

MATERIAL SPECIFICATIONS

FOR

PADUCAH WATER



**PADUCAH WATER
1800 NORTH 8TH STREET
PADUCAH, KENTUCKY 42001**

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1.0 GENERAL

1. For questions regarding these Specifications, contact Jason Petersen, PE, Engineering Manager, at jpetersen@pwwky.com or 270-444-5560.
2. All materials shall be manufactured in the United States of America unless otherwise approved by PW.
3. All references to standards associated with the following entities/agencies shall be the latest edition.
 - American Water Works Association (AWWA)
 - American Society for Testing and Materials (ASTM)
 - American National Standards Institute (ANSI)
 - American Association of State Highway and Transportation Officials (AASHTO)
 - Underwriters Laboratories (UL)
 - Factory Mutual (FM)
 - Kentucky Transportation Cabinet's Standard Specifications for Road and Bridge Construction
4. Materials shall be in new condition, free from corrosion, rust, discoloration and UV damage.
5. All restraint devices, fittings, etc. shall be provided with accessory kits unless otherwise noted.
6. All materials that come in contact with potable water shall conform with the "Reduction of Lead in Drinking Water Act". Brass components in contact with potable water shall be manufactured from UNS/DCA No. C89833 cast alloy conforming with AWWA C800 and ASTM B-584 and shall be identified with "NL" stamped on the major body component. Brass components that do not come in contact with potable water shall be UNS/CDA No. C83600-85-5-5-5 and shall conform with AWWA C800 (ASTM B-62 and ASTM B-84).

2.0 PIPE AND TUBING

1. GENERAL
 1. Pipe shall be delivered with an appropriate quantity of pipe joint lubricant.
2. DUCTILE IRON PIPE
 1. All ductile iron pipe shall be Pressure Class 350 in accordance with AWWA C151.
 2. Pipe shall be cement lined in accordance with AWWA C104 and shall include an asphaltic internal seal coat.
 3. Joint type shall be Fastite® or Tyton® unless otherwise specified.
 4. Pipe sockets shall accommodate either standard or locking restraint gaskets, and all gaskets shall conform with AWWA C111.
 5. When specifically requested, the standard styrene butadiene rubber (SBR) gaskets shall be replaced with petroleum-resistant nitrile Buna-N elastomer gasket and shall be clearly marked on the gasket in a way that delineates it as non-standard.
 6. When "gauged" pipe is specified, the pipe manufacturer shall utilize a suitable gauge to verify conformance with the outside dimension requirements of AWWA C151 along the entire length of each pipe segment.

7. Provide Tyton Joint® pipe as manufactured by U. S. Pipe & Foundry Company, Inc. or approved equal.
3. POLYVINYL CHLORIDE (PVC) PIPE
 1. Pipe shall be DR 14 (pressure class 305 psi) and manufactured in accordance with AWWA C900.
 2. Pipe color shall be blue.
 3. Gasket material shall be SBR.
 4. Provide pipe manufactured by NAPCO Pipe and Fittings or approved equal.
4. POLYVINYL CHLORIDE (PVC) PIPE – RESTRAINED-JOINT
 1. Pipe shall be DR 14 (pressure class 305 psi) and manufactured in accordance with AWWA C900.
 2. Pipe shall have integral bells with a non-corrosive joint restraint mechanism that is specifically designed and constructed to restrain the bell/spigot pipe joint when subjected to either tensile or compressive forces.
 3. Restrained-joint pipe shall be designed and manufactured specifically for use by horizontal directional drilling (HDD) installation method.
 4. Provide 20 foot joint lengths unless otherwise specified.
 5. Provide Certa-LOK® C900 RJIB pipe with Fluid Tite® gasket as manufactured by NAPCO Pipe and Fittings or approved equal.
5. HIGH DENSITY POLYETHYLENE (HDPE) PIPE – 1.5 INCH AND 2 INCH DIAMETER
 1. Pipe shall be Copper Tube Size (CTS), Controlled Outside Diameter (ASTM D2737) HDPE in accordance with AWWA C901 having a dimension ratio (DR) of 9.
 2. Material designation shall be PE 4710.
 3. The exterior of the pipe shall have a UV stabilized blue color.
 4. The pipe shall contain no recycled compounds except those generated in the manufacture’s own plant from resin of the same specification from the same raw material.
 5. Roll length shall be provided based on the requirements at the time of ordering.
 6. Provide EndoPure® pipe as manufactured by Endot Industries, Inc. or approved equal.
6. HIGH DENSITY POLYETHYLENE (HDPE) PIPE > 2 INCH DIAMETER
 1. Pipe shall be Ductile Iron Pipe Size (DIPS) with a Standard Dimension Ratio (SDR) of 11 in accordance with AWWA C906 unless otherwise noted by PW.
 2. Material designation shall be PE4710.
 3. Resin shall meet the requirements of ASTM D 3350 with a minimum cell classification of 445474 C or higher.
 4. Color shall be black or black with blue stripe.
 5. The pipe shall contain no recycled compounds except those generated in the manufacture’s own plant from resin of the same specification from the same raw material.

6. Length shall be nominal 40 foot segments unless specified otherwise.
7. Provide DriscoPlex®4000 as manufactured by Performance Pipe or approved equal.

7. COPPER TUBING

1. Copper tubing shall be manufactured from first line materials and shall conform to AWWA Standard C800 (Appendix A) - ASTM B88.
2. Copper tubing 3/4 inch and 1 inch shall be Type K, soft, 60 or 100 foot coils as specified.
3. Copper tubing 1.5 inch and 2 inch shall be Type L, hard, tempered, 20 foot lengths.
4. Provide copper tubing manufactured by Wieland Copper Products, LLC or approved equal.

3.0 VALVES

1. GATE VALVES

1. Gate valves shall be Series 2500 Ductile Iron Resilient Wedge Gate Valve as manufactured by AMERICAN Flow Control. No substitutes or “equal” will be considered.
2. All bolts securing the bonnet shall be 304 stainless steel.
3. Valves shall have a non-rising bronze stem with a 2 inch square operating nut.
4. Valves shall turn left (counterclockwise) to open.
5. All end connections shall be MJ x MJ unless otherwise noted.

2. BUTTERFLY VALVES

1. Valves shall be bubble-tight at rated pressures for bi-directional flow conditions.
2. Valves shall be short body 150 psi pressure class in conformance with AWWA C504.
3. Body shall be constructed of ductile iron in accordance with ASTM A536 Grade 65-45-12 with integrally-cast Class 125 flanged ends in accordance with ASME B16.1
4. Disc shall be constructed of ductile iron with 316 stainless steel edge and rotate 90 degrees from full open position to the tight shut position.
5. Seats shall be constructed of NBR and shall be recessed in the body of the valve.
6. Shafts shall be constructed of solid 316 stainless steel.
7. Shaft seals shall be of the self-adjusting type.
8. Valves shall be delivered with a bare stem for mounting of an electric actuator. The valve body shall accept the actuator mounting bracket (by others) and the bracket shall be removable without affecting the seals/packing of the valve while under system pressure.
9. Manufacturer shall perform a hydrostatic shell and seat leak test in both directions.
10. Provide BAW AWWA Butterfly valves manufactured by DeZurik or approved equal.

4.0 FITTINGS

1. DUCTILE IRON MECHANICAL JOINT (MJ) FITTINGS

1. Ductile iron fittings shall be constructed of ductile iron in accordance with AWWA C153 and shall be MJ x MJ connection only.
2. Rubber gasket joints shall be in accordance with AWWA C111.
3. Fittings shall be cement lined and seal coated with asphaltic material in accordance with AWWA C104.
4. Fittings shall be manufactured by Tyler Union® or approved equal.

2. DUCTILE IRON SWIVEL FITTINGS

1. Provide compact ductile iron fittings with one or more swivel connections that allow direct connection of a standard MJ fitting or valve to the swivel fitting.
2. The swivel connection shall consist of a rotating ductile iron gland that bolts to a standard MJ connection regardless of clock orientation of the joint.
3. All other aspects of the fitting construction shall be as specified in Section 4.1 above.

3. HDPE MJ ADAPTOR

1. Mechanical Joint (MJ) adaptors shall be constructed of molded HDPE and provide for the transition from butt-fused HDPE to an MJ fitting in accordance with AWWA C111.
2. The material and dimensional properties (e.g. OD, DR, PE4710, etc.) of the fitting shall be the same as the HDPE pipe to which the fitting will be joined. (Refer to Item 2.6 above.)
3. The adaptor shall be provided with required accessories including stainless steel insert, gland, and all hardware.
4. Provide DriscoPlex® HDPE Molded MJ Adaptor Kit as manufactured by Performance Pipe or approved equal.

5.0 ENCASEMENT

1. STEEL CASING PIPE

1. Steel casing shall be new, solid-wall, hot-rolled steel and shall either be Grade B steel in accordance with ASTM A139 or Grade 2 steel in accordance with ASTM A-252.
2. Minimum yield strength shall be 35,000 psi.
3. The exterior shall be fully coated with coal tar epoxy or bitumastic coating.
4. Delivery lengths shall be 20 foot unless specifically requested otherwise.
5. Spiral-welded steel will not be allowed.
6. Minimum wall thickness shall be in accordance with the Table 5.1:

Table 5.1 Minimum Wall Thickness for Steel Encasement

Diameter (in)	Wall Thickness (in) (Schedule 20)
8	0.250
12	0.250
16	0.312
18	0.375
20	0.375
24	0.375
30	0.500
36	0.532*

*Not Schedule 20 standard thickness

2. CASING SKIDS

1. Casing skids shall be constructed of 8 inch wide stainless steel band (14 gauge) with 2 inch wide glass-reinforced polymer runners that are chamfered at each end.
2. All hardware shall be stainless steel.
3. Casing skids shall be designed for installation in the centered/restrained condition within the encasement.
4. Casing skids shall be Model S8G2 as manufactured by PSI-Pipeline Seal and Insulator, Inc. or approved equal.

3. END SEALS

1. End seals shall be a wrap-around type seal manufactured from EPDM rubber.
2. The end seal shall have locating ribs on the outside for banding clamps and ribs on the inside to prevent leakage of soil and water over the depth of bury.
3. Two stainless steel bands shall be provided for each seal. See note 3.5 below.
4. End seals shall be PSI Model "W" Wrap-Around as manufactured by PSI-Pipeline Seal and Insulator, Inc. or approved equal.
5. The screw-type bands that are included with the end seal from the manufacturer are not approved. In place of the manufacturer's bands, secure end seals using 1/2 inch wide, 304 or 316 stainless steel strapping with minimum thickness of 0.020 inches. Stainless steel strapping shall be ULINE® Model S-14376 or approved equal.

4. POLYETHYLENE ENCASEMENT (POLYWRAP) FOR DIP

1. Polyethylene encasement shall be tube-style for all pipe installation. Sheet-style and/or oversized tube-style polywrap may be utilized for fittings and odd-shaped appurtenances.
2. Adhesive tape shall be 2 inches wide, 10 mils thick and shall be manufactured specifically for use with polyethylene encasement.
3. Provide Christy's® TA-33-PW21 Pipe Wrap tape as manufactured by T. Christy Enterprises or approved equal.

- Polyethylene encasement shall be V-BIO® Enhanced Polywrap manufactured in accordance with AWWA C105.

6.0 METER SETTINGS, BOXES AND APPURTENANCES

1. GENERAL

- Table 6.1 provides a concise summary of each component of a typical meter setting from 5/8 inch through 2 inches based on meter size. A more detailed description of each component of the meter and box assemblies is provided below.
- Consult with PW regarding meters 3 inches and larger.
- All components shall conform with AWWA C800 as applicable.
- Components listed in Table 6.1 are to be considered for “or equal” substitution except for brass. All brass components shall be manufactured by Ford Meter Box Company, Inc. are not subject to “or equal” substitution unless approved otherwise by PW.

Table 6.1 Standard Meter Setting Components (5/8 inches through 2 inches)

Item	Meter Size		
	5/8" and 1"	1.5" and 2"	Double Setter (2ea – 5/8")
Lid	DFW Model FW12AFD-3W+F Small-Lid	Old Castle Bolt-Down Flush HDPE w/CI Reader Door	DFW Model DFW12AFD-3W+F Small-Lid
Bonnet	Bingham & Taylor BTA-4	n/a	Bingham & Taylor BTA-4
Meter Box	ADS White Corrugated HDPE Meter Pit, ID=21", L=24" w/mouseholes	Oldcastle® Model 1730-24 Rectangular HDPE black	ADS White Corrugated HDPE Meter Pit, ID=21", L=24" w/mouseholes
Copper Setter	n/a	Ford VBHH7#-18HB-FF-##-TP6-NL	n/a
Meter Yoke	Ford Y50#	n/a	Ford Y502
Yoke Ell	Ford L94-##D-G-NL	n/a	Ford L94-23D-G-NL
Angle Valve	Ford BA94-###W-G-NL	n/a	Ford BA94-323W-NL
Dual Check Valve	Ford HHCA94-####-G-NL	n/a	Ford HHCA94-323-G-NL
Expansion Connector	Ford EC-##-NL		Ford EC-23-NL
Branch Assembly	n/a	n/a	Ford 3/4"x1" Branch U48-43-G-NL

Notes:

- "Ford" = Ford Meter Box Company, Inc.
- "DFW" = DFW Plastics, Inc.
- "Oldcastle" = Oldcastle Precast® or approved equal
- "BT" = Bingham & Taylor or approved equal

5. “#” indicates reference to size that is unique to each meter setting
6. All references to 5/8” meter size is a 5/8” x 3/4” meter

2. METER BOX LID – 5/8 INCH AND 1 INCH METERS

1. Meter box lids shall be recessed, round “Type A” style designed to fit meter bonnets having a lid opening of 11.5 inches unless specifically noted otherwise.
2. Lids shall be manufactured from solid HDPE and shall be blue in color.
3. The lid shall be supplied with a large pentagon bolt locking device which activates a lifter worm lock with a copper washer between the lock and lid.
4. The pentagon bolt shall be of forged silicon bronze of the larger size that shall attach itself to a meter box key so that the key can be used as a handle to lift the lid from the cover.
5. Heavy duty lids, when specifically requested, shall be designed to accommodate HS20/HL93 wheel loading.
6. All lids shall have a recessed 2 inch hole to accommodate a cellular endpoint for each meter.
7. All lids shall be specifically designed to match the bonnet.
8. Provide Model DFW12AFD-3W+F Small-Lid as manufactured by DFW Plastics, Inc. or approved equal.

3. METER BOX BONNET - 5/8 INCH AND 1 INCH METERS

1. Meter box bonnets shall be Type A round with a recessed lid clear opening of 11.5 inches and shall accommodate a meter box with an internal opening diameter of 21 inches.
2. Bonnets shall be constructed of high quality cast iron with a coating of asphalt-based black coating
3. Bonnets shall accommodate a lid of the overlapping, recessed style with worm-gear lock.
4. Bonnet shall be 4 inches in overall depth.
5. Heavy duty bonnets, when specifically requested, shall be designed to accommodate HS20/HL93 wheel loading.
6. All extensions or grade rings shall be designed specifically for use for the bonnet and/or lid.
7. Provide Model BTA-4 meter bonnets as manufactured by Bingham & Taylor or approved equal.

4. METER BOX – 5/8 INCH AND 1 INCH METERS

1. Meter boxes shall be constructed of one-piece, HDPE and shall have a nominal internal diameter opening of 21 inches.
2. The interior shall be white or other light color that is integral to the manufacture of the box and not applied thereafter (e.g. painted).
3. The standard height of the box is 24 inches.
4. Boxes shall be constructed with “mouseholes” to accept incoming and outgoing service lines.
5. Meter boxes shall be specifically designed to accommodate the meter bonnet without modification.

6. Provide White Corrugated HDPE Meter Pit as manufactured by ADS, Inc. or approved equal.

5. METER BOX AND LID – 1.5 INCH AND 2 INCH METERS

1. Meter boxes shall be constructed of one-piece, HDPE that is black.
2. Nominal lid opening dimensions shall be approximately 17 inches x 30 inches.
3. The lid shall be black with bolt-down feature with stainless-steel bolts.
4. Nominal base opening dimensions shall be approximately 28 inches x 41 inches.
5. The standard height of the box is 24 inches.
6. Meter boxes shall be specifically designed to accommodate the lid without modification and the box and lid shall be shipped by the manufacturer as one unit.
7. Provide Model 1730-24 Rectangular black HDPE box with black bolt-down flush HDPE lid and cast iron reader door as manufactured by Oldcastle®, Inc. or approved equal.

6. COPPER SETTER – 1.5 INCH AND 2 INCH METERS

1. All components shall conform with AWWA C800.
2. The copper setter shall be constructed from brass and copper tube and shall be 18 inches high.
3. Copper setters shall be of the riser type with inlet and outlet connections and flanged meter connections.
4. Either vertical or horizontal inlet/outlet configurations may be utilized. Horizontal configuration shall be grip nut type connections. Vertical configurations shall have Female Iron Pipe (FIP) thread connections.
5. The copper setter shall be constructed using flange angle ball valve on the inlet side and a flange angle dual check valve on the outlet side.
6. The copper setter shall be constructed with a high bypass that contains a ball valve with padlock wings.
7. The copper setter shall have a test port.
8. Provide the following copper setters as manufactured by Ford Meter Box Company, Inc.:
 - 1.5 inch Model VBHH76-18HB-FF-66-TP6-NL
 - 2 inch Model VBHH77-18HB-FF-77-TP6-NL

7. METER YOKE

1. Meter yokes shall be of the riser type with inlet and outlet connections for grip joint copper tubing.
2. Yokes shall be constructed to hold the meter and piping rigidly in such a way that piping is undisturbed when the meter is installed or removed.
3. The yoke piece shall be manufactured of cast grey iron in accordance with ASTM A48, Class 25 with black epoxy coating.
4. Provide the following meter yokes as manufactured by Ford Meter Box Company, Inc.:
 - 5/8 inch Model Y502

- 1 inch Model Y504

8. YOKE ELL

1. Yoke ell fittings shall be constructed with 90° orientation.
2. Yoke ells shall be equipped with threaded drain plug.
3. Yoke ells shall be equipped with Grip Joint connections for CTS.
4. Provide the following yoke ells as manufactured by Ford Meter Box Company, Inc.:
 - 5/8 inch Model L94-23D-G-NL
 - 1 inch Model L94-44D-G-NL

9. ANGLE VALVE

1. Angle valves shall be ball type with 90° orientation.
2. Angle valves shall be equipped with Grip Joint connections for CTS unless utilized in a double setter.
3. Provide the following angle valves as manufactured by Ford Meter Box Company, Inc.:
 - 5/8 inch Model BA94-323W-G-NL
 - 1 inch Model BA94-444W-G-NL

10. DUAL CHECK VALVE

1. Dual check valves shall be cartridge-style with a 90° orientation and two (2) internal spring-loaded check valves that can be removed for repair/replacement.
2. Angle valves shall be equipped with Grip Joint connections for CTS.
3. Provide the following dual check valves as manufactured by Ford Meter Box Company, Inc.:
 - 5/8 inch Model HHCA94-323-G-NL
 - 1 inch Model HHCA94-444-G-NL

11. METER EXPANSION CONNECTOR

1. Meter expansion connections shall be standard handwheel type that allow installation and removal of the meter from the setting without requiring disturbing adjacent piping.
2. The expansion piece shall be specifically designed and manufactured to be compatible with both the meter and setting.
3. Provide the following expansion connectors as manufactured by Ford Meter Box Company, Inc.:
 - 5/8 inch Model EC-23-NL
 - 1 inch Model EC-4-NL

12. BRANCH ASSEMBLY

1. Branch assemblies shall have one – 1 inch CTS Grip Joint connection, and two – 3/4" inch male iron pipe (MIP) threaded outlets.
2. The orientation between inlet and outlet shall be 180°.

3. The spacing between outlets shall be 7.5 inch center-to-center.
4. Provide Model U48-43-G-NL Branch Assembly as manufactured by Ford Meter Box Company, Inc.

7.0 CONNECTIONS TO EXISTING WATERMAINS

1. GENERAL

1. All components in this section shall conform with AWWA C800.

2. SERVICE SADDLES – C900 PVC AND CAST IRON PIPE

1. The upper body of the saddle shall be brass alloy per ASTM B62 with female threads to accept a corporation stop as follows:
 - 3/4 inch and 1 inch AWWA tapered thread
 - 1.5 inch and 2 inch Iron Pipe Thread
2. The saddle body shall include an EPDM gasket permanently attached to the saddle.
3. All welds shall be fully passivated.
4. Service saddles shall be manufactured by the Ford Meter Box Company, Inc. and models shall be as follows:
 - 3/4 inch and 1 inch Model 101BS
 - 1.5 inch and 2 inch Model 202B

3. SERVICE SADDLES – IRON PIPE SIZE (IPS) PVC PIPE

1. Service saddles used to connect a service line to an existing IPS PVC main shall be comprised of two brass halves that are permanently connected by a hinge with bronze pin. The two halves are secured by a bronze bolt that is secured in the upper half with a retainer to prevent loss during shipment. The bottom half shall be tapped to receive the bolt without requiring the use of a nut and two wrenches during tightening.
2. The saddle shall be properly shaped and sized to fit snugly over the main to obtain a water-tight seal without the ability to apply a crushing force to the pipe.
3. The outlet shall have female threads to accept a corporation stop as follows:
 - 3/4 inch and 1 inch AWWA tapered thread
 - 1.5 inch and 2 inch Iron Pipe Thread
4. The saddle body shall include an EPDM gasket permanently attached to the saddle.
5. Service saddles shall be Model S70 as manufactured by the Ford Meter Box Company, Inc.

4. SERVICE SADDLES – ASBESTOS CEMENT (AC) PIPE

1. The upper body of the saddle shall be brass alloy per ASTM B62 with female threads to accept a corporation stop as follows:
 - 3/4 inch and 1 inch AWWA tapered thread
 - 1.5 inch and 2 inch Iron Pipe Thread

2. The saddle body shall include an EPDM gasket permanently attached to the saddle.
 3. All welds shall be fully passivated.
 4. Service saddles shall be Model 202B as manufactured by the Ford Meter Box Company, Inc.
5. TAPPING SLEEVES
1. Branch outlets up to and including 12 inch diameter shall be mechanical joint. Branch outlets larger than 12 inch diameter may be either mechanical joint or ANSI Class 125 flange connection as directed by PW based on the application.
 2. Branch outlets shall include a test plug with standard square head for pressure testing before tapping pipe.
 3. Tapping sleeves shall be constructed entirely of ASTM A240 304 stainless steel. No carbon steel components will be allowed.
 4. Gaskets shall be manufactured from virgin SBR rubber compound in accordance with ASTM D 2000 and designed for a full circumferential seal (360°) over the range of working and test pressures of the main.
 5. The shell shall be bonded to the gasket, and gaskets shall be full thickness between shell and pipe.
 6. The neck shall be welded to the shell to form a strong permanent fusion with the shell. All welds shall be fully passivated.
 7. Tapping sleeves shall utilize a lifter bar designed to slide up the profile of the receiver studs to hold position under the bar while tightening nuts. The studs shall be welded to the top side bar and side bars shall be welded to the shell.
 8. The studs and nuts shall be stainless steel Type 304 and rolled national standard coarse thread and shall be coated to prevent galling.
 9. The armors shall be fabricated with a lip curve to hold position while tightening.
 10. Tapping sleeves shall be Model FAST stainless steel tapping sleeves as manufactured by the Ford Meter Box Company, Inc., or approved equal.
6. CORPORATION STOPS
1. Corporation stop shall be constructed of brass alloy per ASTM B62 with inlet male threads as follows:
 - 3/4 inch and 1 inch AWWA tapered thread
 - 1.5 inch and 2 inch Iron Pipe Thread
 2. Outlet shall be Grip Joint connection for copper tubing (CTS).
 3. Corporation stops shall have an internal quarter-turn ball valve designed for working pressures to 300psi.
 4. Corporation shall be compatible with all current tapping machine manufacturers.
 5. Corporation stops shall be Model FB1000 Ballcorp as manufactured by the Ford Meter Box Company, Inc.

8.0 COUPLINGS AND REPAIR CLAMPS

1. SERVICE LINE COUPLINGS AND ADAPTORS

1. This section is applicable for service line connections 2 inches and smaller.
2. Service couplings and miscellaneous service adaptors shall conform with AWWA C800 and shall be constructed of brass.
3. Fittings shall be as necessary to connect to existing materials and shall be Grip Joint connection for all copper, and Pack Joint for all other connections.
4. All connections to newly installed copper service tubing shall be Grip Joint only.
5. Stab-Joint couplings and flared copper connections are not allowed.
6. Service couplings and adaptors shall be manufactured by the Ford Meter Box Company, Inc. or approved equal.

2. REPAIR CLAMPS

1. Repair clamps shall comply with AWWA C230 and shall be constructed entirely of ASTM A240 Type 304 stainless steel. No carbon steel components will be allowed.
2. Gaskets shall be manufactured from virgin SBR rubber compound in accordance with ASTM D 2000 and designed for a full circumferential seal (360°) over the range of working and test pressures of the main to be repaired.
3. The shell shall be bonded to the gasket, and gaskets shall be full thickness between shell and pipe.
4. Repair clamps shall utilize a lifter bar designed to slide up the profile of the receiver studs to hold position under the bar while tightening nuts. The studs shall be welded to the top side bar and side bars shall be welded to the shell.
5. All welds shall be fully passivated.
6. The studs and nuts shall be stainless steel Type 304 and rolled national standard coarse thread and shall be coated to prevent galling.
7. The armors shall be fabricated with a lip curve to hold position while tightening.
8. Repair clamps shall be Model FS style as manufactured by Ford Meter Box Company, Inc. or approved equal.

3. EXTENDED RANGE COUPLINGS (ERC)

1. Couplings shall be designed and manufactured to join two, plain ends of similar and/or dissimilar pipe using a solid body with only two bolts.
2. The coupling shall be designed and manufactured in accordance with AWWA C219.
3. The body and end rings shall be constructed of ductile iron and coated with fusion bonded epoxy coating in accordance with AWWA C116.
4. End rings shall be segmented and joined with integrated hinges. All bolts and hardware shall be Type 304 stainless steel and provided with anti-galling protection.

5. Coupling bodies, end rings and fasteners shall not be constructed of carbon steel.
 6. Bolts shall have a carriage-head or otherwise fastened to prevent rotating while tightening.
 7. The coupling shall be designed with a working pressure exceeding 300 psi and shall be designed to accommodate pipe ranging from IPS through oversized cast iron as ordered and provided with a single, pre-installed gasket.
 8. The coupling shall be shipped with a separate gasket to accommodate asbestos cement pipe, which is clearly labelled as such.
 9. Couplings shall be Macro HP™ Extended Range Coupling manufactured by Romac Industries, Inc. or approved equal.
4. FLANGE COUPLING ADAPTOR (A.K.A. DISMANTLING JOINT)
1. Flange coupling adaptors shall be designed and manufactured to connect an AWWA Class D Steel Ring Flange to plain end pipe using a ductile iron telescopic mechanical restraint connection.
 2. The flange spool shall be compatible with ANSI Class 125 and 150 bolt circles. For pipe sizes 3 inch through 12 inch, the flange spool shall be steel pipe STD Weight Class per ASTM A53 with end ring and body manufactured of ductile iron in accordance with ASTM A536.
 3. For pipe sizes 14 inch through 72 inch, the flange spool shall be ASTM A36 plate 1% cold expanded to size and end ring and body shall be ASTM A36 steel.
 4. Gaskets shall be virgin nitrile butadiene rubber (NBR) in accordance with ASTM D2000.
 5. All bolts and hardware shall be Type 304 stainless steel as per ASTM A193 and ASTM A194 and provided with anti-galling protection.
 6. Tie rods (with hardware) shall be provided based on manufacturer's recommendation per size and shall be type 304 stainless steel.
 7. Flange coupling adaptors shall have a minimum working pressure of 150 psi or the maximum working pressure rating of the flange, whichever is larger.
 8. Unless otherwise specified, flange coupling adaptors shall be provided complete with gasket, lubrication and hardware.
 9. Flange Coupling Adaptors shall be model DJ405 as manufactured by Romac Industries, Inc. or approved equal.

9.0 FIRE HYDRANTS

1. GENERAL
 1. Fire hydrants shall be 5 ¼ inch American-Darling B-62-B-5 as manufactured by AMERICAN Flow Control and shall conform with AWWA C502. No substitutes will be considered.
 2. All below-grade bolts shall be 304 stainless.
 3. The base shall be a 6 inch ductile iron, mechanical joint connection.
 4. Hydrants shall have one, 4.5 inch pumper nozzle and two, 2.5 inch hose nozzles.

5. Bury depth shall be 48 inches unless otherwise specified upon ordering based on project-specific criteria.
6. The hydrant operating nut shall be one-piece bronze pentagon shape (size B11) with grease fitting.
7. The size of the opening nut shall be equal to the nut on all nozzle caps.
8. Hydrants shall turn left (counterclockwise) to open.
9. All caps shall be secured to the body with long heavy chains.

2. CITY/COUNTY DESIGNATION

Paducah Water utilizes two different hydrant nozzle threads and colors schemes that are designated based on their physical location within the system. The designation of either “City System” or “County System” is made by PW and is project-specific. Each material order or project shall specifically designate the intended use based on one of the following:

1. City System

Hydrants designated to be “City” shall have hose nozzles that are fitted with special “Paducah Thread” which consists of 3.231 inch outside diameter, 3.119 inch ditch diameter and 3.007 inch root diameter with 6 threads per inch. The pumper nozzle shall be National Standard Thread. Hydrant color shall be silver.

2. County System

Hydrants designated to be “County” shall have all nozzles fitted with National Standard Thread. Hydrant color shall be bright red.

3. ADJUSTMENT

1. Only parts and materials manufactured by American Flow Control specifically for make and model of the fire hydrant shall be used for vertical adjustment.

10.0 RESTRAINT DEVICES

1. JOINT RESTRAINT GASKETS

1. Gaskets shall be designed to incorporate stainless steel grippers manufactured into the rubber gasket that will lock onto the spigot of pipe upon bellng without damage to the pipe and will prevent separation of the joint.
2. Gaskets shall comply with AWWA C111 or C900 as applicable.
3. Gaskets shall be manufactured of SBR unless otherwise noted.
4. Gaskets shall be rated for the working pressure of the pipe upon which they will be utilized with a minimum of 2:1 safety factor without joint separation.
5. Gaskets for ductile iron pipe shall be designed and manufactured by the same manufacturer as the pipe unless otherwise approved by PW.

2. THRUST RESTRAINTS

1. Thrust restraints shall be constructed of a high-strength ductile iron body as per ASTM A536 with bolt pattern and hardware that is compatible with all mechanical joints conforming to AWWA C111.
2. The wedge action restrainer shall be manufactured of ductile iron in accordance with ASTM A536 with heat-treated wedges that are contoured to properly fit the pipe.
3. The heads of the wedge actuating screws shall twist off at the recommended torque, assuring correct installation without risk of over tightening.
4. The body of the restraint shall be color coded to denote its application for either ductile iron or PVC pipe and shall be stamped with the model number for easy identification.
5. All ductile iron components shall be coated with an epoxy coating in accordance with AWWA C116.
6. Thrust restraints shall be rated at a water working pressure equal to the working pressure rating of the pipe with a 2:1 safety factor against separation in a dead end situation.
7. The restraint and back-up ring may be capable of being split to allow installation on existing pipe provided that the design for components are equal in performance to one-piece gland and back-up ring.
8. Thrust restraints for ductile iron pipe shall be Uni-Flange® Series 1400 and for PVC pipe shall be Uni-Flange® Series 1500 as manufactured by Ford Meter Box Company, Inc. or approved equal.
9. The use of SO-EZ® gaskets is prohibited.

3. BELL JOINT RESTRAINTS

1. Restraints for push-on bell pipe joints shall consist of a wedge action thrust restraint installed on the pipe spigot, connected to a ductile iron backup ring installed behind the pipe bell.
2. All material shall comply with Item 10.2.
3. Bell joint restraints for ductile iron pipe shall be MEGALUG® Series 1700 and for PVC pipe shall be MEGALUG® Series 2000 bell joint restraints as manufactured by EBBA Iron, Inc. or approved equal.

4. BOLT-THROUGH RESTRAINTS

1. Provide restraint devices that allow the direct connection of mechanical joint fittings and valves with a positive-restraint, bolted mechanism that does not exceed 12 inches in length and without attachment to pipe.
2. Materials of construction, accessories and hardware shall be in accordance with Section 4.1 as applicable.
3. Provide Foster Adaptor as manufactured by Infact Corporation or approved equal.

11.0 MISCELLANEOUS

1. VALVE BOXES

1. Valve boxes shall be constructed of ASTM A48 cast iron in two-piece sections with heavy-duty lids.
2. Valve boxes shall be of the screw type, adjustable, and with a five and one-quarter (5 ¼) inch shaft.
3. Each section shall be coated with a minimum 1.5 mil asphaltic bituminous coating.
4. The lengths of the boxes shall be as specified.
5. All distribution valve boxes shall be provided with traffic-rated lids marked "WATER". Valve boxes used for fire main valves shall be marked "FIRE".
6. Extensions shall be screw-type and of the same material and overall construction quality as the valve box.
7. Provide cast iron valve boxes manufactured by Bingham & Taylor or approved equal.

2. VALVE BOX CENTERING DISK

1. Valve box centering disks shall be constructed from corrosion-proof material.
2. Disks shall be compatible with all AWWA gate valves and 5.25 inch valve boxes.
3. Either one or two-piece construction is allowable.
4. Provide BoxLok® Valve Box Alignment device as manufactured by Trumbull Industries, Inc. or approved equal.

3. TRACER WIRE – TRENCH INSTALLATION

1. Tracer wire shall be 12 AWG solid copper in accordance with ASTM B3.
2. Insulation shall be a minimum of 30 mil, blue, HDPE insulation in accordance with ASTM D1248.
3. Wire shall be suitable for direct bury and shall be designed and constructed specifically for use as tracer wire for underground pipe systems.
4. Steel-clad copper tracer wire will not be allowed for trench installation.
5. Provide CU HDPE 30 mil tracer wire as manufactured by Pro-Line Safety Products or approved equal.

4. TRACER WIRE – HDD INSTALLATION

1. Tracer wire shall be 10 AWG extra-high-strength copper-clad steel conductor.
2. Insulation shall be a minimum of 45 mil, blue, HDPE insulation in accordance with ASTM D1248.
3. The conductor must be at least 21% conductivity for locating purposes with a minimum break load of 2,032 lbs.
4. Tracer wire shall be suitable for direct bury and shall be designed and constructed specifically for use as tracer wire for installation with underground pipe systems using trenchless installation methods (i.e. horizontal directional drill).

5. Provide SoloShot™ EHS-CCS HDPE 45 mil tracer wire as manufactured by Copperhead Industries, LLC. or approved equal.

5. TRACER WIRE CONNECTORS

1. Tracer wires shall be connected using thermoplastic wire connectors filled with 100% silicone and designed and constructed specifically for direct bury applications.
2. Connectors shall be suitable for the wire size being installed.
3. Provide UnderGround® Wire Nuts® as manufactured by IDEAL® Industries or approved equal.

6. UNDERGROUND MARKING TAPE

1. Underground marking tape shall have a 2 inch minimum width with a minimum 5.0 mil overall thickness.
2. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core, and then laminated to a 3.75 mil clear virgin polyethylene film.
3. Tape shall be printed using a diagonally striped design for maximum visibility, and meet the APWA Color-Code standard for identification of buried utilities.
4. Detectable marking tape shall be Pro-Line Safety Products or approved equal and made in the USA.

7. CONCRETE

All materials and method of installation shall conform with Section 601 of the Kentucky Standard Specifications for Road and Bridge Construction, latest edition unless otherwise noted.

1. Thrustblocking

1. Concrete utilized for blocking of fittings and appurtenances shall have a minimum compressive strength of 2,500 psi concrete.
2. Bagged concrete mix (e.g. Quikrete®) is allowed provided that it is prepared and placed in accordance with the manufacturer's instructions.

2. Improved Surface Restoration

Concrete used to create new or restore existing concrete improved surfaces (i.e. roadway cuts, curbs, sidewalks, pads, etc.) shall be Class A, 3,500 psi.

3. High Early Strength

Provide Class M1, 4,000 psi concrete.

4. Flowable Fill

Provide "Flowable Fill for Pipe Backfill" (80 psi).

8. AGGREGATE

Aggregate shall conform with Section 805.15 of the Kentucky Standard Specifications for Road and Bridge Construction, latest edition.

9. ASHPHALT PAVEMENT

All work, equipment and materials shall conform with Division 400 of the Kentucky Transportation Cabinet Department of Highways Standard Specifications for Road and Bridge Construction, Latest Edition.

1. Asphalt Base

Provide CL 2 Asphalt Base 0.75D PG64-22.

2. Asphalt Surface

Provide Class 2 Asphalt Surface 0.38B PG64-22.

3. Tack Coat

Provide KYTC SS-1 or SS-1h tack coat at a rate to achieve an undiluted residue of not less than 0.81 pounds (0.1 gallons) per square yard.

LOG OF REVISIONS

Revision	Date	Description
0	03/2020	Update and re-issue in new format.