

City of Lawrence

Water & Sewer Design & Construction Standards

Unit III – Design and Construction of Water Mains

Table of Contents

Section 1 System Design and LayoutIII – 1

Section 2 Pipeline MaterialsIII – 3

Section 3 Pipe InstallationIII – 12

Section 4 Surface Replacement and Site RestorationIII – 26

SECTION 1

SYSTEM DESIGN AND LAYOUT

1.01 GENERAL

The purpose of this section is to provide information on the design and layout of a water distribution system acceptable to the City of Lawrence Utility (LU). These standards reference 327 IAC 8 and the Ten States Standards and are included herein by reference.

1.02 SIZING OF DISTRIBUTION MAINS

All mains shall be sized large enough to provide for domestic and fire protection flows to the area requesting service. The LU reserves the right to size mains to provide service for future needs.

All new mains shall be of one of the standard sizes set by the LU. Standard sizes are 6, 8, 10, 12, 16, 20, and 24-inch mains. Mains three inches or larger shall be used in cul-de-sacs.

1.03 OPERATING PRESSURES WITHIN THE DISTRIBUTION SYSTEM

The main will be sized so pressures within the distribution system will be adequate during the maximum hour demand and shall in no case drop below 30 psi.

1.04 LAYOUT OF THE DISTRIBUTION SYSTEM

General: Mains shall be installed in dedicated public right-of-way of such grade, alignment, curvature, and other characteristics as to permit them to be laid and maintained in the normal and usual manner. When the LU determines it is not feasible for an installation to be made in a dedicated right-of-way due to existing field conditions or future projects, the installation shall be made in an easement provided by the Developer.

The conditions under which such an exception will be allowed will be determined for each individual case, and only easements that conform to the terms of the LU standard easement form will be accepted. The easement requirements defined herein must be complied with prior to acceptance of any existing system.

Alignment: Main alignment shall be parallel to the right-of-way or easement lines. Normal practice is to lay the main on the opposite side of the street of the sanitary sewer at a distance of seven to ten feet in back of the curb in new developments. In existing areas, the water main shall be installed parallel and adjacent to the right-of-way (minimum of five feet from right-of-way).

1.05 LINE VALVES

Line valves are required per standard drawings and as shown on the approved plans.

1.06 CONNECTIONS TO EXISTING FACILITIES

All connections to water mains owned or controlled by the LU shall be installed by the developer/contractor. The developer/contractor shall provide and install all fabricated pipe, tapping saddles, valves, etc., necessary to

construct the connection under the supervision of authorized LU personnel. Under no circumstances shall anyone other than LU personnel operate a water main valve either to open or close said valve.

Taps: An LU representative shall be present on site during the authorized tapping of and connection to all facilities owned by the City of Lawrence.

SECTION 2**PIPELINE MATERIALS****2.01 GENERAL**

The developer or his contractor shall furnish ALL pipeline materials necessary for the complete installation of the work. All material shall be new or of a condition acceptable to LU standards and shall comply with the specifications that follow.

2.02 POLYVINYL CHLORIDE (PVC) PIPE – 6-INCH THROUGH 24-INCH

- A.** PVC – PVC pipe shall be of a blue tint and conform to the latest edition of ANSI/AWWA C900 and C905 with Ductile iron pipe OD for PVC pipe. Materials from which the pipe is manufactured shall have been tested and approved for conveying potable water by the National Sanitation Foundation and the Underwriter’s Laboratories and shall be marked with the U/L logo. Where fittings are required, ductile iron fittings shall be used.
- B.** Wall Thickness, small pipe – Pipe wall thickness for 6-, 8-, 10-, and 12-inch pipe shall be as required to provide a minimum wall thickness with a DR of 18 for pressure class 150 as defined in ANSI/AWWA C900.
- C.** Wall Thickness, large pipe – Pipe wall thickness for 16-, 20-, and 24-inch pipe shall be as required to provide a minimum wall thickness with a DR of 25 for pressure class 165 as defined in ANSI/AWWA C905.
- D.** Joints – Joints for PVC pipe shall be slip-on type with integral bell and spigot pipe, or pipe with extruded type couplings, meeting the requirements of ASTM D-3139, except flexible elastomeric gaskets meeting the requirements of ASTM F 477.
- E.** Acceptable Manufacturers – All domestic manufacturers.

2.03 DUCTILE IRON PIPE AND FITTINGS

- A.** Ductile Iron Pipe – Unless indicated otherwise on the construction plans, all 6-inch pipe and larger shall be Class 50 or minimum pressure Class 250 ductile iron, complete with all accessories and conforming to ANSI A21.51, AWWA C151.

The joint, unless otherwise specified, shall be of the push-on type conforming to ANSI/AWWA C111/A21.11. The pipe shall be cement mortar lined, conforming to ANSI/AWWA C104/A21.4, and shall be coated outside with a bituminous coating with polyethylene encasement.

- B.** Ductile Iron Fittings – The ductile iron fittings shall be complete with all accessories and shall conform to ANSI/AWWA C110/A21.10, 350 psi pressure rating. The joints shall be of the standard mechanical joint type conforming to ANSI/AWWA C111/A21.11 or push-on type conforming to ANSI/AWWA C111/A21.11. All fittings shall be cement mortar lined conforming to ANSI/AWWA C104/A21.4 with polyethylene encasement and shall be coated

outside with a bituminous coating. Fittings shall have distinctly cast upon them the pressure rating and letters “DI” or “DUCTILE”.

- C. Light-Weight Ductile Iron Fittings** – Lightweight ductile iron mechanical joint fittings or push-on type conforming to ANSI/AWWA C153/A21.53 in sizes 6-inch through 12-inch may be used upon approval from LU. Fitting thickness shall meet or exceed ductile iron Class 53 and shall have a working pressure rating of 350 psi. All fittings shall be cement mortar lined conforming to ANSI/AWWA C104/A21.4 and shall be coated outside with a bituminous coating.
- D. Special Gasket Material for Ductile Iron Pipe** – In construction areas where contaminated soils exist, or steam utility lines exist, or may be installed, ductile iron pipe will be required for installation with special nitrile gaskets in the pipe as approved by the Engineer.
- E. Joint Restraints** – Restrained joints shall be manufactured in accordance with pipe manufacturers’ requirements and shall be approved by the Engineer.
- F. Polyethylene Encasement** – All ductile iron pipe and fittings shall be wrapped with polyethylene and shall have tracer wire installed.
- G. Acceptable Manufacturers** – US Pipe, American, Clow, Griffin, Star and Sigma.

2.04 POLYETHYLENE (PE) PIPE AND FITTINGS – 3 INCH THROUGH 24 INCH

- A. Polyethylene Material** – Polyethylene pipe and fittings shall be blue in color or bear a blue stripe and conform to the latest edition of ANSI/AWWA C901 and C906. Material used in the manufacture of polyethylene pipe or fittings shall conform to the PE Standard Code PE 3408.
- B. Wall Thickness** – Minimum pipe wall thickness or Standard Diameter Ratio (SDR) shall be an SDR 13.5 for pipe 6 inches through 24 inches in diameter, and an SDR 11 for pipe 3 inches in diameter.
- C. Iron Pipe Size Versus Ductile Iron Pipe Size** – Ductile iron pipe sizes shall be used for all PE projects with the exception of 3-inch pipe where Iron pipe size shall be used.
- D. Acceptable Manufacturers** – Plexco, Driscopipe, or equal with blue stripe if available and AWWA specification stamp.

2.05 GATE VALVES

- A. Gate Valves** – The type, size, and location of valves shall be as shown on the plans. Except as modified or provided herein, all gate valves in pipe lines shall be 200 psi, iron body, resilient-seated, tight-closure gate valves with non-rising stems conforming to all applicable requirements of ANSI/AWWA C509. All valves furnished shall open left in accordance with LU Standards and be equipped with 2-inch AWWA operating nuts.
- B. Valve Ends** – Valve ends shall be of the mechanical joint type, conforming to ANSI/AWWA C111/A21.11 except where flanged ends are required by the plans.

- C. Resilient Seat – The seat shall consist of a totally encapsulated disc of molded rubber complying with ASTM D 2000. The seat in the closed position must provide a bubble tight seat across the disc at a full differential pressure of 200 psi.
- D. Testing – Each valve shall be tested from both directions by the manufacturer for bubble tight 200-psi differential sealing ability. Each valve shall also be tested in the “disc up” position at 400 psi resulting in a full shell test. There shall be no leakage at any of the valve’s joints or connections.
- E. Removal of Parts – All internal parts shall be accessible without removing the main body from the pressure line.
- F. Fusion Epoxy Coating – Shall be of nominal 10 mils thickness to protect all interior and exterior exposed iron surfaces and comply fully with AWWA C550 and is certified to NSF61.
- G. Stem and Stem Nut – Are to be machined from forged manganese bronze bar stock.
- H. Flow Way – All valves must have a full, round, smooth, unobstructed, oversized flow way, which shall be at least as large as the connecting pipe inside diameter.
- I. Stainless Steel Bolts and Nuts – All bolts and nuts that fasten the bonnet to the valve body, the bonnet thrust plate to the bonnet, and the key nut to the stem shall be ANSI Type 304 or 316 gauge stainless steel.
- J. Thrust Washers – A minimum of two synthetic polymer thrust washers shall provide low operating torque resulting in easier valve operation.
- K. O-Ring Seals – A minimum of two O-ring seals are required. One is to be above the thrust collar, one below. These are to retain lubrication on thrust collar and isolate it from waterway and outside contamination. The top O-ring seal shall be replaceable with valve fully open and under pressure.
- L. Acceptable Manufacturers –Mueller (Resilient Wedge), or approved equal.

2.06 TAPPING VALVES

- A. Tapping Valves – The size and location of the tapping valves shall be as shown on the plans. The valves shall be 200 psi, iron body, resilient-seated, tight closure gate valves with non-rising stems conforming to all applicable requirements of ANSI/AWWA C509/515. All valves furnished shall open left in accordance with the LU standards with 2-inch AWWA nuts.
- B. Valve Ends – The outlet end shall be standard mechanical joint end. The inlet end must have a raised face to assure proper alignment with the tapping sleeve.
- C. Resilient Seat – The seat shall consist of a totally encapsulated disc of molded rubber complying with ASTM D 2000. The seat in the closed position must provide a bubble-tight seat across the disc at a full differential pressure of 200 psi.
- D. Testing – Each valve shall be tested from both directions by the manufacturer for bubble-tight 200-psi differential sealing ability. Each valve shall also be tested in the “disc up” position at

- 400 psi resulting in a full shell test. There shall be no leakage at any of the valve's joints or connections.
- E.** Removal of Parts – All internal parts shall be accessible without removing the main body from the pressure line.
 - F.** Fusion Epoxy Coating – Nominal 10 mils thickness to protect all interior and exterior exposed iron surfaces. Complies fully with AWWA C550 and is certified NSF61.
 - G.** Stem and Stem Nut – Are to be machined from forged manganese bronze bar stock.
 - H.** Flow Way – All valves must have a full, round, smooth, unobstructed, oversized flow way that shall be at least as large as the connecting pipe inside diameter. The waterway is to be bored to accommodate full-size cutters.
 - I.** Stainless Steel Bolts and Nuts – All bolts and nuts that fasten the bonnet to the valve body, the bonnet thrust plate to the bonnet, and the key nut to the stem shall be AISI Type 304 or 316 stainless steel.
 - J.** Thrust Washers – A minimum of two synthetic polymer thrust washers shall provide low-operating torque resulting in easier valve operation.
 - K.** O-Ring Seals – A minimum of two O-ring seals are required. One is to be above the thrust collar, one below. These are to retain lubrication on thrust collar and isolate it from waterway and outside contamination. The top O-ring seal shall be replaceable with valve fully open and under pressure.
 - L.** Acceptable Manufacturers – Mueller (Resilient Wedge), or approved equal.

2.07 BUTTERFLY VALVES

- A.** Butterfly Valves – The size and location of butterfly valves shall be shown on the plans and conform to Class 150B of the ANSI/AWWA C504 Standard. All valves furnished shall open left in accordance with LU standards.
- B.** Valve Disc – Valve discs shall be Ni-Resist, Type 1. Where the seat is attached, the ring must be stainless steel.
- C.** Valve Shafts – Valve shafts shall consist of 1-piece units extending through the discs of 18-8 stainless Type 303 or 304. Shaft diameter shall be in accordance with Table 3 of ANSI/AWWA C504 Standard.
- D.** Valve Bearings – Valve bearings shall be nylon or Teflon.
- E.** Actuator – Manual buried operators shall be either worm gear or traveling nut type and shall be furnished with 2-inch AWWA nuts. Input required at nuts to produce specified output torque shall be less than 150 ft.-lbs. Operators shall be designed to withstand an input at the rate of 300 ft.-lbs. without damage to any operator components.

- F.** Integral Seat Positioner – The valve disc must be permanently centered at the factory. The shaft is to be marked to distinguish where the closed position is to eliminate field adjustment problems.
- G.** External Fasteners – All external fasteners are to be 304-gauge stainless steel.
- H.** Fusion Epoxy Coating – Nominal 10 mil thickness to protect all interior and exterior exposed surfaces. Complies fully with AWWA C550 and is certified NSF61.
- I.** Valve Ends – Valve ends shall be mechanical joint or flange type per AWWA C504-80.
- J.** Acceptable Manufacturers – Mueller, or approved equal.

2.08 TAPPING SADDLES (FABRICATED)

The contractor, when making a 6-inch or larger tap on an existing water main under pressure, shall install fabricated or stainless tapping saddles.

A. Tapping Saddles (Fabricated)

1. These saddles may be used where the tap is at least one size less than the pipe diameter, with the exception of ductile iron.
2. Saddle body is to be finished with 8 to 12 millimeters of fused epoxy coating.
3. Gasket must be ASTM D 2000 BA 508 resistant to water, oil, and hydrocarbon fluids.
4. Flange AWWA Class D plate flange with proper recessing for tapping valves.
5. Bolts and nuts are to be stainless steel.
6. Test plug is to be ¾-inch NPT with a square operating head. The plug must be stainless steel or brass.
7. All tap saddles are to be wrapped with polyethylene wrap.
8. A Hydrostatic test of 150 psi for a minimum of ten (10) minutes shall be performed on the saddle and valve before tapping pipe.
9. Acceptable Manufacturers – JCM Model 412, Ford Model FTSC, Romac Model FTS420 and Smith Blair Model.

B. Tapping Saddles (Stainless)

1. These saddles are to be used where the tap is size on size.
2. The saddle body must be entirely stainless steel for total corrosion control. All welds must be fully passivated to restore stainless characteristics.
3. For polyethylene pipe (HDPE) the saddle must be fused per ASTM F 2620 or TR-41.

4. The gasket is to be gridded virgin GPR compounded for water service. The gasket must be of SBR per ASTM D 2000 MBA710 glued into the face of the flange. The full gasket will give 360-degree pipe coverage.
5. The flange will conform to AWWA C207 Class D ANSI 150 lb. drilling. The flange is to be stainless steel with recess to accept standard tapping valves.
6. The bolts and nuts are to be stainless steel with NC threads. The hex nuts are to be fluorocarbon coated with plastic lubricating washers.
7. The test plug is to be ¾-inch NPT with a square operating head. This plug must be stainless steel or brass.
8. A Hydrostatic of 150 psi for a minimum of ten minutes shall be performed on the saddle and valve before tapping pipe.
9. All tap saddles are to be wrapped with polyethylene wrap.
10. Acceptable Manufacturers – JCM, Romac Ford, and Smith Blair.

2.09 TAPPING SLEEVES

- A. Tapping Sleeves – Tapping sleeves are to be standard mechanical joint type for cast iron pipe or ductile iron and are to comply with all applicable requirements of AWWA C100 for cast iron fittings.
- B. Acceptable Manufacturers – US Pipe, Tyler, Union Foundry, Mueller and American Cast Iron Pipe

2.10 HYDRANTS

- A. Special LU Specifications
 1. Dry top construction – The operating threads should be isolated from potentially corrosive environments, air and water, and should be lubricated with a food-grade lubricant.
 2. National standard pentagon operating nut opened by turning counterclockwise (open left)
 3. “Traffic” or “Safety” model with breakaway flange and coupling assembly
 4. 5¼-inch main valve opening
 5. Two 2½-inch hose nozzles with national-standard hose thread and one 5-inch pumper nozzle. The pumper nozzle shall be equipped with a 5-inch Storz Fitting as manufactured by Action Coupling & Equipment Department, Inc., Part Number AAS+137, or approved equal. The hydrant shall come factory equipped with the Storz fitting and shall not be retrofitted in the field.
 6. Nozzles are to be screwed into the upper section; O-ring sealed and have a pin or set-screw to prevent backing out.
 7. Upper valve plate is to be bronze.

8. Main valve seat must be bronze-to-bronze thread.
 9. Hydrant will be equipped with a mechanical stop to prevent over-torquing the stem.
 10. Drain holes
 11. 6-inch, mechanical joint base, or flange connection if used with PE.
 12. Epoxy-coated lower valve plate and interior parts of hydrant shoe.
 13. 5-foot bury and option for 6-foot bury
 14. Lower barrel to be ductile iron, equivalent to Class 52 pipe.
 15. Hydrants shall be painted “Safety Yellow” (Sherwin Williams); paint shall be seven to eight mils in thickness. All private hydrants shall be painted red (those hydrants located on private water systems not under the control or responsibility of the City of Lawrence).
- B. Hydrants** – Hydrants shall be located as shown on the plans or as directed by the engineer. The location shall provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. When placed behind the curb, the hydrant barrel shall be set so no portion of the pumper or hose nozzle cap will be less than 24 inches from the gutter face of the curb. All hydrants shall stand plumb with the pumper nozzle facing the curb. Hydrants shall be set to the established grade, with breaking ring three inches above the ground as shown and as directed by the engineer.
- C. Bollards** – When hydrant installations have a greater than normal exposure to damage due to vehicular traffic (parking lot installations, unusual driving situation, etc.), the engineer may authorize hydrant protection using steel pipe bollards. Hydrants requiring such protection are to be designated by the engineer and installed by the contractor.
- D. Drainage Area** – Unless otherwise directed by the engineer, a drainage area two feet in diameter and two feet in height shall be excavated above the base of each hydrant. The area shall be filled and compacted with coarse gravel, free of fine sediments, under and around the base of the hydrant to a level above the waste opening. A plastic or geotextile material shall be placed at the interface between the gravel layer and dirt backfill. No hydrant drainage area shall be connected to a sanitary sewer.
- E. Hydrant Restraint** – Hydrants must be restrained per LU standard practice.
- F. Hydrant “Out of Service”** – Hydrants must be clearly indicated out of service by use of manufactured “Out of Service” signs or other means as approved by the LU until the main has been placed “In Service” by the inspector.
- G. Acceptable Manufacturers** – Mueller Super Centurion, or approved equal.

2.11 VALVE BOX, LID AND RISER

- A. Cast Iron Valve Box and Lid** – 8-inch cast iron valve box and lid shall be installed for each valve with a plastic riser. Cast iron box shall be the ‘Top Hat’ style (IWC style).

B. Valve Box Riser – A solid 8-inch riser will be required. The valve riser shall be centered over the valve with a key nut extension required if the valve is below eight feet in depth. Extension shall be within four feet of final grade.

C. Acceptable Manufacturers – Burger Metal Products (New Albany, Indiana), or approved equal

2.12 BLOW-OFF ASSEMBLY FOR 3-INCH THROUGH 24-INCH WATER MAINS

Blow-off shall be 5-foot bury, with a 2-inch horizontal FIP inlet and a 2-inch FIP outlet with PVC plug. Blow-off shall be freeze-proof and self-draining. Top mounted curb stop type operating nut shall turn left to open. Blow-off must seal the drain holes when the valve is one-quarter turn open to fully open. All working parts shall be serviceable from above ground with no excavation required.

Acceptable Manufacturers – Blow-off shall be the model TF500 or TF250 as manufactured by the Kupferle Foundry Department, St. Louis, Missouri, or approved equal.

2.13 AIR RELEASE VALVES FOR 16-INCH, 20-INCH, AND 24-INCH WATER MAINS

Air/vacuum release valves shall be installed at locations shown on the plans or as directed by the engineer. All air releases shall be APCO Model No. 145C, or approved equal. Bodies shall be cast iron with stainless steel floats.

Acceptable Manufacturers – Valve and Primer Corporation (Schaumburg, Illinois) or approved equal.

2.14 JOINT RESTRAINT DEVICES

Joint restraint devices shall be used at all bends and fittings. Thrust blocks are to be used where shown on drawings. Joint restraint devices may be used in lieu of thrust blocking with LU approval.

Acceptable Manufacturers – Uniflange, Ebaa-Iron, Romac, JCM, US Pipe, or approved equal.

2.15 SERVICE SADDLES AND CORPORATION STOP

A. Service Saddles – Service saddles are required for all chlorination and air relief taps on PVC mains 16-inch diameter or greater.

1. Saddle casting is to be ductile iron per ASTM A-536 covered by a black nylon fusion coat approximately 10 to 12 mils thick.
2. Band is to be double-strap stainless steel per ASTM a-240 type 304, two inches wide to spread out clamping forces on pipe.
3. Bolts – UWC rolled thread, stainless steel per ASTM A-192 Type 304. Threads Teflon coated to reduce friction.
4. Nuts – Heavy hex, stainless steel per ASTM A-193 Type 304.
5. Gaskets – Virgin WBR per ASTM MBC 610.
6. Acceptable Manufacturers – Romac 202N, JCM 406, Ford FC202, Mueller DE25

B. Corporation Stop (Tap) (3/4 to 1 inch)

1. Tap is to be easy turning, O-ring sealed, balanced pressure plug type valve having a round, full, open, unobstructed flow way
2. Body is to be one piece with integral wrench slats
3. Operating head is to be large enough to provide adequate wrench gripping area.
4. O-rings on top and bottom are required to seal the valve from exterior leakage
5. Threads are to be AWWA taper on inlet
6. Outlet is to be a compression connection
7. Acceptable Manufacturers – Mueller, McDonald

2.16 PERMANENT SAMPLING STATIONS

The LU may require the installation of a permanent sampling station on new main construction. When required, the station shall be the ECLIPSE NO. 88 sampling station as manufactured by the Kupferle Foundry Department, St. Louis, Missouri. Station shall be 5-foot bury. All working parts shall be made from brass and removable from above ground with no excavation.

2.17 FIRE DEPARTMENT CONNECTIONS

The City of Lawrence Fire Department shall review and approve all fire department connections.

SECTION 3

PIPE INSTALLATION

3.01 GENERAL

The water main construction to be done by the contractor/developer shall consist of the excavating, laying, backfilling, grading, seeding, and cleaning up for installation of water mains per the approved plans submitted to the Lawrence Utilities (LU) and in accordance with the city, county, state, or federal “right-of-way” requirements.

All work shall be in the best practices of the water utility industry and the American Water Works Association and in accordance with all applicable federal, state, and local codes and regulations. Further, it shall be the responsibility of the contractor/developer to obtain all permits necessary for the performance of the work plus completion of the following.

- A. A preconstruction meeting will be held with the developer/contractor for each project.
- B. The LU will have a field inspector to inspect the materials furnished and the work performed for compliance with the main extension requirements. The contractor/developer shall furnish all reasonable assistance as required by the inspector in his inspection and shall obey his/her directions and instructions when they are consistent for the performance of the main extension.
- C. Any damage done to the City’s water system by the contractor/developer or his affiliates shall immediately be repaired to the satisfaction and direction of the LU by the contractor/developer at his own expense.
- D. Should the contractor/developer propose to depart from the specifications contained herein, he shall submit samples and/or specifications of such alternatives to the LU for approval before proceeding.
- E. No work shall be performed under conditions that in the opinion of the LU would adversely affect the quality of the finished job.
- F. The contractor/developer shall conduct his work so as not to interfere with the present operation of the LU water treatment plants or water distribution system. If any conflicts are encountered between the LU and the contractor/developer, the LU will receive priority in scheduling.

3.02 MATERIALS

- A. PVC Piping – PVC Pressure pipe DR18 for pressure Class 150 shall be used on all main extension projects 6- through 12-inch mains and DR25 for pressure Class 165 for mains 16 inches through 24 inches as specified in Section 2.02 of these Standards except in areas of contamination or in areas where other types of materials would be more appropriate for use as directed by the LU.
- B. Pipe Fittings – Fittings shall be Ductile Iron as specified in Sections 2.03 B and C of these Standards.

- C. Valves** – All valves, 6 inches through 12 inches, shall be Resilient Seat Gate Valves as specified in Section 5.05 of these Standards.
1. Valves 16 inches and larger shall be butterfly valves as specified in Section 2.07 of these Standards.
 2. All of the above valves shall be of the same size as the main and open to the left (counterclockwise) and restrained to the pipe per LU specifications.
 3. Provide valves 8 inches and larger with special support such as crushed stone or concrete pads so the pipe will not be required to support the weight of the valve. Set truly vertical.
- D. Tapping Valves and Sleeves** – A tapping valve and sleeve are used together to tap an existing main in service and under pressure without interrupting service. Care shall be exercised to select sleeves and gaskets, which are properly sized to fit the type and class of pipe to be tapped.
1. Where tapping sleeves six inches and larger are used, a thrust block shall be poured behind the tapping sleeve to prevent possible damage to the main. Tapping valves and sleeves shall conform to the specifications in Section 5.06, 5.08, and 5.09 of these Standards.
- E.** A LU inspector must be present and on site during entire tapping procedure.
- F. Valve Boxes** – All buried valves shall be provided with an 8-inch valve box and cover and shall be the IWC-style box.
1. A plastic riser shall be used that will not transmit shock or stress to the valve and shall have enough extension capability to be raised to final grade.
 2. The valve box shall be supported by means of three S hooks (per valve) hung from the top of the riser pipe. This will prevent the box from sliding down the riser.
- G. Fire Hydrants** – All fire hydrants shall meet the latest AWWA standards and the LU requirements as shown on the standard drawings.

3.03 HANDLING PIPE AND ACCESSORIES

All materials furnished by the contractor/developer, including pipe, fittings, valves, hydrants, and other accessories shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoist in such a manner as to avoid shock or damage to coatings. Under no circumstances shall they be dropped.

Hooks shall not be permitted to come in contact with joint surfaces.

3.04 ALIGNMENT AND GRADE

Piping eight inches and smaller shall be laid to the lines and grades with a minimum of 54 inches of cover over the top of the pipe barrel to finished grade. Piping ten inches and larger shall be laid to a minimum of 48 inches of cover over the top of the pipe. Pipe cover less than 48 inches may be approved if hydraulic analysis indicated sufficient flow exists to prevent the main from freezing. Pipeline or runs intended to be straight shall be laid

straight. Curves may be formed by using fittings or beveled joints. Curves made by beveled joints shall not exceed manufacturer's recommendations or design requirements. The contractor/developer shall use surveying instruments when necessary to maintain alignment and grade.

- A. Other Utilities: Protecting Underground and Surface Structures – Temporary support, adequate protection, and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the work shall be furnished by the contractor/developer at his own expense.
- B. Deviation without LU's Consent – No deviation shall be made from the required line or grade without the written consent of the LU.

3.05 EXCAVATION AND PREPARATION OF TRENCH

- A. Description – The trench shall be dug to the alignment and depth required but only so far in advance of pipe laying as the work permits. The trench shall be so braced and drained such that workmen may perform their duties therein to avoid contamination. It is essential the discharge from pumps be led to natural drainage channels or drains.
- B. Width – The trench width may vary with, and depend upon, the depth of trench and the nature of the excavated material encountered but in any case shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly.
- C. Support – The trench shall be excavated to provide a uniform and continuous bearing and support for the pipe barrel on solid and undisturbed ground at every point between joints.
- D. Care of Surface Material for Reuse – If local conditions permit their reuse, all surface materials suitable for reuse in restoring the surface shall be kept separate from the general excavation material.
- E. Flow of Drains and Sewers Maintained – Adequate provision shall be made for the flow of sewers, drains, and watercourses encountered during construction, and the structures, which may have been disturbed, to be satisfactorily restored to avoid contamination.

3.06 PUBLIC UTILITIES

The contractor/developer will provide plans that will endeavor to show all of the information available concerning the location of underground obstructions, such as sewers, culverts, gas lines, duct, conduits, cables, pipes, and other obstructions.

The contractor/developer shall give due notice to the owners of all utilities and shall see their property is properly supported and protected before disturbing, undermining, or interfering with it.

3.07 PIPE LAYING (PVC)

- A. Materials Inspection – Before lowering any materials into the trench for assembly, the pipe, fitting, valve, or fire hydrant shall be thoroughly inspected in an appropriate manner so as to determine any defects, damage, or unsoundness of the material. Any defective, damaged, or unsound PVC pipe, valve, fire hydrant, or fitting shall be rejected.

- B.** Pipe to be Clean – When the PVC pipe is laid, it shall be free of all foreign matter and cleaned by swabbing with bleach and water solution before it is placed in the trench.
- C.** Manner of Handling PVC Pipe and Accessories into Trench – Proper implements, tools, and facilities satisfactory to the LU shall be provided and used by the contractor/developer for the safe and convenient completion of the work. All PVC pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece by means of derrick, ropes, or other suitable tools or equipment, in such manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench, or on the ground.
- D.** Laying Pipe – After placing a length of PVC pipe in the trench, the spigot for the joint shall be properly lubricated in accordance with manufacturer requirements. The spigot end shall then be centered in the bell, the pipe manually pushed to the marks on the pipe and brought into true alignment.
- E.** Closure of Pipe – At times when PVC pipe laying is not in progress, the open ends of the pipe shall be closed by approved means, and at no time shall trench water be permitted to enter the pipe.
- F.** Cutting Pipe – Cutting of PVC pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Whenever it is necessary to cut PVC pipe with a slip-joint type bell end, the cut end shall be adequately beveled so as to prevent the edge of the pipe from cutting or tearing the gasket as the spigot end is inserted into the bell of the adjoining pipe or fitting.
- G.** Bell Ends to Face Direction of Laying – Unless otherwise directed, PVC pipe shall be laid with bell ends facing in the direction of laying.
- H.** Concrete blocking – Shall be installed when and as shown on the drawings. Concrete shall be as specified in the cast-in-place concrete section (Section 6.20).
- I.** Tracing Wire – Tracing wire shall be placed and secured to the top of all PVC pipe as it is being laid. Where PVC pipe is used to wrap around cul-de-sacs, the tracing wire shall be secured to the top of the pipe at 10-foot intervals or less to ensure the wire remains at the same location as the PVC pipe is being laid. When PVC pipe is used in horizontal directional drilling applications, three tracing wires shall be pulled with the final pull back of the PVC pipe. The tracing wires shall be attached to the leading end of the pulling head to ensure that at least one wire follows the PVC pipe.

3.08 PIPE LAYING (DUCTILE IRON)

- A.** Materials Inspection – Before lowering any materials into the trench for assembly, the ductile iron pipe, fitting, valve, or fire hydrant shall be thoroughly inspected in an appropriate manner so as to determine any defects, damage, or unsoundness of the material. Any defective, damaged, or unsound pipe, valve, fire hydrant, or fitting shall be rejected.
- B.** Pipe to be Clean – When the ductile iron pipe is laid, it shall be free of all foreign matter and cleaned by swabbing before it is placed in the trench.

- C. Manner of Handling Pipe and Accessories into Trench – Proper implements, tools, and facilities satisfactory to the LU shall be provided and used by the contractor/developer for the safe and convenient completion of the work. All ductile iron pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece by means of derrick, ropes, or other suitable tools or equipment, in such manner as to prevent damage to pipe, pipe coating, pipe lining, or polyethylene wrap. Under no circumstances shall pipe or accessories be dropped or dumped into the trench, or on the ground.
- D. Laying Pipe – Unless the LU shall permit otherwise, after placing a length of ductile iron pipe in the trench, the gasket material for the joint shall be properly positioned and lubricated. The spigot end shall then be centered in the bell, the pipe forced “home” and brought into true alignment. The pipe shall not be “forced home” with a backhoe or excavator.
- E. Closure of Pipe – At times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means, and at no time shall trench water be permitted to enter the pipe.
- F. Cutting Pipe – Cutting of ductile iron pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Whenever it is necessary to cut ductile iron pipe with a slip-joint type bell end, the cut end shall be adequately beveled so as to prevent the edge of the pipe from cutting or tearing the gasket as the spigot end is inserted into the bell of the adjoining pipe or fitting.
- G. Bell Ends to Face Direction of Laying – Unless otherwise directed, ductile iron pipe shall be laid with bell ends facing in the direction of laying.
- H. Permissible Deflection of Joints – Whenever necessary to deflect ductile iron pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions, to plumb stems or for other reasons, the degree of deflection shall be approved by the LU per the manufacturer’s specifications.
- I. Concrete blocking – Shall be installed when and as shown on the drawings. Concrete shall be as specified in the cast-in-place concrete section (Section 6.20).
- J. Tracing Wire – Tracing wire shall be placed and secured to the top of all pipe as it is being laid. Where pipe is used to wrap around cul-de-sacs, the tracing wire shall be secured to the top of the pipe at 10-foot intervals or less to ensure the wire remains at the same location as the pipe is being laid. When pipe is used in horizontal directional drilling applications, three tracing wires shall be pulled with the final pull back of the pipe. The tracing wires shall be attached to the leading end of the pulling head to ensure at least one wire follows the pipe.

3.09 PIPE LAYING (POLYETHYLENE)

- A. Materials Inspection – Before lowering any materials into the trench for assembly, the PE pipe, fitting, valve assembly, or hydrant assembly shall be thoroughly inspected in an appropriate manner so as to determine any defects, damage, or unsoundness of the material. Any defective, damaged, or unsound pipe or appurtenance shall be rejected. At any point along the polyethylene pipeline where 10% of the wall thickness has been penetrated or removed by way of marring, gouging, or abrasion, then that damaged section of pipe will be deemed unsound and shall be removed and replaced with a new, clean section of polyethylene pipe.

- B. Pipe to be Clean** – When PE pipe is joined and/or laid, it shall be free of all foreign matter inside the pipe and at the outside ends of the pipe.
- C. Manner of Placing Pipe and Accessories into Trench** – Proper implements, tools, and facilities satisfactory to the LU shall be provided and used by the contractor/developer for the safe and convenient completion of the work. All PE pipe, fittings, valve assemblies, and hydrant assemblies shall be carefully lowered into the trench by means of an approved nylon sling, in such manner as to prevent damage to pipe, fitting or assemblies. Under no circumstances shall pipe, fittings, or assemblies be lowered into the trench by means of a metallic cable, chain or sling. Also, under no circumstances shall pipe or accessories be dumped, dropped, or rolled into the trench, or on the ground.
- D. Preventing Trench Water from Entering Pipe** – At times when PE pipe laying is not in progress, the open ends of the pipe shall be closed by an approved method. At no time shall trench water be permitted to enter the pipe.
- E. Cutting Pipe** – Cutting of PE pipe for the installation of valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Where it is necessary to cut PE pipe, the cut end shall be squared as much as possible prior to facing. Field cutting of PE pipes eight inches in diameter or less can be accomplished by means of a pipe saw without damaging the pipe ends due to melting. When PE pipe diameter larger than eight inches are to be cut, a chain saw with a glycerin-base lubricant is recommended. **DO NOT USE OIL AS A LUBRICANT** or use a chain saw that has had oil in the oiler. Oil will penetrate the pipe wall and decrease the strength of the pipe wall material.
- F. Thrust Restraints** – To help minimize the effects of thermal contraction for PE pipe, water stops shall be installed where and as shown on the drawings. Water stops shall be encased in concrete with dimensions for the cast-in-place concrete to conform to the following table based on the size of PE pipe.

Pipe Size	Concrete Block Face Area	Square Size
6” SDR 13.5	1179 in ²	36” x 36”
8” SDR 13.5	2000 in ²	45” x 45”
10” SDR 13.5	3100 in ²	56” x 56”
12” SDR 13.5	5560 in ²	75” x 75”

- G. Allowable Deflection of PE Pipe** – The maximum allowable deflection of PE pipe shall not exceed the manufacturers’ recommendations. Where the maximum allowable deflection is insufficient to achieve the required change in direction, then a molded or fabricated butt-based bend shall be used. Deflection of PE pipe shall not be permitted at any in-line butt-fused fabricated or molded fitting.
- H. Tracing Wire** – Tracing wire shall be placed and secured to the top of all PE pipe as it is being laid. Where PE pipe is used to wrap around cul-de-sacs, the tracing wire shall be secured to the

top of the pipe at 10-foot intervals or less to ensure the wire remains at the same location as the PE pipe being laid. When PE pipe is used in horizontal directional drilling applications, three tracing wires shall be pulled with the final pull back of the PE pipe. The tracing wire shall be attached to the leading end of the pulling head to ensure at least one wire follows the PE pipe.

- I. River Weights – Where PE pipe is installed at stream crossings by means of open cutting the streambed, then river weights shall be used to prevent the PE pipe from floating during installation. The weights shall be composed of reinforced concrete. The inside diameter of the weights shall be slightly larger than the outside diameter of the PE pipe being installed to allow for cushioning material to be inserted between the contact surface of the pipe and the weights.
- J. Maximum Depth of Bury – The maximum depth of bury for PE pipe shall be eight feet.

3.10 JOINTING PIPE (PVC)

- A. Preparation of PVC Pipe Ends – Before laying the pipes, all lumps, blisters, and foreign material shall be removed from the bell and spigot ends of each pipe. The pipe ends shall then be wiped until clean and dry.
- B. Making up Slip Joints – After the preparation of the PVC pipe ends for a slip joint; the gasket shall be inserted in the bell or on the spigot, as appropriate. The spigot ends of the pipe shall be lubricated with a food-grade lubricant, and the spigot shall be centered and manually pushed to the marks on the pipe.
- C. Making up Mechanical Joints – After the preparation of the pipe ends for a mechanical joint, the gasket shall be inserted in the bell by drawing the gland toward the bell. The bolts shall be drawn up uniformly on opposite side of the pipe with a 10-inch torque wrench.
- D. Hydrostatic Test – The contractor/developer shall perform a hydrostatic test on the pipe as directed by the engineer. All joints shall be watertight and free from leaks. Each leak discovered related to faulty workmanship within three years after final acceptance of the work by the LU shall be repaired by and at the expense of the contractor/developer.
- E. Thrust Restraints – Pipe joints shall be restrained to a length of two joints upstream and downstream of all valve and fitting installations with the exception of 11 ¼° fittings. Acceptable manufacturers are Uni-Flange, Ford, and EBA Iron type 1300 and 1390 Bell Restraints.

3.11 JOINTING PIPE (DUCTILE IRON)

- A. Preparation of Pipe Ends – Before laying the pipes, all lumps, blisters, and excess coal tar coating and other foreign material shall be removed from the bell and spigot ends of each pipe. The pipe ends shall then be wire brushed and wiped until clean and dry.
- B. Blocking shall bear against undisturbed ground, and its minimum bearing area shall be as shown on the drawing or as directed.
- C. Making up Slip Joints – After the preparation of the pipe ends for a slip joint, the gasket shall be inserted in the bell or on the spigot as appropriate. Both the bell and the spigot ends of the

pipe, including the gasket, shall be lubricated with a food-grade lubricant, and the spigot shall be centered and manually pushed or jacked “home.”

- D. Making up Mechanical Joints** – After the preparation of the pipe ends for a mechanical joint, the gasket shall be inserted in the bell by drawing the gland toward the bell. The bolts shall be drawn up uniformly on opposite sides of the pipe.
- E. Restraint Joint Pipe** – When installing restrained joint pipe, it is mandatory that pipe be retracted after being pushed home until the locking segments are seated. Pipe joints shall be restrained to a minimum length of two joints upstream and downstream of all valve and fitting installations with the exception of 11 ¼° fittings or as shown on drawings.
- F. Hydrostatic Test** – The contractor/developer shall perform a hydrostatic test on the pipe as directed by the engineer. All joints shall be watertight and free from leaks. Each leak discovered and related to faulty workmanship within three years after final acceptance of the work by the LU shall be repaired by and at the expense of the contractor/developer.

3.12 JOINTING PIPE (POLYETHYLENE)

- A. Joining of PE Pipe to PE Pipe or PE Fittings** – PE pipe shall be joined to successive lengths of PE pipe or PE fittings by means of butt-fusion, sidewall fusion socket-fusion or by the use of electro-fusion couplings in the trench. The contractor/developer shall furnish evidence of fusion capabilities, including but not limited to, fusion charts identifying recommended fusion temperature, interface pressure, and cooling time. Also the contractor/developer shall furnish evidence thermal fusion shall be conducted by personnel that have received proper training in the use of fusion equipment according to the recommendations of the pipe supplier and fusion equipment supplier. Where sidewall fusion is to be employed, a PE sidewall outlet shall be used. Mechanical type taps may be approved by the LU upon approval.
- B. Joining of PE Pipe to Valves** – PE pipe shall be joined to all valves by means of a flange adapter and back-up ring for each valve face. Where flange adapters are to be used, flange faced valves shall also be used. When butterfly valves are used, a spacer shall be inserted between the face of the adapter and the face of the butterfly valve to accommodate the full operational range of the valve disc. Also, full-face Type “E” gaskets shall be used between the face of the valve and spacer and the face of the spacer and the flange adapter. Where PE flange adapters are installed, high-grade stainless steel studs or bolts and nuts shall be used to secure the flange adapter to the flange face of the valve.
- C. Joining of PE Pipe to Mechanical Joint Fittings** – PE pipe shall be restrained to all mechanical joint fittings to prevent pipe pull out. This connection shall be by means of mechanical rings and bolts using a molded coupling or MJ (Harvey) adapter fused to the pipe.
- D. Alternate Methods** – The method of restraint shall be submitted to the LU for approval in advance of using said restraining method. When connecting pipe to fittings without the use of an MJ Adapter, pipe stiffeners or inserts must be used to prevent toe-in of the pipe material.
- E. Hydrostatic Test** – The contractor/developer shall perform a hydrostatic test on the pipe as directed by the LU. All joints shall be watertight and free from leaks. Each leak discovered related to faulty workmanship within a period of three years after final acceptance of the work by the City of Lawrence will be repaired by, and at the expense of, the developer.

3.13 SETTING VALVES, VALVE BOXES, FITTINGS, AND BLOW-OFFS

- A. Valves – Gate valves and pipe fittings shall be set and jointed to new pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.
- B. Valve Boxes – Valve boxes shall be firmly supported and kept centered and plumb over the operating nut of the valve, with box cover flush with the surface of the finished pavement or at such other level as may be directed. Valve box support hooks that will aid in keeping the valve box body in place shall be used.
- C. Placement – Provide valves eight inches and larger with special support, such as crushed stone or concrete pads, so the pipe will not be required to support the weight of the valves. Set truly vertical.

3.14 SETTING HYDRANTS

- A. General Location – Fire hydrants shall be installed in the locations shown by the plans and in accordance with the LU's Standards. In residential areas with a zoning classification of D-3 or higher and in commercial districts, the maximum spacing between hydrants shall not exceed 300 feet. In rural areas and residential areas D-1 and D-2, the maximum spacing shall not exceed 500 feet.
- B. Bracing and Drainage at Hydrant – The bowl of each hydrant shall be well braced against undisturbed earth at the end of the trench and tied to the main with accepted joint restraints to prohibit the hydrant or valve from becoming disconnected from the main. Hydrant swing arms conforming to AWWA C153/ANSI A21.53F and AWWA C104/ANSA A21.4 may be used. Adequate drainage as described in Section 2.10 (D) of this specification shall be provided.
- C. Cleaning – Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

3.15 CONNECTION WITH EXISTING DISTRIBUTION SYSTEM

- A. General Information – The water mains to be installed will be connected to the existing distribution system by the contractor/developer as shown on the plans. The contractor/developer shall not place the mains in service or out of service by opening or closing the valves.
- B. Removing Existing Plugs for Connections – To ensure all the pressure is off the main, the LU shall open the closest hydrant, blow-off assembly, or service line. If there is no means of checking for pressure, a ¾-inch tap must be installed by the contractor/developer on the top of the main.
- C. Main Connection – Where connections are made between new work and existing piping, such connections shall be made using suitable fittings to suit the conditions encountered. Each connection with an existing pipe shall be made at a time and under conditions as authorized by the LU. Facilities shall be provided for proper dewatering and disposal of all water removed from the dewatered lines and excavations to avoid contamination.

1. The work on the connection to the existing system must be continuous until the water system is placed in service. The LU will schedule this work at a time that is least disruptive to the LU’s water system and customers.
 2. Before connecting the main to an existing dead end, the existing main shall be thoroughly flushed at the nearest hydrant or at the blow-off to remove any sediment which may have accumulated in the existing main as directed by the LU.
- D. Blow-Off** – The contractor/developer will be required to remove the air from the water system at air release locations specified by the LU.
- E. Customer Notification** – The LU shall give minimum 24 hours notification to all customers affected by the temporary interruption to all water service while connections to the distribution system are being made. If any customer cannot be contacted personally, written notification on forms supplied by the LU shall be left at the front door.

3.16 BACKFILL MATERIAL AND COMPACTION

Backfill shall be accomplished as soon as possible after the placement of pipe in the trench. Backfilling shall be carried on with care so the pipe or the pipe coating will not be injured. Backfill material and method used will be of such quality to meet or exceed the requirements of the LU.

The LU shall have the right to alter the backfill procedure so as to give maximum protection to the pipe and coating. No trash, such as sticks, welding rod, stumps, or refuse material of any kind shall be contained in the backfill material. After the pipe is laid and ditches backfilled and tamped, excess excavated material shall be removed and disposed of by the contractor/developer.

All backfill in public right-of-way shall conform to the rules and regulations of the LU.

3.17 CASING PIPE

- A. General Requirement** – The installation of casing pipe shall conform to these specifications and any federal, state, or local requirements or any railroad requirements that may be applicable.
- B. Casing Pipe** – Ductile iron pipe (AWWA C151, latest revision), cast iron pipe (AWWA C106, latest revision), or RCP (ASTM C76) shall be used as a carrier pipe. Casing pipes shall be per ASTM A139 Grade B.

Casing Outside Diameter Thickness	Highway Casing Wall Thickness Inches	Railroad Crossing Casing Wall Thickness Inches
16	0.250	0.281
20	0.312	0.344
24	0.312	0.406
30	0.375	0.469
36	0.500	0.532
42	0.500	0.563

48	0.625	0.625
54	0.625	0.688
60	0.625	0.750

3.18 STREAM CROSSING

- A. General Requirement – The installation of the stream crossing shall conform to a minimum of three feet to cover or any federal, state (Indiana Department of Natural Resources), or local requirements that may be more restrictive.
- B. Type of Construction – The installation of the stream crossing shall be constructed in a manner as to protect the mains from erosion and to restore, as much as practicable, the stream banks and bottom to their original condition.

3.19 PAVING

- A. General Requirement – Materials of construction for paving, curbing, and surfacing shall be furnished in accordance with applicable federal, state, and local standards. If there are no applicable standards, the contractor/developer shall use materials that will produce a result at least equal to the type, which existed before the work began.
- B. Maintenance – Upon completion of the project, the contractor/developer shall maintain the surfaces of curbs and gutters, paved surfaces, sidewalks, and grass areas for a period of one year thereafter, or for such greater period as may be required by federal, state, or local authorities.

3.20 THRUST BLOCKING

- A. Design – Concrete, kicker blocks, and thrust blocks shall be sized for the internal static water pressure of 100 psi plus 100-psi water hammer and the soil bearing capacity. Standard sizes of thrust blocks are shown below.
- B. Construction – Blocking shall be constructed against the vertical face of undisturbed earth or sheeting left in place. The concrete shall be prevented from enclosing more than half the circumference of the pipe and shall be kept away from joints or bolts in the piping. At all locations where concrete is to be in contact with piping and fittings, said pipe and fittings shall be wrapped in polyethylene plastic secured with adhesive tape conforming to AWWA C209.

Minimum Bearing Surface Area (Sq. Ft.) (Dry Clay – 3000 psi Soil Bearing Capacity)				
Size of Pipe	Bearing			Tee or Dead End
	22 ½ °	45°	90°	
10"		4	7	6
12"		6	11	8
16"	6	11	22	15
20"	9	18	36	24
24"	13	27	50	36
30"	20	45	76	57
36"	31	59	115	80

Thrust blocking for hydrants shall be placed to allow the hydrant to drain.

3.21 JOINT RESTRAINT DEVICES

Joint restraint devices shall be used at all bends and fittings and shall be used where these Standards specifically require joint restraint devices. Joint restraint devices shall be required for the following installations.

- A. Fire hydrants
- B. Vertical bends
- C. Reducers
- D. Bends, line valves, and fittings
- E. Plugs
- F. Bored casings
- G. When it is not possible to pour against undisturbed earth
- H. When, in the opinion of the engineer, the bearing capacity of the soil is not sufficient to provide adequate restraint.

3.22 DISINFECTION OF WATER MAINS

- A. Disinfection – The contractor shall be responsible for all aspects of disinfecting new water mains. This shall include the de-chlorination process and the lawful and proper disposal of all water used in the disinfection/de-chlorination project. The LU or its authorized agent or inspector shall be notified at least 48 hours in advance of any disinfection or dechlorination procedure being conducted. In no case will new mains be disinfected with chlorine content in excess of 50 ppm without the express written approval of the utility.

- B.** Bacteriological Samples – The contractor shall be responsible to collect all required water samples for bacteriological testing at the direction of, and under the supervision of, the utility or its authorized agent. The inspector shall be responsible to transport the samples to a laboratory of the utility’s choosing for testing. Contractor will be responsible for all costs of testing. When satisfactory sample results are obtained, the LU will place the main in service.

3.23 INSTALLATION OF TRACING WIRE AND IDENTIFICATION RIBBON

Due to the insulating properties of polyvinyl chloride and polyethylene, electronic sensing devices cannot locate them. Therefore, the contractor/developer shall install insulated No. 10, No. 12 solid gauge copper wire and identification ribbon along with all pipe installations of PVC, PE and DI. The DI pipe shall be also wrapped with polyethylene encasement.

- A.** In open trench installations, the stranded copper wire must be laid directly over the water main. To ensure it is directly over the main, the wire must be attached to the pipe at regular intervals to ensure it stays in place during backfill.

In directional bore installations; a minimum of three (3) No. 10 or No. 12 gauge stranded wires must be attached to the main. Contractors must ensure the wire is attached to the main by performing a continuity test after bore is completed, to be witnessed by the LU’s observer.

- B.** In cul-de-sacs, the tracing wire must be taped or plastic-tied to the polyethylene pipe at 10-foot intervals.
- C.** At each valve, the wire shall be brought to ground level. The wire shall be brought to one foot below ground level on the outside of the riser. A hole one-half inch in diameter is to be cut in the side of the riser and the wire looped and knotted to keep at this elevation. The wire is to have 12 inches (minimum) of loop inside of the valve box riser.
- D.** Where all coupling connections are made in the wire, an overhand loop knot shall be made to prevent the coupling from pulling loose.
- E.** All connections on the wire are to be spliced with a water-tight, gel-packed water proof seal.
- F.** Along with this wire, the contractor shall also install an identification ribbon. The ribbon is to be installed between one and two feet below ground level directly over the pipe. In paved areas, the ribbon is to be installed directly under the pavement base.
- G.** The ribbon must be blue in color and state “Caution: Buried Water Line Below.” The ribbon shall be a minimum of three inches wide.

3.24 CHARGING AND FLUSHING

- A.** The LU will furnish water in reasonable amounts for proper completion of the work at existing fire hydrants. The contractor/developer shall furnish necessary pipe, hose, nozzles, and tools and shall perform necessary labor. The contractor/developer shall make arrangements with the LU (who will fix the time, rate, and duration of each withdrawal from the system) as to the amount of water required and the time when the water will be needed. The LU shall direct and/or perform all charging and flushing procedures. Unnecessary waste of water will not be

permitted. Special hydrant wrenches shall be used for opening and closing fire hydrants. In no case shall pipe wrenches, pliers or channel-locks be used for this purpose.

- B.** All salvageable material from the existing system shall remain the property of the LU. Scrap and rubbish material shall become the property of the contractor/developer, and it shall be the contractor/developer’s responsibility to dispose of such material.
- C.** Permanent Paving – Install by following the standard specifications of state, city, or local agency involved.

3.25 CONSTRUCTION RECORD MEASUREMENTS

After sections of the water mains have been laid, the contractor/developer shall make the construction record measurements of the length of the pipe installed, its location, the location of all fittings, valves, and other appurtenant features of the water main installation. The measurements shall be taken as noted in Section 1.05 of these standards. The superintendent, foreman, or some other equally qualified person shall perform this work.

The contractor/developer or their engineer shall also provide “as-built” plans of the project with the manufacturer information for all materials. “As-built’s” shall be submitted on paper first, for review by the LU. Upon LU approval, the “as-built’s” will be submitted in electronic format compatible with ArcView.

3.26 PROTECTION OF PUBLIC STRUCTURES

See Resolution of Utility Conflicts, City of Indianapolis, April 19, 1995, pages 68 through 71. This resolution shall also be in effect for all areas serviced by the LU unless otherwise stated in writing.

3.27 APPEALS

All appeals to the requirements of this standard shall be addressed in conformance with Ordinance No. 10, 1994 and Title 5, Article 3 of the City of Lawrence Municipal Code.

3.28 PENALTIES

All appeals to the requirements of this standard shall be addressed in conformance with Ordinance No. 10, 1994 and Title 5, Article 3 of the City of Lawrence Municipal Code.

SECTION 4

SURFACE REPLACEMENT AND SITE RESTORATION

4.01 GENERAL

Section 4 pertains to the restoration of areas within the public right-of-way and/or acquired easements where an off-site water line is being constructed. Surface restoration within the construction site being developed is the responsibility of the owner and in conformance to permit requirements.

When the water line construction is complete, remove all surplus material and rubbish from the site. That portion of the surface disturbed by construction shall be rebuilt to as good condition as it was before the commencement of the work. The project site shall be promptly and regularly maintained. The contractor shall be responsible for repairs of unsatisfactory trench backfilling or other unsatisfactory contracted services.

4.02 PAVEMENT, CURB, AND GUTTER REPLACEMENTS

In all streets, alleys, or other areas to be paved, all backfilling shall be well compacted by handheld or other mechanical compaction machines per the requirements of the City of Lawrence. After the trench or excavation has been backfilled, the subgrade for the new paving, curb, and/or curb and gutter shall be further compacted by rolling the backfill at subgrade elevation. After examination of the backfill and subgrade compaction by the engineer and City of Lawrence, if the subgrade, backfill, pavement, curb, and/or curb and gutter is found to be deficient, it shall be replaced at the owner's expense.

All pavements, curbs and/or gutters shall be replaced with the same materials as that removed in accordance with the latest revisions of Standards of the City of Lawrence.

4.03 TRAFFIC CONTROL

The contractor shall maintain vehicular and pedestrian traffic during all paving operation as required per the permit issued by City of Lawrence.

The contractor shall provide flagmen, barricades, and warning signs for the safe and expedient movement of traffic through construction zones within the right-of-way. This shall be in accordance with the principles and standards in the latest revision of *INDOT Standard Specification*.

4.04 LAWN AND GRASS AREA REPLACEMENT

All lawn and grass areas disturbed or damaged during construction shall be restored to original or better condition. Backfills, fills, and embankments shall be brought to subgrade level six inches below finished grade. When subgrade has settled, deposit and spread topsoil to a finished depth of at least six inches, fine raked and ready for seeding.

If the backfill, fill, or embankment material is sand, an 8-inch layer of clay furnished by the contractor at his expense shall be spread over the subgrade and thoroughly mixed into the sand subgrade. Mix the clay into the sand subgrade, then level and smooth. Deposit and spread topsoil to a finished depth of at least two inches and fine rake.

Commercial fertilizer 6-12-12 or equal shall be uniformly spread over the topsoil by a mechanical spreader and mixed into the soil for a depth of two inches on areas to be seeded. This shall be done at least 48 hours before the sowing of any seed at the rate of 35 pounds per thousand square feet. The area shall then be lightly raked or harrowed until the surface of the finished grade is smooth, loose, and pulverized.

Then the grass seed shall be sown by a mechanical seeder and lightly raked into the surface or sown with a standard agricultural drill. The seeded areas shall be thoroughly watered with a fine spray in such a manner as not to wash out the seed. The contractor shall use care in raking in order to avoid disturbance of the finished grade and seed distribution.

Seeding shall be done only within the seasons extending from August 15 to October 15 and from April 1 to June 1, unless otherwise permitted by the LU.

The contractor must submit a seed mixture certificate to the LU before using. Grass seed shall be sown at the rate of not less than three pounds per thousand square feet and shall be the following analysis.

- 35 parts Kentucky Bluegrass
- 30 parts Perennial Rye
- 30 parts Kentucky 31 Fescue
- 5 parts inert matter

Hydro seeding shall be done in accordance with the latest revision of *INDOT Specifications*.

4.05 MULCHING

Adequate mulching material following seeding and fertilizing shall be applied followed by culti-packing.

Mulch shall consist of:

- A.** Dry straw or hay of good quality applied at the rate of 2 ½ tons per acre; or
- B.** Wood cellulose or cane fiber mulch applied at a rate of 1,000 pounds per acre; or
- C.** A combination of good quality dry straw or hay free of seeds of competing plants applied at a rate of 2 ½ tons per acre and wood cellulose or cane fiber mulch applied at a rate of 500 pounds per acre; or
- D.** Manufactured mulch materials such as soil retention blankets, erosion control netting, or others that may be required on special areas of high water concentration or unstable soils. When these materials are used, follow the manufacturer's recommendation for installation.

The seeded area shall be watered, maintained, and patched as directed by the engineer until the contractor's work is completed and accepted.

4.06 STAND OF GRASS

The contractor shall be required to establish a satisfactory stand of grass at least one inch in height. Satisfactory stand of grass defined as full coverage without bare spots. This is not required for areas subject to agricultural activities.

Within three months after work completion, the contractor shall be required to correct any defective work, such as bare spots in grass coverage, erosion, gullies, etc.

4.07 SODDING

The areas to be sodded shall be as shown on the plans and as specified in these Standards.

The use of sod shall be in accordance with the latest revision of *INDOT Specifications*. At a minimum, sod shall be fibrous, well-rooted bluegrass, or other approved sod, with the grass cut to a height of not more than three inches. Edges of sod shall be cleanly cut, either by hand or machine, to a uniform thickness of not less than 1 ½ inches, to a uniform width of not less than 16 inches, and in strips of not less than three feet in length.

Sod shall be free from all primary noxious weeds as defined by the Indiana State Seed Law.