The register shall be secured by means of a locking device located in the interior of the outer case so that the register can only be removed with specialized tools.

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- G. The register shall measure flow in gallons and shall be read by visual inspection and radio relay. The electronic register shall be provided to function with reading devices as manufactured by Itron, Inc.
- H. The meter shall have internal straightening vanes installed on the meters inlet. The straightening vanes shall be easily removable. The straightening vanes shall not be cast as part of the main case or molded as part of the measuring chamber.
- I. The meter shall be equipped with an external strainer as listed by UL and approved by FMR. The strainer assembly shall be ductile iron and located upstream of the meter's inlet flange. The strainer screen shall be stainless steel and V-shape design. The strainer screen shall have a net open area at least four (4) times that of the pipe opening. The strainer screen shall be accessible without disturbing the meter's pipeline setting or measuring chamber assembly.
- J. Meter connection to the service line shall be flanged, Class 125# and conform to ANSI 16.1 for diameter, drilling pattern and thickness. Where companion flanges are required, flanges shall be cast iron and tapped with American Standard internal taper pipe threads. Bolts, nuts and gaskets associated with companion flanges shall be provided for connection to the meter only.

Acceptable Manufacturers

- 1. Neptune Radio Read Meter
- 2. Other Approved.

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7.04 Fire/Domestic Combination Service

- A. The fire portion of the combination service shall comply with Division III, Section 7.03.
- B. The domestic portion of the combination service shall comply with Division III, Section 7.02 and be accomplished via by-pass piping. By-pass piping shall be brass with threaded connections. Domestic service piping shall be 1-1/2 inches in diameter for a four (4) inch fire service. Domestic service piping shall be two (2) inches in diameter for a six (6) inch and larger fire service.
- C. The by-pass assembly shall be fitted with a bronze bodied check valve situated immediately downstream of the meter. The check valve shall be UL listed and approved by FMR. The use of electronic switching devices or spring loaded check valves shall be prohibited.
- D. The by-pass assembly shall be fitted with two (2) lockable bronze bodied ball valves; one (1) situated upstream of the meter and one (1) situated downstream of the check valve.

7.05 Water Meter Boxes (Residential and Light Commercial)

- A. Meter assemblies ranging in size from 3/4 inch to two (2) inches shall be housed in meter boxes manufactured from high-density polyethylene or fiber reinforced plastic.
- B. Meter box lids shall be fiber reinforced plastic. Minimum outside dimensions of the lid shall be 16-5/8 inches by 11-7/16 inches. Down legs on each corner shall be a minimum of 1-1/2 inches long.

Acceptable Manufacturers

- 1. D/FW Plastics.
- 2. CDR – 24 inches by 60 inches for 1-1/2 inch and 2 inch meter assemblies.
- 3. Other Approved.

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7.06 Water Meter Vaults (Commercial and Industrial)

- A. Vaults shall be constructed of concrete block, pre-cast concrete or cast-in-place concrete (preferred).
- B. Vaults shall be designed to withstand a minimum H-10 Line Load. Additional design strength may be required.
- C. Vaults shall be sized to the following inside dimensions: 8 ft x 8 ft x 6 ft (min.) depth and 12 ft x 8 ft x 6 ft (min.) depth.
- D. Meter vaults shall have a minimum six (6) inch thick concrete reinforced base slab. A 12 in x 12 in drain opening shall be cast in the slab. The drain shall be serviced by a 12 inch bed No. 57 stone wrapped with geofabric. The bed of No. 57 stone shall extend to the edges of the excavation.
- E. Where vaults are constructed of concrete block, the block shall be 8"x12"x16" in size. Each block wall cell shall be reinforced vertically to a minimum with a No. 5 bar, tied to the slab reinforcing. Block cells shall be filled with a minimum 3,000 psi grout. Longitudinal joints between blocks shall be reinforced with wire.
- F. Where vaults are constructed of pre-cast or cast-in-place concrete, the walls shall be a minimum of six (6) inches thick and steel reinforced. Wall reinforcing shall be tied to the slab reinforcing.
- G. Vaults shall be covered with a removable pre-cast concrete cover. The cover shall be a minimum of six (6) inches thick and steel reinforced. Cover shall be sealed to top of walls using neoprene gasket material.
- H. Where two (2) pre-cast vaults are situated together to form one (1) larger vault, each of the two (2) vaults shall have their separate cover.
- I. An aluminum access hatch, minimum 48 inches by 72 inches in size shall be cast in the cover slab. The access hatch shall be situated as shown on details.

DIVISION III
SECTION 7: WATER METERS

MATERIAL REQUIREMENTS

- G. Bottom side of the meter assembly shall have a minimum twelve (12) inch clearance from the top of the floor slab.
- H. Meter assembly shall be supported at a minimum of two (2) points by galvanized pipe saddles. Backflow assembly shall be supported at a minimum of one (1) point by galvanized pipe saddles. Pipe saddles shall be capable of carrying the weight of the assembly. Pipe saddle height shall be adjustable via screw jack. Pipe saddle shall have a minimum four (4) inch square base, one-quarter (1/4) inch thick.
- I. Pipe penetrations (annulus between concrete and outside face of pipe) shall be sealed with expanding foam.
- J. Vault cover shall extend three (3) inches above finished grade.

Acceptable Manufacturers

- 1. As Approved.

7.07 Vault Access Hatches

- A. Vault access shall be via aluminum double hatch having a minimum clear opening of 48 inches by 72 inches. Clear opening dimensions may be increased.
- B. Access shall be rated to withstand a minimum H-10 Line Load. Design strength of access hatch may be increased.
- C. Access hatch shall have a manual locking arm device to prevent hatch lids from closing.
- D. Access hatch shall be capable of being secured using a keyed lock.

Acceptable Manufacturers

- 1. As Approved.

DIVISION III
SECTION 8: HYDRANTS

MATERIAL REQUIREMENTS

8.01 Fire Hydrant

- A. Fire hydrants shall be of the compression type, closing with line pressure, complying with AWWA C502 for 150 psi working pressure and NFPA, 1993 edition.
- B. Hydrants shall have a non-freeze design and an automatic drain that closes fully when hydrant valve is opened.
- C. Hydrants shall be furnished having factory burying depths of 4'-6" or 5'-0". Deeper burying depths shall be accomplished using extension kits provided by same manufacturer. Break-away device shall be situated +/- 3 inches from finished grade.
- D. Hydrant standpipe, fittings and upper barrel shall be ductile iron. Parts designed to break away may be cast iron.
- E. Hydrant bolts below ground level shall be stainless steel.
- F. Hydrant lead to main line connection shall be mechanical joint.
- G. The means of attaching the barrel to the standpipe shall permit 360° rotation of the barrel.
- H. Hydrant barrel shall break away from the standpipe at an elevation above ground level without causing damage to the standpipe and stem. When barrel is broken away, internal valve shall function and repairs shall be permitted without excavating or turning off water supply.
- I. Hydrants shall be bronze mounted and all internal working parts shall be bronze. Valve seat shall screw into retainer.
- J. Internal working parts shall be removable without disturbing the barrel.

DIVISION III
SECTION 8: HYDRANTS

MATERIAL REQUIREMENTS

- K. The operating nut situated atop the hydrant shall be hexagonal and constructed of ductile iron or cast iron and open in a counter clockwise direction. The threads shall be enclosed in an operating chamber separated from the hydrant barrel by a rubber O-ring stem seal lubricated by a grease or oil reservoir.

- L. Hydrant shall be equipped with two 2-1/2 inch threaded (7.5 threads per inch) hose connections and one 4-1/2 inch threaded (4 threads per inch) hose connection. Hose and pump connections shall be threaded and pinned to seal the connection to the barrel. Threads shall comply with National Standard Threads. Each connection shall be equipped with a cap and chain.

Acceptable Manufacturers – Product

Approved manufacturers must produce only ductile iron fire hydrants.

- 1. American - Darling M73.
- 2. U.S. Pipe - M94.
- 3. Mueller Company - A421: Ductile Iron Hydrant
- 4. M&H Valve Company - 129: Ductile Iron Hydrant
- 5. Clow Vale Company

8.02 Yard Hydrant

- A. Yard hydrant shall be self-draining, non-freeze and operated by lever handle. Lever handle shall be capable of being secured with a keyed lock.

- B. Yard hydrant shall be fitted for a standard three-quarter ($\frac{3}{4}$) inch hose connection.

- C. Exterior casing shall be schedule 40 galvanized steel and internal operating parts shall be of bronze and the plunger shall be neoprene.

Acceptable Manufacturer - Product

- 1. Iowa – No. 34.
- 2. Other Approved.

DIVISION III
SECTION 9: MANHOLES

MATERIAL REQUIREMENTS

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9.01 General

- A. Manholes shall be cylindrical and constructed of steel reinforced pre-cast concrete or other concrete structure approved by the WCW&SA Executive Director.
- B. Manholes shall have a minimum inside diameter of four (4) feet.
- C. Manholes shall be fitted at grade with a cast iron ring and cover.
- D. An existing or newly installed manhole intersected by a sanitary sewer force main and the next downstream manhole shall be lined in accordance with Division III, Section 12 "Environmental Coatings".
- E. A newly installed lift station wet well and underside of slab over wet well shall be lined in accordance with Division III, section 12 "Environmental Coatings".

9.02 Pre-cast Manholes

- A. Pre-cast manholes shall be manufactured, tested and marked in accordance with ASTM C478.
- B. Minimum compressive 28-day strength of concrete in all sections shall be 4,000 psi.
- C. Maximum allowable absorption of moisture by concrete shall not exceed 8% of dry weight.
- D. Pre-cast manholes shall consist of a base section, riser section and eccentric cone top or flat slab top section, as conditions require. Top cone section of manhole housing an air release valve shall be concentric. The sections shall form a continuous uniform assembly.
- E. Joints between each section shall be tongue and groove type sealed with a preformed gasket meeting requirements of Federal Specification SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe.

DIVISION III
SECTION 9: MANHOLES

MATERIAL REQUIREMENTS

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- F. Each section shall have not more than two (2) holes for purposes of handling. The holes used for handling shall be tapered and shall be plugged with rubber stoppers or grout after installation.
- G. Pipe openings in sections shall be fitted with an integrally cast flexible rubber boot or other approved flexible joint connector. A manufacturer supplied stainless steel band shall be used to seal boot to pipe.
- H. Manhole steps shall be solid cast iron of standard pattern conforming to ASTM A-48 or polypropylene plastic coated steel conforming to ASTM A615 and ASTM D-4101 and shall be integrally cast into manhole sections. Steps shall be twelve (12) inches wide and spaced at 1'0" on center.
- I. Inverts shall be constructed of cast-in-place concrete or brick and mortar.

9.03 Pre-cast "Dog House" Manholes

- A. Pre-cast "Dog House" Manholes shall comply with this section.
- B. Dog house opening shall be pre-cast by the manufacturer. Field cutting-in dog house opening shall be prohibited.
- C. Size of dog house opening shall be as recommended by the manhole manufacturer.
- D. Annulus between pipe and opening shall be grouted water tight with non-shrink grout.

9.04 Brick and Mortar

- A. Brick used as part of manhole construction shall be either solid or cored, medium hard or better, Grade MA conforming to ASTM C-32 for sewer and manhole brick.
- B. Mortar used as part of manhole construction shall be comprised of one (1) part Portland cement to two (2) parts clean sand. The sand shall conform to ASTM C-144.

DIVISION III
SECTION 9: MANHOLES

MATERIAL REQUIREMENTS

Page III-9.3

- C. Water shall be clean, potable and free from deleterious amounts of alkalis, acids and organic matter.

9.05 Frames and Covers

- A. Manhole rims, toe pockets, frames and covers shall be cast iron conforming to ASTM A-48 for Class 30 Gray Iron Castings.
- B. Defective castings that have been plugged or otherwise treated shall not be used.
- C. Manhole frames and covers shall be a nominal twenty-four (24) inches in diameter and weigh not less than 340 pounds.
- D. Manhole covers shall have the word "WATER" or "SEWER", according to the service, cast on top in letters two (2) inches high.
- E. Manhole frames and covers shall be thoroughly cleaned and painted or coated with a bituminous paint.
- F. Manhole covers required to be bolt-down shall be secured with not less than four (4) stainless steel bolts as provided by the manufacturer.
- G. Covers situated in paved areas shall be raised to finished grade using no more than five (5) courses of brick and mortar.
- H. Covers situated in non-paved areas shall be integrally cast in the top cone section.

Acceptable Manufacturers

- 1. As Approved.

DIVISION III
SECTION 10: CAST-IN-PLACE CONCRETE

MATERIAL REQUIREMENTS

10.01 Concrete Design

- A. Concrete mix design shall be in accordance with ACI 318-89.
 - 1. 28-Day Strength: 4,000 psi, unless otherwise noted.
 - 2. Type: Normal Weight.
 - 3. Slump Range: 3 inch to 5 inch.
 - 4. Weight: 135 pcf to 160 pcf.
 - 5. Air Content: 5% to 7%.
 - 6. Water-Cement Ratio: 0.45 Maximum.
 - 7. Fly Ash: Do Not Use.
 - 8. Chlorides: Do Not Use
 - 9. The use of admixtures shall require the approval of the CCWA Engineer.

- B. Concrete materials shall be in accordance with applicable ASTM standards.
 - 1. Portland Cement: Meeting ASTM C150, Type I, natural color, domestic manufacturer. Use only one brand of cement throughout project.
 - 2. Fine Aggregates: Meeting ASTM C33-86.
 - 3. Coarse Aggregates: Meeting ASTM C33-86, No. 57 Stone.
 - 4. Water: Clean, potable and free from deleterious amounts of alkalis, acids and organic matter.

10.02 Reinforcement

- A. Reinforcement bars shall be in accordance with ASTM A615, Grade 60, deformed.

- B. Welded wire fabric shall be in accordance with ASTM A185. Use size as indicated on drawings.

- C. Bar supports, chairs and spacers shall comply with the CRSI Manual for Placing Reinforcing Bars.

- D. Reinforcement shall be secured in proper position using No. 16-1/2 or No. 16 gauge black soft-annealed wire.

DIVISION III
SECTION 10: CAST - IN - PLACE CONCRETE

MATERIAL REQUIREMENTS

Page III-10.2

10.03 Formwork

A. Forms shall be as follows.

1. Pre-engineered steel.
2. Pre-engineered reinforced fiberglass.
3. Lumber: No. 2 Southern Yellow Pine.
4. Plywood for exposed finish: HDO-EXT-APA overlay plywood or B-B Plyform-EXT-APA.
5. Plywood for unexposed finish: C-C EXT-APA.
6. Earth, provided earth is dry, level and stable.

B. Form ties shall be break-back type with 5/8 inch removable vinyl sleeve or one (1) inch diameter break-back cone type.

10.04 Curing and Sealing Compounds

A. Moisture retaining cover shall meet ASTM C171-69 (1980): Waterproof paper, polyethylene film or burlap.

B. Curing and sealing compound shall meet ASTM C309-81, Type 1, Class B: Clear acrylic base.

10.05 Epoxy Bonding Agent

A. The use of an epoxy, bonding agent shall require the approval of the WCW&SA Executive Director.

B. A bonding agent shall be used during the placement of reinforcing steel into existing concrete and shall be of a two (2) component, 100% epoxy resin adhesive system.

DIVISION III
SECTION 10: CAST - IN - PLACE CONCRETE

MATERIAL REQUIREMENTS

10.06 Acrylic Latex Bonding Agent

- A. The use of an acrylic, latex, bonding agent shall require the approval of the WCW&SA Executive Director.

- B. A bonding agent shall be used as an aid in applying a concrete surface patch or finish to existing concrete and shall be an acrylic polymer emulsion base chemical bonding system.

Acceptable Manufacturers

- 1. As Approved.

DIVISION III
SECTION 11: MASONRY AND GROUT

MATERIAL REQUIREMENTS

11.01 Mortar and Grout Materials

- A. Portland Cement shall meet ASTM C150, Type I, natural color, domestic manufacturer. Use only one brand of cement throughout project.
- B. Masonry Cement shall meet ASTM C91-89, non-staining, 22% maximum air content by volume.
- C. Hydrated Lime shall meet ASTM C207-79 (1988), Type S.
- D. Aggregates for mortar shall meet ASTM C144-87 and ASTM C404-87, size 2 natural and shall be clean, hard and washed sand.
- E. Aggregates for cement grout shall meet ASTM C404-87, fine aggregate, size 1.
- F. Water reducing and plasticizing admixtures are acceptable.
- G. Admixtures containing calcium chloride shall be prohibited.
- H. Water shall be clean, potable and free from deleterious amounts of alkalis, acids and organic matter.
- I. Non-shrink Grout: Submit products for approval by WCW&SA Executive Director.

11.02 Mortar and Grout Proportions

Proportion materials by volume in accordance with ASTM C270-88a or as follows:

- A. Mortar: One (1) part Masonry cement to $\frac{1}{2}$ part Portland cement to aggregate proportioned at not less than 2- $\frac{1}{4}$ nor more than three (3) times the volume of cementitious material used.
- B. Grout: One (1) part Portland cement and $\frac{1}{4}$ to $\frac{1}{2}$ parts hydrated lime to aggregate, proportioned at not less than three (3) times the combined volume cement and lime used.

DIVISION III
SECTION 11: MASONRY

MATERIAL REQUIREMENTS

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11.03 Concrete Masonry Units

- A. Concrete masonry units shall be in accordance with ASTM C90-85, light weight, Grade N, Type 1.
- B. Concrete masonry units shall have a nominal face dimension of 8"x 8"x16" or 8"x12"x16".
- C. Concrete masonry units shall have a minimum compressive strength of 2,500 psi, based on net area.
- D. Concrete masonry units damaged in any manner shall not be used.

11.04 Joint Reinforcement

Horizontal joints between concrete masonry units shall be reinforced as follows.

- A. Use cold drawn wire meeting ASTM A82-88.
- B. Longitudinal rods shall be nine (9) gauge galvanized deformed wires with nine (9) gauge galvanized cross wires welded to form triangular style pattern.
- C. Width of reinforcement shall be two (2) inches less than the total wall thickness.
- D. Provide reinforcement in ten (10) foot lengths with prefabricated corners and tees at intersecting walls of same design and finish.

Acceptable Manufacturers

- 1. As Approved.

DIVISION III
SECTION 12: ENVIRONMENTAL COATINGS

MATERIAL REQUIREMENTS

12.01 Materials Requiring Coatings

- A. Materials for buried surface shall be coated as indicated in their respective section.
- B. The following materials shall have exterior coatings manufacturer applied or field applied.
 - 1. Piping and appurtenances
 - 2. Supports
 - 3. Pumps
 - 4. Valves
 - 5. Equipment and appurtenances
- C. The following materials shall be lined by the manufacturer or field applied:
 - 1. Manhole intersected by a sanitary sewer force main and next downstream manhole.
 - 2. Lift station wet well and slab area above wet well.

12.02 Coating Schedule

- A. Non-Submerged Ferrous Metal
 Minimum Surface Preparation: SSPC – SP6
 Generic System Type: Aliphatic Polyurethane

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	3.0	P-14	2.0	#69
2	3.0	Armorgaurd	2.0	#69
3	2.0	5500	2.0	#74

- B. Submerged Ferrous Metal
 Minimum Surface Preparation: SSPC – SP10
 Generic System Type: Polyamide Epoxy

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	5.0	PE-54	5.0	#20 P-Pox
2	5.0	PE-54	5.0	#20 P-Pox

DIVISION III
SECTION 12: ENVIRONMENTAL COATINGS

MATERIAL REQUIREMENTS

- C. Non-Submerged Non-Ferrous and Galvanized Metal
 Minimum Surface Preparation: SSPC – SP6 (non-ferrous); SP1 (galvanized)
 Generic System Type: Aliphatic Polyurethane

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	0.5	VW Prime	5.0	#69
2	2.0	5500	2.0	#74

- D. Submerged Non-Ferrous and Galvanized Metal
 Minimum Surface Preparation: SSPC – SP10 (non-ferrous); galvanized per coating manufacturer. Generic System Type: Polyamide Epoxy

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	0.5	VW Prime	5.0	#69-1211
2	5.0	PE-54	5.0	#69

Acceptable Manufacturers

1. Induron.
2. Tnemec.
3. As Approved.

12.03 Manhole and Wet Well Lining

- A. Line existing concrete manhole with a modified aliphatic amine epoxy mortar or aggregate filled epoxy coating system or other coating system approved by the WCW&SA Executive Director.
- B. Materials required for concrete surface preparation/restoration, lining and finishing shall be supplied by the same manufacturer.
- C. Line new manhole, wet well and underside of slab over wet well with an integrally cast polyvinyl chloride or high density polyethylene liner.

DIVISION III

MATERIAL REQUIREMENTS

SECTION 12: ENVIRONMENTAL COATINGS

Acceptable Manufacturers – Product

1. Tnemec – Chembloc H2S (existing manhole coating system).
2. Sauereisen – Sewergard 210, 210S, 210RS (existing manhole coating system).
3. A-LOK Products, Inc. – Duraplate 100 (new manhole, wet well, slab integrally cast liner).
4. Agru America – AGRU Sure Grip (new manhole, wet well, slab integrally cast liner).
5. As approved.

DIVISION III

MATERIAL REQUIREMENTS

SECTION 13: MISCELLANEOUS MATERIALS

13.01 Stabilization Stone

- A. Stabilization stone shall be No. 57 size and conform to ASTM C33-78 unless noted otherwise.
- B. Maximum stone size shall be 1-1/2 inches unless noted otherwise.
- C. Stone shall be clean, tough, uniform quality, durable fragments of crushed rock, free from flat, elongated, soft or disintegrated pieces, or other objectionable matter occurring either free or as coating on stone.

13.02 Other Materials

- A. Materials not covered in Division III, Material Requirements, shall be in accordance with the approved plans.