

## Section 500

### Ductile Iron Pipe and Fittings

#### 500.1. General

##### 500.1.1 Description

- A. This section covers ductile iron pipe and fittings for water line installation and replacement.
- B. Pipe shall be furnished complete with all fittings, flanges, specials, and other accessories.

##### 500.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

##### 500.1.3 Quality Assurance

- A. Manufacturer
  - 1. All ductile iron pipe shall be supplied by one manufacturer.
  - 2. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

##### 500.1.4 Product Delivery

- A. Handling
  - 1. Use slings, pipe tongs or skids.
  - 2. Do not drop pipe or fittings including dropping on cushions.
  - 3. Do not skid or roll pipe into pipe already on the ground.
  - 4. Do not damage coating or lining.
  - 5. Special care to be taken when handling epoxy coated specials and fittings.
  - 6. Do not use hooks.
  - 7. Pipe shall not be handled in any manner which will cause damage.
  - 8. Care shall be taken to prevent damage to pipe and fittings by impact, bending, compression, or abrasion.
  - 9. Damaged pipe or fittings shall not be installed and shall be immediately removed from the work site.

B. Storage

1. Store and use lubricants in a manner which will avoid contamination.
2. Pipe shall be delivered to the site and stored with plastic end plugs to ensure it is kept free from dirt, debris, animals, etc.
3. Store rubber gaskets in a cool, dark location away from grease, oil, and ozone producing electric motors.
4. Do not exceed maximum stacking heights listed in AWWA C600, Tables 1 and 2.

500.2. Materials

500.2.1 Ductile Iron Pipe and Fittings

A. Specifications

1. The pipe shall be designed, manufactured, tested, inspected and marked in accordance with the provisions of this Specification and AWWA Standard C151, "American Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids", except as herein modified.

B. Dimensions

1. Nominal pipe lengths shall be 18 feet or 20 feet, with shorter lengths provided as required by Construction Drawings, alignment and profile. Random pipe lengths are not acceptable, except when using restrained joint pipe. Permissible variations in length, diameter, weight, wall thickness and straightness shall comply with the allowable tolerances specified in the applicable AWWA Standards. The minimum finished inside diameter of the pipe, after lining is placed, shall be as set forth in the applicable AWWA Standards.

C. Ductile Iron Pipe Diameter and Rated Working Pressure Class

<u>Pipe Size (inches)</u>	<u>Pressure Class</u>
3 through 12	350
16 through 20	250

D. Joint Design and Fabrication

1. The standard joints shall be push-on rubber gasket joints conforming to AWWA Standard C-111. The joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing the gasket radially to the pipe to form a

positive seal. The joint shall be suitable for a minimum of 250 psi working pressure.

The manufacturer shall furnish all joint materials including rubber gasket and joint lubricant. The mechanical joint restraint shall be designed to resist thrusts resulting from internal pressure acting at bulkheads, bends, valves and extending over the distances as shown on the Construction Drawings. The joint restraint shall be designed for a minimum working pressure of 250 psi. Although thrust blocks may also be required, joint restraint is to be designed without consideration given to any support derived from these blocks. The Engineer/Utility may request that the Design Engineer furnish joint restraint calculations including all design considerations and assumptions prior to and/or during installation in order to accommodate specific site conditions.

In addition to restraint systems manufactured into the pipe, joint restraint devices may include:

- i. Mechanical joints shall be restrained with any of the following:  
Reference the Design Standards Volume II, Appendix A - Approved Materials List.
  - ii. Push-on joints may be restrained with any of the following:
    2. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
    3. All nuts and bolts shall be high-strength, low alloy 304 Stainless Steel, manufactured in accordance ANSI A21.11 (AWWA C111).
    4. Flanged ductile iron pipe with threaded flanges shall have a working pressure rating of 250 psi.
- E. Specials and Fittings
1. Unless otherwise shown on the Construction Drawings, all specials and fittings shall conform to the dimensions and requirements of AWWA Standards. Fittings shall be made of gray iron or ductile iron and have fusion bonded epoxy Coating designed for 250 psi minimum working pressure and shall have the same lining and coating as the abutting pipe.

Specials and fittings shall have fusion bonded epoxy coating in accordance with ANSI/AWWA C116/A21.16 and shall be applied to interior and exterior surfaces. Areas of lining and coating that have been damaged shall be repaired by hand application in accordance with applicable AWWA Standards.

Moderate deflections and long radius curves may be made by means of bends or fittings, by deflecting straight pipe, by using short lengths of pipe, or by a combination of any of these methods.

All fittings and couplings shall have one of the following types of connections:

- i. Flanged joint (meter vaults only).
- ii. Mechanical joint.
- iii. Push-On joint shall not be allowed.

All ductile iron pipe with threaded flanged joints for meter vaults shall be manufactured in accordance with ANSI A21.15-83 (AWWA C115)

- iv. All flanges shall be sized and drilled in accordance with ASME/ANSI B16.1: Cast Iron Pipe Flanges and Flanged Fittings, Class 125; or Ductile Iron Pipe Flanges and Flanged Fittings, Class 150

#### F. Cement-Mortar Lining

1. Interior surfaces of all pipe, fittings and specials shall be lined in the shop with cement-mortar in accordance with AWWA Standard C104. The cement shall meet the requirements of "Standard Specifications for Type II Portland Cement", ASTM Designation C150. The sand shall conform to that prescribed in AWWA C-104. The cement mortar shall contain not less than one part of cement to two parts of dry sand.

Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty, the unsatisfactory pipe shall be replaced.

All ductile iron pipe shall have a standard thickness cement mortar lining.

- i. Ductile iron pipe which is twelve inches (12") and smaller in diameter shall have a cement mortar lining with a minimum thickness of 1/16 inch.
- ii. Ductile iron pipe which is larger than twelve inches (12") in diameter shall have a cement mortar lining with a minimum thickness of 3/32 inch.

#### G. Exterior Coating

1. The outside coating shall be a bituminous coating of either coal tar or asphalt base approximately 1 (one) mil thick. The finished coating

shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun and shall be strongly adhered to the pipe.

#### H. Polyethylene Encasement

1. All ductile iron pipe and fittings shall be polyethylene encased. The polyethylene encasement material shall be manufactured in accordance with AWWA. Standard C 105, "Polyethylene Encasement for Ductile Iron Pipe Systems" with the following additional requirements or exceptions.

i. Material - High density, cross-laminated polyethylene film. The raw material used to manufacture polyethylene film shall be Type III, Class A, (natural color) Grade P-33 in accordance with ASTM Standard Designation D-1248.

ii. Physicals - The polyethylene film shall meet the following test requirements:

Tensile Strength: 5000 psi minimum

Elongation: 100% minimum

Dielectric Strength: 800 V/mil thickness minimum

Thickness: 0.004" (4 mils) minimum with minus tolerance not exceeding 10% of nominal thickness

#### I. Tapping Sleeves

1. Reference **Section XX**, Tapping Sleeves for Distribution Lines and **Section XX**, Water Distribution System.

#### J. Seals

1. For penetrations into Precast Concrete structures use two sets of Thunderline Link-Seal units w/stainless steel hardware.

### 500.3. Execution

#### 500.4.1 Ductile Iron Pipe Installations

##### A. Handling

1. Ductile iron pipe and fittings shall be handled at all times by lifting with padded cradles of canvas, leather or other suitable material so as to avoid shock or damage. Pipe shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be made by the Developer in a manner satisfactory to the Engineer/Utility. Pipe handling equipment is to be approved by the ENGINEER. The use of bare metal cables, chains, or hooks, etc. will not be permitted.

Stockpiled ductile iron pipe shall be supported on wood blocks and/or sandbags placed under the uncoated ends of the pipe. Bags shall be of sufficient size to prevent contact of the pipe coating with the ground or any obstruction. Rolling the pipe on coated surface will not be permitted. Adequate strutting shall be provided if necessary to prevent damage to pipe lining and coating.

B. Subgrade

1. No blocking of pipe will be permitted. Before the pipe is laid, the subgrade shall be prepared by backfilling with clean uniformly graded sand so as to provide a uniform and continuous bearing and support for the pipe at every point between bell holes, except that it will be permissible to disturb or otherwise damage the subgrade surface over a maximum length of 18-inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle.

C. Joining Slab Joints

1. Immediately before joining two lengths of ductile iron pipe, the inside of the bell end, the outside of the spigot end and the rubber gasket shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. The rubber gasket shall be flexed inward and properly inserted in the gasket recess of the bell socket. Caution shall be exercised to ensure the correct type of gasket is used.

A thin film of gasket lubricant shall be applied to either the inside face of the gasket or the spigot end of the pipe or both.

The spigot end of the pipe shall be placed in the socket with care to prevent the joint from contacting the ground. The joint shall be completed by pushing the pipe home with a slow steady pressure without jerky or jolting movements. Pipe furnished without a depth mark shall be marked before assembly to assure insertion to the full depth of the joint. The spigot end of field cut pipe lengths shall be filed or ground to resemble the spigot end of such pipe as manufactured.

Whenever it is desirable to deflect slab joint pipe in order to form a long radius curve, the deflection shall not exceed eighty percent (80%) of the pipe manufacturer's recommendations for maximum deflection.

D. Joining Mechanical Joint Pipe

1. Before joining mechanical joint ductile iron fittings to the ductile iron pipe, the outside of the spigot, the inside of the bell and the rubber gasket shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter.

Normal practice is to lubricate the joint with a soap solution; however, in cold weather the joint may be assembled dry if approved by the Engineer/Utility. Extreme care shall be exercised in making the dry joint.

The ductile iron gland shall be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland.

The pipe shall be pushed forward until the spigot end fully penetrates the bell. The gasket shall then be pressed into place in the bell evenly around the entire joint. The gland shall be moved along the pipe into position for bolting, the bolts inserted, and the nuts screwed finger tight, then tightened with a torque limiting wrench. The torque for the various sizes of bolts shall be as follows:

<u>Pipe Size</u> <u>(inches)</u>	<u>Bolt Size</u> <u>(inch)</u>	<u>Range of Torque</u> <u>(ft.-lbs.)</u>
2-3	5/8	60
4-24	3/4	75-90

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland.

Whenever it is desirable to deflect mechanical joint pipe in order to form a long radius curve, the deflection shall not exceed eighty percent (80%) of the pipe manufacturer's recommendations for maximum deflection.

#### E. Flanged Joint

1. Before the joint is assembled, the flange faces shall be thoroughly cleaned of all foreign material with a power wire brush. The gasket shall be centered, and the connecting flanges drawn up watertight without unnecessary stressing of the flanges. All bolts shall be tightened in a progressive diametrically opposite sequence using torque wrenches at settings recommended by the manufacturer (75 lb. min.). Only EPDM (ethylene propylene diene monomer) rubber gaskets or Styrene-Butadiene (SBR) Skirtboard gaskets shall be used. Where steel flanges are connected to ductile iron flanges, an insulating connection shall be provided.

#### F. Polyethylene Wrap

1. Ductile iron pipe and fittings shall be polyethylene encased (cross-laminated HDPE) in accordance with AWWA Standard C-105,

"Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids," and as detailed on the Drawings.

G. Cutting and Fitting

1. The Developer shall make all pipe cuts required to conform to location, line and grade. All cuts on ductile iron pipe shall be made by the use of pipe cutters or pipe saws. All cuts shall be straight and true.

500.4.2 Pipe Installation – General

A. Underground Interference

1. It shall be the responsibility of the Developer to verify the locations shown on the Construction Drawings. The Developer shall exercise care when working in order to protect all underground interference and shall be fully responsible for any and all damage caused by their operations.

B. Temporary Bulkhead

1. Whenever the pipe is left unattended, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent children, animals, or debris from entering the pipe. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

C. Pipeline Marker or Detection

1. Polyethylene warning tape shall be installed approximately one (1) foot above the pipe, centered over all buried waterlines.

END OF SECTION



# Section 501

## Plastic Pressure Pipe

### 501.1. General

#### 501.1.1 Description

- A. This section covers the furnishing and installation of plastic pressure pipe and fittings.

#### 501.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

#### 501.1.3 Product Delivery, Storage, and Handling

##### A. Handling

1. Pipe shall not be handled in a manner which will cause damage to the pipe.
2. Pipe or fittings shall not be dropped.
3. Pipe shall be handled in a manner as to keep the pipe clean and free from dirt and debris.
4. Care must be taken to prevent damage to the pipe and fittings by impact, bending, compression or abrasion.
5. Damaged pipe or fittings shall not be installed and shall be immediately removed from the site.

##### B. Storage

1. Lubricant shall not be stored or handled in a manner which will cause contamination to the lubricant.
2. Rubber gaskets shall be stored in a location which protects them from deterioration.
3. Pipe shall be delivered to the site and stored with plastic end plugs to ensure it is kept free from dirt, debris, animals, etc.
4. Pipe shall be stored in accordance with the manufacturer's specifications.
5. Pipe shall be stored on a surface which provides even support for the pipe barrel.

a. Pipe shall not be stored in such a way as to be supported by the bell.

6. Care shall be taken to ensure plastic pipe is not exposed to sunlight (UV) for extended periods of time to cause UV discoloration. Any pipe with UV discoloration shall immediately be removed from the site.

501.1.4 Quality Assurance

501.1.5 Standard

A. AWWA C900 or C909: PVC Pressure Pipe and Fabricated Fitting, 4"- 12", For Water Distribution

B. AWWA C905: PVC Pressure Pipe and Fabricated Fitting, 16"- 48", For Water Transmission and Distribution

C. ASTM F477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe

D. ASTM D1784: Specification for Rigid PVC Compounds and CPVC Compounds

E. ASTM D3139: Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seal

501.1.6 Manufacturers

A. Reference the Design Standards Volume II, Appendix A - Approved Materials List

B. Or An Approved Equal

## 501.2. Products

501.2.1 Materials

A. PVC Pressure Pipe (4 inch through 12 inches)

1. Conformance: AWWA C-900 DR-18 Class 150 and AWWA C909 Class 200.

2. O.D. Base: Cast Iron equivalent.

3. Pipe Joints:

a. Direct Bury: Bell ends with elastomeric gaskets. Solvent cement joints are strictly prohibited.

b. Horizontal Directional Drilling:

i. Fusible C-900™ manufactured by Underground Solutions, Inc.

- ii. Low profile restrained joint pipe such as C900/RJ system manufactured by CertainTeed or approved equal.
  4. All joints on plastic pressure pipe shall be push-on, using an integral bell with an elastomeric gasket.
  5. Color of the pipe shall be blue to distinguish as potable water.
  6. All plastic pressure pipe shall have a nominal laying length of twenty feet (20').
    - a. Random pipe lengths are not acceptable.
- B. PVC Pressure Pipe (16 inch through 20 inches).
  1. Conformance: AWWA C-905.
  2. O.D. Base: Cast Iron equivalent.
  3. Pressure Rating: Refer to drawings for minimum pressure class.
  4. Joints: Bell ends with elastomeric gaskets. Solvent cement joints are strictly prohibited.
  5. Color of the pipe shall be blue to distinguish as potable water.
- C. Mechanical Joint Restraints
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List
  2. Or An Approved Equal
- D. Fittings: Ductile Iron
  1. Standard: AWWA C-104, C-110, C-111, or C-153.
  2. Lining: Epoxy.
  3. Coating: Epoxy.
  4. Pressure rating: minimum 250 psi.
  5. Connections: mechanical joint unless specified otherwise indicated.
    - a. All nuts and bolts shall be high-strength, low alloy 304 Stainless Steel, manufactured in accordance ANSI A21.11 (AWWA C111).
- E. Tracer Wire
  1. Tracer wire shall be #12 AWG high strength single strand solid copper clad steel conductor. Wire shall be insulated with a 30 mil, high density polyethylene (HDPE) insulation and rated for direct bury use at 30 volts. The tracer wire shall be continuous (without splices) whenever possible.

2. When splices are required, an approved wire connector shall be used (Reference the Design Standards Volume II, Appendix A - Approved Materials List).

F. Locator Stations

1. Reference standard details for Locator Box and PVC Water main tracer wire detail.
2. Marked: "LOCATOR STATION".

G. Warning Tape

1. Tape to read: CAUTION: BURIED WATER LINE BELOW
2. Colors: Blue background with black text
3. APWA & AASHTO compliant
4. Tape shall be detectable 5 mil foil for plastic piping or other detectable non-degradable material.

H. Joint Restraining Devices

1. Mechanical joints may be restrained with any of the following:
  - a. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
2. Push-on joints may be restrained with any of the following:
  - a. Reference the Design Standards Volume II, Appendix A - Approved Materials List

### 501.3. Execution

#### 501.3.1 Inspection

- A. Examine the pipe and fittings for cracks, dents, abrasions or other flaws prior to installation. Mark defective pipe and remove from the site.
- B. Cutting the pipe
  1. Cut the pipe square with saws or pipe cutters designed specifically for the material.
  2. Bevel the end in accordance with the manufacturer's recommendations.
  3. Locate a depth mark with a marker or crayon to assure the spigot end is inserted to the recommended depth.
  4. Remove burrs and wipe off all dust from the jointing surfaces.

C. Gasketed Joint

1. Remove all dirt and foreign material from the spigot, gasket and gasket groove.
2. Apply lubricant furnished by the pipe manufacturer.
3. Insert the spigot to the depth recommended by manufacturer.
4. Do not disturb previously completed joints during jointing operations.

D. Do not bend pipe on any radius. Joints may be deflected if manufacturer's written literature allows, but bending of pipe is not allowed.

E. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

F. PVC to ductile iron pipe joints shall be made with epoxy coated mechanical joint solid sleeves.

G. Tracer wire.

1. Tracer wire shall be installed in a manner as to conform to the PVC Water Main Tracer Wire Detail shown in Standard Details.
2. Tape to top centerline pipe every 5 feet with tape such that wire remains in place during bedding of pipe.
3. Secure tracer wire to fire hydrant by wrapping twice around riser to hydrant. Terminate end of tracer wire in a pre-fabricated Locator Box with two (2) feet of wire shall be coiled inside each box. Place locator box 12 to 24 inches in front of fire hydrant.
4. When splices are required, an approved wire connector shall be used (Reference the Design Standards Volume II, Appendix A - Approved Materials List). With approval from Engineer/Utility wire splices may be made with an approved equal product/method.
5. Attach one pound (1 lb) sacrificial anodes to tracer wire every 500 feet.
6. Testing.
  - a. Pass current through wire and demonstrate that wire is capable of locating the pipe.
  - b. If wire will not pass current, locate break in circuit and test until tracer wire works in accordance with its intended use.

7. Warning Tape

- a. Place twelve (12) inches above top of pipe and centered over pipe in backfill.
- b. Tape shall run continuous with pipe.

501.3.2 Tapping

- H. Reference Section XX, Tapping Sleeves for Distribution Lines and Section XX, Water Distribution System.

END OF SECTION

## Section 502

### Plastic Non-Pressure Pipe

#### 502.1. General

##### 502.1.1 Description

- A. This section covers plastic non-pressure sanitary sewer pipe and fittings to be furnished complete with all jointing materials.

##### 502.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

##### 502.1.3 Submittals

- A. Certification: Submit manufacturer's certification that products meet requirements of referenced specifications.
- B. Shop Drawings: Submit Shop Drawings and data showing details of joints, gasket material and pipe length.

##### 502.1.4 Product Delivery

- A. Do not damage the pipe by impact, bending, compression or abrasion during handling and storage.
- B. Store PVC sewer pipe on a flat surface which provides even support for the barrel with bell ends overhanging.
- C. Do not stack pipe higher than 5 feet.
- D. Do not use pipe and fittings stored in direct sunlight for periods in excess of 18 months. Any pipe with UV discoloration shall immediately be removed from the site.
- E. Use only nylon protected slings or hands to handle pipe. Do not use hooks or bare cable.

#### 502.2. Products

##### 502.2.1 Polyvinyl Chloride (PVC) Pipe

- A. Pipe and Fittings
  1. 4" through 15", ASTM D3034, type PSM, SDR 35.
  2. 18" through 27", ASTM F679 (T1).

3. All pipe shall have the ASTM Specification, nominal diameter, and name or trade mark of the manufacturer imprinted on the outside of the pipe.
  4. Fittings shall be of the same material and class as the pipe to which it is attached.
  5. Plugs: P.V.C., size shall be the same as for the pipe. Plugs shall be airtight for testing of the lines.
- B. Joints: ASTM F477 push-on. Joints: ASTM D3212, push-on with an O-ring rubber gasket conforming to ASTM Designation D3034. Solvent cement joints are strictly prohibited.
- C. Pipe lengths: maximum pipe length shall be twenty (20) feet and no shorter than fourteen (14) feet, except service tees and closure pieces.
- D. Markings: All sizes of PVC pipe shall have the SDR rating, the ASTM Specification, nominal diameter, and name or trademark of the manufacturer imprinted on the outside of the pipe.

### 502.3. Execution

#### 502.3.1 Inspection

- A. In addition to any deficiencies covered by ASTM D3034, PVC which has any of the following visual defects will not be accepted.
1. Straight pipe, measured from the concave side, shall not deviate from straight greater than 1/16 inch per foot of length.
  2. Pipe which is sufficiently out-of-round to prohibit proper jointing.
  3. Improperly formed bell and spigot ends.
  4. Fractured, cracked, chipped, dented, abrasions or otherwise damaged pipe.
  5. Pipe that has been damaged during shipment or handling. Acceptance of the pipe at point of delivery will not relieve the Contractor of full responsibility for any defects in material of the completed pipeline.
- B. Mark rejected pipe and remove from the site.

#### 502.3.2 Installation

- A. Install pipe in accordance with **Section xxxx, Sanitary Sewer System.**
- B. Cutting the pipe
1. Cut pipe square with saw or pipe cutter designed specifically for the material.



2. Bevel the end in accordance with the manufacturer's recommendations.
3. Insert the spigot to the reference mark, according to manufacturer's recommendations.
4. Do not disturb previously installed joints during jointing operations.

502.3.3 Field Quality Control

A. Reference Section xxxx, Sanitary Sewer System.

END OF SECTION

# Section 503

## Valves

### 503.1. General

#### 503.1.1 Description

- A. This This section covers the furnishing and installation of butterfly line valves, air release and vacuum valves, gate valves, valve boxes, and valve appurtenances used for water distribution lines.

#### 503.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

#### 503.1.3 Product Delivery, Storage, and Handling

- A. Precautions shall be taken to prevent damage to materials during delivery and storage.
- B. Valves shall be stored off of the ground and away from materials that could contaminate potable water systems.
- C. Precautions shall be taken to keep all joints and internal parts clean.

### 503.2. Materials

#### 503.2.1 General

- A. All valves shall open clockwise (right).

#### 503.2.2 Butterfly Valves

- A. Butterfly valves shall be used when pipe is larger than 12-inches in diameter.
- B. All butterfly valves shall conform to AWWA C504.
  - 1. All butterfly valves shall have an epoxy coated interior and exterior.
  - 2. All nuts and bolts shall be high-strength, low alloy 304 Stainless Steel, manufactured in accordance ANSI A21.11 (AWWA C111).
  - 3. All flanged butterfly valves shall be the short body type.
  - 4. All butterfly valves shall be Class 150B.
  - 5. Valve operator torque shall be as specified in Appendix A, of AWWA C504.
  - 6. Acceptable manufacturers of butterfly valves are:

- a. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
7. All butterfly valves shall be placed in a manhole or vault.
  - a. Reference Butterfly Valve Vault Standard Detail.
8. All butterfly valves shall have a disc position indicator.

#### 503.2.3 Gate Valves

- A. All gate valves shall be a resilient seat type and manufactured in accordance with AWWA C509.
  1. All gate valves shall have an epoxy coated interior and exterior.
  2. All nuts and bolts shall be high-strength, low alloy 304 Stainless Steel, manufactured in accordance ANSI A21.11 (AWWA C111).
- B. All gate valves shall be provided with two O-ring type stem seals in accordance with Section 4.8 of AWWA C509.
- C. If the operating nut on gate valves is more than five (5) feet below finish grade, a valve extension shall be used.
  3. When a valve extension is installed, the top of the extension shall be set two (2) feet below finished grade.
    - a. Valve Extension shall not be pinned to operator nut on valve.
  4. Reference Valve Extension Detail Standard Detail.
- D. Manufacturers:
  5. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 503.2.4 Combination Air Release Valves

- A. Combination air release valves shall be designed to exhaust large volumes of air when the system is filled with water and to allow large volumes of air to enter the pipeline when the system is drained. The air and vacuum relief portion of the valve shall have a discharge orifice area which is equal to or greater than the valve inlet. The valve shall also be capable of venting small quantities of entrained air which typically accumulate at high points in the pipeline during system operation. Entrained air shall be vented under pressure by means of a small, independently controlled orifice. The combination air release valve shall be designed for water-tight operation and a minimum working pressure of 200 psi and a hydrostatic test pressure of 250 psi.

- B. The combination air release valve body, cover and baffle shall be high strength plastic or cast iron conforming to ASTM A48 or ASTM A126. The valve float shall be stainless steel conforming to ASTM A240. The float retainer, outlet orifice plug, float cushion retainer, restraining screws and internal lock nuts and washers shall be stainless steel conforming to ASTM A276. The float cushion and outlet orifice seat shall be synthetic Buna-N rubber manufactured in compliance with ASTM SB800.
- C. Unless prior permission is obtained from Utility, size of air relief and vacuum relief valves shall be a minimum of 2-inches in diameter.
- D. Taps for air relief and vacuum relief valves shall be made with a tapping saddle at the 12' o'clock position on the pipe with a 2" corporation stop.
- E. All pipes shall be brass.
- F. Connections:
  - 1. Between the corporation stop and the air relief and vacuum relief valve shall be 2" brass tee with test port installed off of the tee branch (see approved details).
  - 2. The inlet connection for air relief and vacuum relief valves shall be 2-inches in diameter with a tapered iron pipe thread conforming to AWWA C800.
  - 3. Connections on the outlet side of air relief and vacuum relief valves shall be threaded and shall be protected to minimize entry of debris and dirt into the valve.
- G. Acceptable Manufacturers:
  - 1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 503.2.5 Valve Boxes

- A. General
  - 1. The manufacturer of valve box components shall be experienced in the design and construction, shall be regularly engaged in the manufacture and shall have produced valve boxes which have given successful service for a period of at least five (5) years.
  - 2. Valve boxes herein described are for 4" or larger main and service lines.

- B. Material
  - 1. Valve box parts shall be made of gray cast iron in compliance with the requirements of ASTM A48 or ASTM A 126.
- C. Approved Patterns
  - 1. Valve boxes shall be screw-type with the word "WATER" cast into the lid.
  - 2. Valve Box Bases, Reference the Design Standards Volume II, Appendix A - Approved Materials List
  - 3. Valve Box for all main line valves, Reference the Design Standards Volume II, Appendix A - Approved Materials List.

### 503.3. Execution

#### 503.3.1 Valves

- A. All valves shall be handled in such a manner as to prevent any injury or damage. All joints shall be thoroughly cleaned before installation.
- B. Valves shall be located as shown on the Construction Drawings. Any deviations from this shall be at the discretion of the Engineer/Utility.
- C. Valves shall be set and joined to pipe in the manner previously specified for cleaning, laying and joining the appropriate joints as provided with the valves. Valves shall be set in such a manner that the valve stems are plumb.
- D. Valves shall be examined for cracks, dents, abrasions, and other flaws prior to installation. Defective valves shall be marked and removed from the site.
- E. All valves shall be installed a minimum of 4 feet from any fence, bush, building or structure.
- F. With the exception of tapping valves, flanged valves shall not be buried.
- G. Valves shall be installed in such a manner that the operating nut is perpendicular to the ground surface.
- H. Installed valve shall be supported in place with concrete bricks and then backfilled underneath and around the valve with compacted granular material.
- I. Tapping valves shall be installed in accordance with the manufacturer's recommendations.

- J. Tapping valves and sleeves are to be water pressure tested to 150 psi for 5 minutes with no leakage allowed, prior to proceeding with the wet tap.

#### 503.3.2 Valve Boxes

- A. A valve box shall be provided for every valve of size 12" and smaller or as shown on the Construction Drawings. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover set to the elevation determined by the Design Engineer. Compact around barrel with hand equipment to minimize misalignment and settling of backfill.

Drop inserts are not allowed to raise a valve box. Valve box shall be raised and adjusted by turning the box to raise or lower to the appropriate elevation.

Valve boxes shall be examined for cracks, dents, abrasions, and other flaws prior to installation. Defective valve boxes shall be marked and removed from the site.

#### 503.3.3 Air Relief/Vacuum Relief Valves

- A. Air relief and vacuum relief valves shall be installed at high points, and as shown on the Construction Drawings.

#### 503.3.4 Operation

- A. Valves which have been accepted by the Town shall be operated by Town personnel only.

END OF SECTION

## Section 504

### Tapping Sleeves for Distribution Lines

#### 504.1. General

##### 504.1.1 Work Included

- A. Furnish and install all tapping sleeves as either shown or implied on the Construction Drawings.

##### 504.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

#### 504.2. Materials

##### 504.2.1 General

- A. Tapping sleeves shall be used to tap into existing waterlines. The sleeves shall be designed for a minimum working pressure of 150 psi. Sleeves for 12 inch and smaller mains shall be stainless steel with stainless steel nuts and bolts.

##### 504.2.2 Sleeve Body

- A. The sleeve body shall be fabricated stainless steel or steel with epoxy lining and coating. The sleeve body shall have a flanged outlet for the branch connection with dimensions and drillings complying with ANSI B16.1 and AWWA C207 Class D, ASNI 150 lb. drilling. The sleeve body shall form a watertight seal at the main line tap by means of a synthetic rubber gasket.
- B. Full circle gaskets are required for all size on size taps.

##### 504.2.3 Nuts and Bolts

- A. All nuts and bolts shall be high-strength, low alloy 304 Stainless Steel, manufactured in accordance ANSI A21.11 (AWWA C111).

##### 504.2.4 Gaskets

- A. Gaskets shall be a resilient, synthetic rubber material subject to the manufacturer's specification and formulated to resist oil, water, acids and alkalis and aliphatic hydrocarbons.

##### 504.2.5 Acceptable Manufacturers

- A. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

### 504.3. Execution

#### 504.3.1 General

- A. Install tapping sleeves in accordance with the manufacturer's recommendations.
- B. Prior to installation, thoroughly remove all oil, scale, and dirt from the saddle and provide a clean seat for the gasket.
- C. Wipe gasket clean prior to installation.
- D. Final nut tightening shall be performed with a torque-limiting wrench to the torque level recommended by the Manufacturer.
- E. Taps larger than two inches (2") shall not be closer than five feet (5') from each other, measured from the center of the tap.
- F. Taps shall not be made within five feet (5') of a bell or spigot end of the pipe being tapped unless approved by the Engineer/Utility.

END OF SECTION



# Section 505

## Hydrants

### 505.1. General

#### 505.1.1 Work Included

- A. The Developer shall furnish all labor, materials, tools, equipment and perform all work and services necessary for, or incidental to, the furnishing and installation, complete, of all dry-barrel hydrants as shown on the Construction Drawings and completely coordinated with the work of other trades.

#### 505.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

#### 505.1.3 Product Delivery, Storage and Handling

- A. Fire hydrants shall be handled, stored, and protected in such a manner as to prevent damage to materials, coatings, and finishes.
- B. All fittings and joints shall be kept free from dirt, oil and grease.

#### 505.1.4 Acceptable Manufacturers

- A. Reference the Design Standards Volume II, Appendix A - Approved Materials List

### 505.2. Materials

#### 505.2.1 General

- A. All fire hydrants shall be designed and manufactured in strict compliance with AWWA Standard C-502 entitled "AWWA Standard for Dry-Barrel Fire Hydrants".

#### 505.2.2 Service

- A. All fire hydrants shall be designed for working pressure of 250 psi and each factory assembled unit shall be hydrostatically tested in accordance with applicable Standards noted in this specification. Shop tests for the body and main valve will be subjected to a hydraulic pressure of 300 psi.

#### 505.2.3 Size of Hydrant

- A. Hydrants shall have a main valve opening size of five and one quarter (5-1/4) inches.

#### 505.2.4 Type of Hydrant

- A. Hydrants shall be a three-way type with two (2) hose nozzles and one (1) pumper nozzle located on the same plane with the center line of the pumper nozzle, at least eighteen (18) inches above ground line.

#### 505.2.5 Inlet Connection

- A. Hydrant shall be provided with a mechanical joint inlet to accommodate 6-inch diameter ductile iron or PVC pipe complete with plain rubber gasket, gland, bolts and nuts all in accordance with ANSI A21.11.

All nuts and bolts shall be high-strength, low alloy 304 Stainless Steel, manufactured in accordance ANSI A21.11 (AWWA C111).

#### 505.2.6 Main Valve Assembly

- A. Main valve of the hydrant shall be 5-1/4-inch diameter compression type which closes with the water pressure. Seat ring shall be bronze with a machined face and external threads for threading into a bronze drain ring or a bronze bushed shoe to provide bronze to bronze seating for the main valve, complete with O-rings for sealing.

Gasket for valve shall be a replaceable type fabricated of a resilient material with a threaded bottom plate or nut complete with seal to prevent leakage from the hydrant.

The valve assembly shall include one or more drain valves which will work automatically with the main valve and drain the barrel when the main valve is in the closed position. All drain tubes shall be bronze lined and sized large enough for the barrel to drain within 12 minutes when the barrel is sized for a five (5) foot trench depth.

All parts of the main valve assembly shall be so designed that removal of the assembly from the barrel is accomplished without excavation in accordance with [Section 3.2 of the referenced specifications](#).

#### 505.2.7 Operating Shaft Nut

- A. The operating nut shall be 7/8-inch tapered square. Bushings in bonnet shall be so constructed that it will prevent the operating nut from traveling during opening or closing operation; also the bushing shall house a gasket or seal to prevent moisture or foreign material from entering the lubricant reservoir.

The hydrant shall open by turning the operating nut to the right in a clockwise direction and shall have an arrow on top of the bonnet to designate the direction of opening.

505.2.8 Pumper Nozzle and Cap

- A. The pumper nozzle shall be 4-1/2-inch nominal diameter with four (4) threads per inch NST; threads shall be open right (clockwise).

Nozzle cap shall be furnished with a synthetic rubber gasket installed in a retaining groove and the dimensions and shape of the nozzle cap nut shall be the same as the operating shaft nut as described in Paragraph 2.8 of the specifications.

Nozzle caps shall be furnished with security chains with one end of each securely attached to the upper barrel section of the hydrant.

505.2.9 Hose Nozzles and Caps

- A. The two hose nozzles shall be 2-1/2-inch nominal diameter with seven and one-half threads per inch (2.5 – 7.5 N.H.). Threads shall be open right (clockwise) and National Standard in accordance with NFPA No. 194. Each hose nozzle shall include a nozzle cap with nut and security chain.

505.2.10 Nozzle Attachment

- A. The hose and pumper nozzles shall be threaded and locked in place by a stainless-steel pin or screw. Sealing of the threaded connections shall be accomplished by the use of O-ring gaskets.

505.2.11 Color

- A. The upper exposed section of the hydrant above ground shall be given a prime coat of synthetic red lead primer, Type IV-TFP-86a, followed by one shop coat of heavy-duty alkyd enamel paint conforming to the City's standards. Acceptable paint and manufacturers: Diamond Vogel Nu-Cling; 100% acrylic latex enamel gloss Part #MH3533 Safety Yellow or approved equal from the Utility.

The buried portion of the hydrant shall be given a bituminous coating in accordance with Section 6-8.1 of AWWA C-106 Standards.

505.2.12 Hydrant Gravel

- A. Hydrant Gravel shall be a well graded crushed stone or gravel, conforming to ASTM-D448, CDOT #67, as listed below:

<u>Size</u>	<u>Percent Passing</u>
1"	100
3/4"	90-100
3/8"	20-55
#4	0-10
#8	0-5

### 505.3. Execution

#### 505.3.1 Prior to Installation

- A. Carefully clean hydrants of all foreign material and inspect hydrant's valves in open and closed positions. Notify the Engineer/Utility and do not install the hydrant if it does not function properly.

#### 505.3.2 Installation

- A. Installation practices shall conform to the manufacturer's recommendations.
- B. Install hydrants as shown on the Construction Drawings and set plumb.
- C. All joints on fire hydrant lateral (lead) shall be restrained from main to hydrant.
- D. All underground valves shall be installed with cast iron valve boxes set over the valve with no weight bearing on the valve or pipe. All underground valves shall be coated with bituminous material and encased in polyethylene.
- E. Developer shall provide offset staking for both vertical and horizontal control.
- F. Joining of laterals, valves, and hydrants shall be handled in the same manner as pipe.
  - 1. Fire hydrant shall be installed vertically plumb with pumper nozzle facing direction shown on Construction Drawings.
    - a. The vertical distance from any finished surface to centerline of pumper nozzle shall not be less than eighteen (18) inches, nor greater than twenty (22) inches.
  - 2. Fire hydrant shall be set to elevation staked, to insure that bury line is at final grade.
  - 3. Hydrant, piping and valve shall be encased in eight (8) mil polyethylene.
    - a. When hydrant is connected to a PVC water main, the locator wire for the PVC main shall be wrapped around the lower barrel and then placed in locator station box (reference section xxxx – Plastic Pressure Pipe).
  - 4. All joints on fire hydrant laterals shall be restrained joint.
- G. All fire hydrants shall be supported on a minimum of eighteen (18) inches of compacted Hydrant Gravel and supported on a concrete brick.

- H. If the Contractor chooses to install concrete thrust block than Concrete thrust block shall have a minimum bearing surface area of 4.5 square feet and shall be placed behind hydrant shoe.
  - 1. A sheet of eight (8) mil polyethylene film shall be placed between hydrant shoe and concrete thrust block.
  - 2. Care shall be taken when placing thrust blocks so that hydrant drain holes remain free of obstructions.
  - 3. After pouring thrust block, Hydrant Gravel shall be placed to a depth of twelve (12) inches above hydrant shoe.
  - 4. Hydrant drain holes shall remain free of obstructions.
- I. Following placement of Hydrant Gravel, area around hydrant shall be backfilled with Flo-fill.
  - 1. Reference Section XX, Controlled Low Strength Material Backfill (Flow-Fill).
- J. Fire hydrants which are placed in concrete sidewalks or pavement, shall maintain twelve inches of horizontal clearance between the concrete and the hydrant barrel.
  - 1. Space between concrete and barrel shall be filled with asphalt or gravel.
- K. When installation of fire hydrant in parking or driveway area is approved by Utility, bollards shall be installed around the fire hydrant.
- L. No post, fence, vehicle, trash, storage, or other permanent or temporary material or item, shall be within four (4) feet of a fire hydrant.
- M. No tree shall be within 10 feet of a fire hydrant and no bush shall be within 4 feet of a fire hydrant.
- N. Ground surrounding the fire hydrant shall slope away from the hydrant at a minimum grade of 2%, toward street.
- O. After installation of fire hydrant is complete, oil/grease reservoir shall be checked to ensure that it is full.
  - 1. If necessary to fill reservoir, it shall be filled with oil/grease which is specified by hydrant manufacturer.
- P. If hydrant must be raised, no more than one (1) extension section can be used, unless approved by Engineer/Utility.
  - 1. All adjustments must meet manufacturer's recommendations for final bury.

2. Breakaways on stem must be relocated up relative to the height that the hydrant is being raised to the upper portion of the extension and meet manufacturer's recommendations.

3. Contact Engineer/Utility for final approval of hydrant adjustment.

Q. Reference Standard Detail.

505.3.3 Operation

- A. Fire hydrants which have been accepted by the Town, shall be operated by Town personnel only.

- B. Fire hydrants shall be booted or bagged until they have been accepted for service by the Town.

505.3.4 Testing

- A. Hydrants shall be tested at the same time that the adjacent pipeline is tested. Joints shall show no visible leakage under test. The Developer shall repair joints that show signs of leakage prior to final acceptance.

END OF SECTION

## Section 506

### Water Service Lines and Appurtenances

#### 506.1. General

##### 506.1.1 Description

- A. This section concerns materials and installation of corporation stops, curb stops, service lines less than two (2) inches in size, backflow prevention assemblies, stop & waste valves and appurtenances.

##### 506.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

##### 506.1.3 Product Delivery, Storage and Handling

- A. Products shall be handled, stored, and protected in a manner which will prevent damage to materials, coatings and finishes.
- B. All material shall be kept clean and free from dirt.
- C. No galvanized pipe or fittings shall be used.
- D. All brass fittings shall be no lead brass.

##### 506.1.4 Installation of Service Taps

- A. **Reference Typical Water Service Detail** for 5/8 x 3/4-inch through 2-inch services.
  - 1. All residential water service shall be installed in the center of the lot unless otherwise approved by the Engineer/Utility.
  - 2. All water and sanitary sewer services shall have a minimum horizontal separation of ten feet.
- B. Contractors licensed by Town for utility work in the public right-of-way shall be allowed to make service taps on new water mains which have been initially accepted.
- C. Contractor shall not make service taps on existing water mains without permission from the Engineer/Utility.
  - 1. Engineer/Utility may authorize Contractor to make service taps or to use a licensed or authorized tapping Contractor to make service taps on existing mains. The Engineer/Utility representative will observe the tapping operation.

2. The Engineer/Utility shall be notified forty-eight (48) hours before making a tap.
- D. Utility reserves the right to make taps in lieu of Contractor and the right to deny permission for any main to be tapped.
  - E. Tapping equipment shall be of good quality, used for the purpose intended and used in accordance with manufacturer's instructions.
  - F. All ¾-inch and 1-inch taps, on ductile iron pipe, shall be installed by direct tapping.
  - G. On ductile iron pipe, 1 ½-inch and 2-inch taps shall be installed by one of the following methods:
    1. Taps on new construction shall be a mechanical joint tapped tee with an iron pipe thread inlet corporation.
    2. Taps on existing lines shall be made with a tapping saddle.
  - H. Service connections larger than 2-inch shall be installed by one of the following methods:
    1. Reference Section XX, Tapping Sleeves for Distribution Lines and Section XX Water Distribution System.
  - I. Unless otherwise approved by Engineer/Utility, all taps on plastic pressure pipe shall be made with a tapping saddle in accordance with manufacturer's recommendations.

#### 506.1.5 Maintenance and Correction

- A. Developer shall maintain and repair all service lines and any associated appurtenances which leak, were installed incorrectly, or otherwise prove to be defective. Developer shall provide a two-year (2) maintenance guarantee and a five-year (5) guarantee covering all errors and omissions in the design and/or construction of the improvements and which guarantees shall run concurrently and shall commence upon the date of completion of the improvements and acceptance thereof by the Town.

### 506.2. Products

#### 506.2.1 Tapping Saddles

- A. Tapping saddles for 2-inch and smaller services shall have either a bronze or brass body with bronze single or double flat straps and bronze nuts.
  1. Outlet threads on tapping saddles shall be "cc" type.
  2. Acceptable manufacturers of tapping saddles are:



- a. Reference the Design Standards Volume II, Appendix A - Approved Materials List

#### 506.2.2 Corporation Stops

- A. All corporation stops shall conform to AWWA C800.
  1. All corporation stops shall be constructed of no lead brass.
  2. Corporation stop inlet threads for tapping saddles shall be "cc" type.
  3. Corporation stop inlet threads for tapped tees shall be IP type.
  4. All corporation stop outlets shall use a compression connection.
  5. All corporation stops shall be ball type valves only.
  6. Corporation stops shall be used for all taps which are 2-inches and smaller.
  7. Corporation stops shall have uniform size on inlet and outlet.
- B. Acceptable manufacturers of corporation stops are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 506.2.3 Water Service Lines

- A. Copper pipe shall be used for service lines 3/4" and 1" and may be used for 1-1/2" and 2" service lines.
  1. All copper services shall conform to the Appendix to AWWA C800.
  2. All copper services shall be Type K copper.
- B. DR 9 High Density Polyethylene (HDPE) Pipe may be used for 1-1/2inch and 2-inch services instead of copper.
  1. HDPE pipe shall conform to ASTM D2737 Copper Tube Size (CTS).
  2. Stiffeners are required when making a compression connection on HDPE pipe.
  3. Tracer wire is required for all plastic service lines and shall be terminated in a locator station box in conformance with **Section xxxx – Plastic Pressure Pipe.**

#### 506.2.4 Couplings

- A. All couplings shall use a compression connection.
- B. Acceptable couplings are:

1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 506.2.5 Curb Stops

- A. All curb stops shall have compression connections at both ends.
- B. Top threads for all curb stops shall be Minneapolis type.
- C. Curb stops shall be used for services which are 2-inches and smaller.
- D. Curb stops shall be ball type valves only.
- E. Curb stops shall not be of the "Stop & Waste" type.
- F. Curb stops shall have positive stop at 90 degrees on or off.
- G. Acceptable curb stops are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
- H. Acceptable 2-inch curb stops are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 506.2.6 Curb Boxes for Curb Stops

- A. Minneapolis pattern base shall be used for all curb stops.
- B. Acceptable curb boxes are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 506.2.7 Valves and Valve Boxes for 3-inch and Larger Services

- A. Reference Section xxxx – Valves.

### 506.3. Execution

#### 506.3.1 General

- A. The Contractor shall make all taps and install the service line to the curb stop prior to disinfection and pressure testing of the water main.
- B. The Contractor shall adjust stop boxes to horizontal location and to final grade as determined by a grade stake.
  1. Grade stakes shall be placed a minimum of five feet from the location of the stop box.
  2. Grade stakes shall not be disturbed prior to inspection of the service by the Engineer/Utility.

506.3.2 Corporation Stops

- A. Taps shall not be made within three (3) feet of any joint or fitting.
- B. Taps shall be separated by a minimum of three feet (3') (measured along the pipe length), even when taps are made on opposite sides of pipe.
- C. ¾" and 1" taps shall be positioned at either the 10:00 O'clock or 2:00 O'clock position unless otherwise approved by the Engineer/Utility.
- D. 1½" and 2" taps shall be positions at either the 9:00 O'clock or 3:00 O'clock position unless otherwise approved by the Engineer/Utility.
- E. Taps which are made on the same side of the pipe and within 10 feet of each other (measured along the pipe length), shall be staggered fifteen degrees.
- F. Taps made to plastic pressure pipe shall be made in accordance with the manufacturer's recommendations.
  - 1. Use tapping saddles only.
  - 2. Use shell cutters to make tap.

506.3.3 Service Lines

- A. All service lines shall be a minimum of 54 inches and a maximum of 66 inches below the final grade.
- B. There will be a maximum of one coupling per service, between the main and the curb stop.
  - 1. Service lines (¾-in. through 2") shall be uniform in size from the corporation stop to 5 feet past the meter.
  - 2. An exterior meter setting will be required if the customer's service line is not uniform in size from the corporation stop to the building.
- C. When backfilling the service trench, squeegee shall be used under and 6-inches above the goose neck at the service connection.
  - 1. Squeegee shall conform to Section XX, Trenching, Bedding and Backfill specifications.

Water Distribution Bedding (Squeegee)	
Size	Percent Passing
1/2"	100
3/8"	85-100
#4	10-30
#8	0-10
#16	0-5

D. Service trenches shall be subject to compaction specifications.

1. Reference Section xxxx – Trenching, Bedding and Backfill.

E. All commercial service lines shall be protected by a backflow prevention assembly per the most recent Cross-Connection Control Manual adopted by Town Council. This shall include domestic, fire and lawn irrigation service lines.

506.3.4 Curb Stops

A. The Contractor shall adjust the curb stop box to ½-inch above final grade prior to final inspection.

B. Curb stop box shall be screwed onto the curb stop.

C. Curb stop box shall be plumb, so that a shut-off key can be placed on the curb stop.

D. Major landscaping (shrubs, boulders, etc.) and structures (retaining walls, fences, buildings, etc.) shall not be placed within four (4) feet of the curb stop box.

1. Trees shall not be planted within ten feet (10') of the curb stop box.

E. If the grade of the ground surrounding the curb stop box is changed, after the curb stop box has been installed, the curb stop box cover shall be adjusted to ½-inch above final grade.

506.3.5 Service and Tap Inspection

A. The Contractor shall insure that the curb stop, corporation stop, and any couplings remain exposed until after the inspection and the approval for backfill is given by the Engineer/Utility.

B. All tap and service inspections shall be scheduled with the Engineer/Utility.

1. Without exception, a minimum of forty-eight (48) hour notice is required on all tap and service inspections.

END OF SECTION

## Section 507

### Meters and Appurtenances

#### 507.1. General

##### 507.1.1 Description

- A. This section concerns materials and installation of meters, meter setters, meter pits and appurtenances.

##### 507.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

##### 507.1.3 Product Delivery, Storage and Handling

- A. Products shall be handled, stored, and protected in a manner which will prevent damage to materials, coatings and finishes.
- B. All material shall be kept clean and free from dirt.

##### 507.1.4 Maintenance and Correction

- A. Contractor shall maintain and repair all meter pits, copperhorns, coppersettlers and any associated appurtenances which leak, were installed incorrectly, or otherwise prove to be defective.

Developer shall provide a two-year (2) maintenance guarantee and a five-year (5) guarantee covering all errors and omissions in the design and/or construction of the improvements and which guarantees shall run concurrently and shall commence upon the date of completion of the improvements and acceptance thereof by the Town.

##### 507.1.5 Meter Setters

- A. Contractor shall furnish meter setters for 3/4-inch, 1-inch, 1 1/2-inch, and 2-inch meters.
  - 1. Single family and duplex residential buildings may utilize interior or exterior meter settings for 3/4-inch meters only.
    - a. Single family and duplex residential buildings with fire lines shall use exterior meter settings. The fire line connection shall be downstream of the meter box.
    - b. No meters shall be installed in crawl spaces.
  - 2. Multi-family residential buildings shall use exterior meter settings.

3. Commercial buildings shall have meters installed as follows:
  - a. 3/4-inch meters may use an exterior or interior meter setting, at the option of the Developer.
  - b. All 1-inch, 1 ½-inch and larger meters shall use an exterior setting.
4. Interior meter settings shall be installed in accordance with [Standard Interior Setting for 3/4-inch Water Meters Detail Drawing](#).
5. Exterior meter settings for 3/4-inch and 1-inch meters shall be installed in accordance with [Standard Exterior Setting For ¾" and 1" Water Meters Detail Drawing](#).
6. Exterior meter settings for 1½-inch and 2-inch meters shall be installed in accordance with [Standard Setting For 1½" and 2" Water Meters Detail Drawing](#).

507.1.6 Meter Boxes (3/4- and 1-Inch Meters)

- A. Contractor shall install 3/4-inch and 1-inch meter boxes.
  1. Meter boxes shall be a minimum of 20-inches in diameter, a minimum of 48-inches in length.
  2. Meter box covers shall be constructed of cast iron with cast iron recessed lids and rubber or plastic inner lids.
  3. Meter boxes shall be installed in accordance with [Standard Exterior Setting For ¾" and 1" Water Meters Detail Drawing](#).

507.1.7 Meter Pits (1 ½ - and 2-Inch Meters)

- A. Contractor shall install 1 ½-inch and 2-inch meters pits.
  1. Meter pits shall be constructed from standard 48-inch inside diameter precast concrete manhole sections.
  2. Meter pit covers shall be an aluminum manhole ring and cover with a 24-inch diameter opening.
    - a. All meter pit covers shall have a 27/32-inch worm-lock with a Standard Waterworks pentagon head.
    - b. All meter pit covers shall have the word "water" cast in the lid.
    - c. Meter pits shall be installed in accordance with [Standard Setting for 1½" and 2" Water Meters Detail Drawings](#).

507.1.8 Meter Vaults (3-Inch and Larger Meters)

- A. Contractor shall install 3-inch and larger meters and meter vaults.

1. Meter pits and vaults shall be constructed from precast concrete box sections designed for HS-25 bridge loading.
  - a. Minimum interior vault dimensions for different size meters shall be as noted on Standard Detail for 3" and 4" Water Meters.
2. Unless otherwise specified, meter vault covers shall be an aluminum manhole ring and cover with a 24 inch diameter opening.
  - a. All meter vault covers shall have a 27/32-inch worm-lock with a Standard Waterworks pentagon head.
  - b. All meter vault covers shall have the word "Water" cast in the lid.
  - c. All meter vaults shall be installed in accordance with the Standard Detail for 3" and 4" Water Meters.

## 507.2. Products

### 507.2.1 Meters and Strainers

- A. All meters and strainers shall be purchased from the Utility unless otherwise specified.
- B. Acceptable meters and strainers are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

### 507.2.2 Meter Setters

- A. All multi-family buildings shall use exterior meter settings.
- B. Acceptable 3/4-inch copperhorns (interior meter settings) are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
- C. Acceptable 3/4-inch coppersettlers (exterior meter settings) are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials Lists.
- D. Acceptable 1-inch copperhorns (interior meter settings) are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
- E. Acceptable 1-inch coppersettlers (exterior meter settings) are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
- F. Acceptable 1 1/2-inch and 2-inch meter setters are:

1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 507.2.3 Meter Boxes

- A. Acceptable 3/4-inch and 1-inch meter boxes are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
- B. Acceptable meter box covers and lids for 3/4-inch and 1-inch meter boxes are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
- C. Acceptable 3-inch meter box extensions for 3/4-inch and 1-inch meters are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

#### 507.2.4 Meter Pits and Vaults

- A. Acceptable meter pits and vaults for 1 1/2-inch and larger meters are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.
- B. Acceptable meter pit and vault covers for 1 1/2-inch and larger meters are:
  1. Reference the Design Standards Volume II, Appendix A - Approved Materials List.

### 507.3. Execution

#### 507.3.1 Exterior Meter Settings

- A. Exterior meter settings shall be installed by the Contractor according to the manufacturer's recommendations, and in accordance with the Standard Detail for exterior setting of 3/4" and 1" water meters, 1 1/2" to 2", 3" and 4" water meters.
  1. 3/4-inch, 1-inch, 1 1/2-inch, and 2-inch meters shall be installed by the Utility upon inspection and acceptance of the meter setting.
  2. 3-inch and larger meters are issued by the Utility to be installed by the Contractor prior to inspection and acceptance.
- B. Meter pits and vaults shall not be installed in any street, alley, parking area, driveway, or sidewalk.



- C. Major landscaping (shrubs, boulders, etc.) and structures (retaining walls, fences, buildings, etc.) shall not be placed within four (4) feet of any meter box, pit or vault.
- D. Trees shall not be planted within ten feet (10') of any meter box, pit or vault.
- E. The ground surrounding meter boxes, pits and vaults shall slope away from the lid at a minimum grade of 2% and a maximum of 10% for a minimum of three (3) feet around the meter box measured from the center of the lid.
- F. No plumbing connections will be allowed inside the meter box, pit or vault.
- G. All tees, connections, and couplings shall be a minimum of three (3) feet downstream from the meter box, pit, or vault wall on the outlet side. Reference Standard Detail.
  - 1. Tees and connections shall not be installed between the curb stop and the meter setter or copper horn.
  - 2. Buried stop & waste valves shall not be installed between the meter boxes, pits, or vaults and the backflow prevention assembly. If blowout needed reference Standard Detail.
- H. If the grade of the ground surrounding the meter box, pit or vault changes after the installation, the cover shall be adjusted to ½ inch above the final grade by the property owner.
- I. Meter boxes, pits, or vaults shall not be covered or enclosed as to inhibit meter reading or meter maintenance.

#### 507.3.2 Interior Meter Settings

- A. Interior meter settings shall be installed (residential only) by the Contractor in accordance with the Standard Detail for interior setting of ¾" water meters.
  - 1. The meter, readout wire and readout shall be installed by the Utility upon inspection and acceptance of the meter setting.
- B. If the water service enters the house through the floor, a minimum of 4 inches of concrete or 24 inches of soil shall cover the water service from the edge of the foundation to the vertical riser.
  - 1. The meter setter shall be installed in a heated portion of the building.
  - 2. Services shall be insulated from direct contact with concrete or other abrasive surfaces.

- C. Copper horns shall not be placed in a crawl space.
- D. All copper horns shall be installed so that the meter is in a horizontal position.
  - 1. The copper horn shall not be installed above a hot water heater.
- E. A clear and unobstructed access of not less than 24 inches by 24 inches shall be provided so that the copper horn can easily be reached.
- F. There shall be no tees or connections made between the water main and the meter.
- G. A ½-inch, or larger, conduit shall be installed from the meter setter to the remote reading point.
  - 1. The conduit shall be EMT only.
  - 2. There shall be no more than 75 feet of conduit between pull boxes.
    - a. There shall be no more than 4 (four) 90-degree bends between pull boxes.
    - b. All pull boxes must be installed no more than 48 to 66 inches above the floor.
    - c. Pull boxes shall not be installed in attics or crawl spaces.
  - 3. The remote reading point shall be a two (2) inch deep recessed electrical box with a blank metal cover.
    - a. The recessed electrical box shall be mounted on the outside wall of the building, 48 to 66 inches above the ground, conduit will be connected to the recessed electrical box mounted within one foot of the front corner of the structure on the same side as the electrical meter and terminated within six (6) inches of the copperhorn.
    - b. The remote reading point shall not be covered or enclosed as to inhibit meter reading or meter maintenance.
    - c. Single family attached homes that are individually metered shall be placed on the nearest exterior wall of that unit.

### 507.3.3 Meter Inspections

- A. All water fees shall be paid prior to inspection.
- B. A minimum of 48 hour notice is required on all meter inspections.
- C. All water meter inspections shall be scheduled through the Utilities Water Meter Shop.

1. The Developer shall be billed for re-inspections.
- D. Inspection of 3-inch and larger meters shall be made within 30 days of the issuance of the meter to the Contractor.

END OF SECTION

## Section 508

### Water Distribution System

#### 508.1. General

##### 508.1.1 Description

- A. This section concerns the installation of water distribution mains, and includes the acceptable products, materials, and construction practices which may be used in the installation of water distribution mains.

##### 508.1.2 Related Sections

- A. **Sections 100-110** for general specifications.

##### 508.1.3 Quality Assurance

- A. Water system installations shall conform to the regulations of the Colorado Department of Public Health and Environment, and the Water Quality Control Commission.

- B. Construction staking.

- 1. **Reference Section xxxx – Field Engineering and Surveying.**

- C. Horizontal alignment shall not be deviated from by more than six (6) inches.

- D. Vertical alignment shall not be deviated from by more than three (3) inches, as measured from the pipe invert.

- E. The minimum effective area of thrust blocks, shall be as specified in the Standard Detail for thrust blocks.

##### 508.1.4 Job Conditions

- A. Foreign material, including trench water, shall not be permitted in the pipe.

- B. Debris, tools, clothing, or other material shall not be permitted in the pipe.

- C. Pipe shall be delivered to the site and stored with plastic end plugs to ensure it is kept free from dirt, debris, animals, etc.

- D. In order to prevent water, debris, and animals from entering the pipe, the open ends of the pipe shall be plugged with a restrained watertight plug when pipe laying is not in progress.

- E. Effective measures shall be used to prevent uplifting or floating of the pipeline prior to completion of the backfilling operations.
- F. Pipe, or taps, shall not be installed under the following conditions:
  - 1. When the trench contains water.
  - 2. When weather conditions are unsuitable.
    - a. Temperature is less than 10°F. Written approval is required when the temperature is 32°F or less.
    - b. Snowing heavily.
    - c. Raining heavily.
    - d. High winds.
- G. When the trench bottom is unstable.
- H. Pipe and appurtenances shall be protected against dropping and damage.
  - 1. Pipe and appurtenances shall not be used if they are damaged.

## 508.2. Products

### 508.2.1 Pipe

- A. The same type of pipe material shall be used for each size pipe.
  - 1. Pipe material shall not be interchanged, except where another type of pipe material is specifically indicated.
  - 2. Manufacturer of pipe material shall not be interchanged without permission of the Engineer/Utility.
- B. Reference Sections xxxx – Ductile Iron Pipe and Fittings and xxxx - Plastic Pressure Pipe.

### 508.2.2 Valves

- A. Reference Section xxxx - Valves.

### 508.2.3 Hydrants

- A. Reference Section xxxx – Hydrant

### 508.2.4 Service Lines, Meters, Appurtenances

- A. Reference Section xxxx – Water Service Lines and Appurtenances and Section xxxx – Meters and Appurtenance

## 508.3. Execution

### 508.3.1 Inspection

- A. Pipe barrel, fittings, and valve boxes shall be free of dirt or other foreign objects prior to installation.
- B. Pipe and fittings shall be inspected for cracks, dents, abrasions or other flaws prior to installation.
- C. Pipe and fittings with damaged linings or coatings shall be rejected.
  - 1. Defective pipe shall be marked and removed from the site.

### 508.3.2 Preparation

- A. Trenching, backfilling and compaction.
  - 1. Reference Section xxxx – Trenching, Bedding, and Backfill.
- B. Connections.
  - 1. The location and elevation of the existing pipe shall be verified prior to construction.
- C. Cutting the pipe.
  - 1. The pipe shall be cut smooth, straight, and at right angles to the pipe axis, with saws or pipe cutters which are designed specifically for the material.
  - 2. The cut end of the pipe shall be beveled in accordance with the manufacturer's recommendations.
  - 3. Burrs shall be removed and all dust shall be wiped off of the jointing surface.
- D. Joints.
  - 1. Dirt, oil, grit, and other foreign matter shall be removed from the inside of the bell and outside of the spigot.
  - 2. A thin film of lubricant shall be applied to the inside surface of the gasket and the spigot end of the pipe, per the pipe manufacturer's recommendations.
  - 3. The lubricated joint surface shall be kept clean until joined.
  - 4. The pipe shall have a depth mark prior to the assembly to ensure that the spigot end is inserted the full depth of the joint.
  - 5. Stabbing of the pipe shall not be allowed.

6. Previously completed joints shall not be disturbed during the jointing operation.
7. All joints shall be watertight and free from leaks.
8. After the initial acceptance of the water main, the Contractor shall be responsible for the repair of any leak, resulting from improper workmanship or materials, which is discovered within a two (2) year period.

#### 508.3.3 Pipe Installation

- A. Pipe shall be installed with the bells pointing in the direction that the work is progressing.
- B. The Contractor shall prevent the opening of joints during bedding and backfilling operations.
  1. Bedding Zone Material shall not be dropped onto unsupported pipe, which has been set to alignment and grade.
- C. The joint shall be completed in accordance with the pipe material specification, and the pipe shall be adjusted to the correct line and grade as each length of pipe is placed in the trench.
  1. Pipe shall be laid to and maintained at required lines and grades as specified in the approved Construction Drawings.
- D. Ductile iron pipe shall be installed with polyethylene encasement.
- E. Plastic pressure pipe shall not be installed without the use of a tracing wire.
  1. **Reference Section xxxx – Plastic Pressure Pipe.**
  2. A continuity test will be required on the tracing wire after backfilling.
- F. The pipe shall be secured in place with the specified Bedding Zone Material consolidated under and around the pipe.
- G. The pipeline shall be installed so that a uniform positive or negative grade is maintained between the designed high and low points.
- H. The minimum depth of cover shall be 4 ½ feet from the finished grade to the top of the pipe, except as otherwise indicated on the Construction Drawings.
- I. The maximum depth of cover shall be 5 ½ feet from the finished grade to the top of the pipe, except as otherwise indicated on the Construction Drawings.

- J. Concrete encasement shall be provided where indicated on the Construction Drawings or required by these specifications.
- K. A Minimum of 18" vertical clearance shall be maintained when crossing all other utilities.
- L. A Minimum horizontal clearance of 10' shall be maintained from all other utilities unless approved by the Engineer/Utility.
  - 1. Cast-in-Place Concrete.
    - a. Reference Section XXX.
  - 2. Where water lines cross sewer mains, and the sewer is above the water main or less than 18 inches clear distance vertically below the water main, construct the crossing using one length of pipe at least 14 feet long centered over or under the water main. Encase all sewer line joints with concrete that exist within 10 feet either side of the waterline.
  - 3. In lieu of the above, Contractor may, upon approval of the Engineer/Utility, wrap the joints of the joints of the sewer pipe with Butyl adhesive tape.
    - a. Tape shall be 12" wide at all locations within 10 feet either side of the water line.
    - b. Comply with ASTM C 877 (Type III) and manufacturer's instructions for installation of the material.
    - c. Suitable backfill or other structural protection shall be provided to prevent settling or failure or the higher pipe.
    - d. The center of the sewer line pipe shall be centered under or over the waterline unless approved by the Engineer/Utility.
- M. If an existing water main is taken out of service or shut down than the Contractor shall provide to the Engineer/Utility a written plan on how the main will be put back in service (recharged). This plan should include flushing points, de-chlorination, and valves that will need to be operated.

#### 508.3.4 Thrust Restraint (Thrust Blocks)

- A. Anchorage and blocking.
  - 1. General: Thrust blocks can be constructed at all horizontal bends, tees, wyes, offsets, dead ends and reducers in lieu of Mechanically Restrained Bell Restraint Devices (except for fire hydrant leads). A bond breaker shall be placed between the pipe and the thrust block to aid in ease of future removal. For the same reason if a large thrust block is to be poured, it shall be separated by a suitable material into



sections. The Construction Drawings show sizes and shapes of thrust blocks. The bearing surface areas are the minimum areas to bear against the undisturbed trench wall. If, in the opinion of the Design Engineer or the Engineer/Utility, the soil bearing capacity is not sufficient to provide adequate restraint based on the minimum bearing areas shown on the Construction Drawings, then the minimum bearing area shall be increased to the size that will ensure adequate restraint. In every instance the thrust block shall bear against undisturbed earth. When it is impossible, through over excavation or other causes, to pour a thrust block against undisturbed earth, approved restraining systems shall be required to anchor the fittings to the main. Before placing concrete, all equipment for mixing and transporting the concrete shall be clean. All debris, water or ice shall be removed from the place to be occupied by the concrete. Concrete shall not be placed in frozen subgrade. Concrete shall be placed only in the presence of the Engineer/Utility unless inspection has been waived prior to the placement.

B. Form Work for Thrust Blocks

1. All forming for concrete thrust blocks and anchors will be done by bulkheading around the shape of the thrust block or anchor with burlap or reinforced paper sacks which have been filled with sand or earth. Sacks shall be of a size easily handled by the workmen when the sacks are full. Filled sacks used to form concrete blocks shall be left in place in the trench.
2. If the main must be placed immediately into service, plastic wood composite or concrete blocks may be used to form up the thrust block. The plastic wood composite or concrete blocks shall be of such design as to support the thrust until the concrete has set.
3. No horizontal struts or braces required for trench shoring shall remain in the concrete thrust blocks. Prior to placing concrete, the forms and ditch bank shall be inspected and approved by the Engineer/Utility.

C. Minimum Curing Time

1. Newly placed concrete shall be allowed to set, undisturbed for a minimum curing time of 24 hours prior to pressurizing the pipeline.

D. Compaction of Fill Over the Thrust Block

1. Backfill may be placed over the thrust block once the surface has set sufficiently to resist the weight of the backfill.

E. Reference Standard Details for concrete thrust blocks & water main lowerings.

- F. Concrete thrust blocks and anchors for preventing pipe movement shall be provided at all mechanical joint plugs, wyes, tees, crosses, bends which deflect 11-1/4 degrees or more.
- G. Minimum size of concrete thrust blocks and anchors shall be determined from the table in Standard Detail for concrete thrust blocks & water main lowerings.
- H. Concrete thrust block bottom shall be flat, and sides shall be vertical.
- I. If soil is disturbed, making a concrete thrust block or thrust anchor unusable, alternate restraining systems must be approved by the Engineer/Utility prior to pipeline installation.
- J. The concrete thrust block shall be formed to provide access to fittings, valves and hydrants.
- K. Concrete thrust blocks shall be constructed so that joints and drain holes are clear and accessible.
- L. The Engineer/Utility shall be notified 24 hours before concrete is placed.

#### 508.3.5 Thrust Restraint (Mechanically Restrained Devices)

- A. Restraining devices.
  - 1. Mechanically restrained devices can be used in lieu of Thrust Blocks for restraining push-on and mechanical joints at bends, tees, wyes, offsets, reducers and dead ends.
    - a. The Design Engineer shall determine the amount of pipe which needs to be restrained for each individual situation where a mechanical restraining device is needed.
    - b. The Engineer/Utility may request that the Design Engineer furnish joint restraint calculations including all design considerations and assumptions prior to and/or during installation in order to accommodate specific site conditions.
  - 2. All nuts and bolts shall be high-strength, low alloy 304 Stainless Steel, manufactured in accordance ANSI A21.11 (AWWA C111).
  - 3. Reference Section xxxx – Ductile Iron Pipe and Fittings and Section xxxx – Plastic Pressure Pipe.

#### 508.3.6 Installation of Pipeline Appurtenances

- A. Valves, meters, hydrants and other appurtenances to the water distribution lines shall be installed at the location and to the elevation shown on the Construction Drawings, or as approved by the Engineer/Utility to accommodate field conditions.

1. Measurements of the actual location of appurtenances shall be made prior to backfilling for recording in the Record Drawings, by the Developer.
  2. Taps shall not be made within five feet (5') of any joint, fitting, or other taps greater than 2 inches.
  3. No taps shall be made when the temperature is 320 Fahrenheit, or less, without permission from the Engineer/Utility.
- B. All dead-end water mains shall be plugged and have a thrust block poured against the plug or be mechanically restrained.
- C. Blow-offs shall not be permanently installed on dead-end mains.
1. Dead-end water mains with services, shall have a fire hydrant at the end of the water main to facilitate the discharge of air and water from the water main.
    - a. If the water main is to be extended in the future, the fire hydrant may be installed temporarily, until the extension occurs.
    - b. Reference Section xxxx- Hydrants.
- D. Blow-offs which are installed by the Contractor during construction shall be abandoned at the main and removed prior to acceptance of the water main.

#### 508.3.7 Protection of Metal Surfaces

- A. If the supplied material has not been factory coated it shall not be accepted and shall be removed from the site. If the coating has been damaged by installation, the material shall be protected by one of the following methods:
1. Two coats of coal tar paint shall be applied to ferrous metal rods, rebars, clamps, bolts, nuts and other accessories which are subject to submergence or contact with earth or fill material, and are not encased in concrete.
    - a. The first coat of coal tar paint shall be applied to a dry, clean surface.
    - b. The first coat of coal tar paint shall be allowed to dry before the second coat is applied.
- B. If the factory coated epoxy coating has been damaged or chipped it shall be repaired with an epoxy repair kit at the discretion of the Engineer/Utility.

END OF SECTION