

**E. MATERIALS:**

1. Pipe: All pipe shall meet one of the following specifications:
  - a. Ductile-Iron Pipe: ANSI/AWWA C151/A21.51-09, Thickness Class 52 or Pressure Class 350, push-on joint, cement-mortar lined, bituminous coated. Acceptable manufacturers are: Griffin, Clow, American, and U.S. Pipe. For restrained joint pipe, acceptable manufacturers are U.S. Pipe TR-Flex™, Griffin Snap-Lok™ and Clow Super-Lock™ or approved equal.
  - b. PVC Pipe, 4"-12": Polyvinyl Chloride 1120 pipe, meeting AWWA Specification C900-07, outside diameter equivalent to cast iron pipe, 150 psi pressure class or 200, if specified, DR (dimension ratio) series 18, gasket bell-end coupling. Installation requirements shall be the same as for cast iron or ductile iron pipe. Acceptable manufacturers are: Extrusion Tech, Inc., PW Eagle, Inc., JM, Certainteed, Diamond, Ipex Blue Brute, Freedom Plastics, and Napco. Centennial Plastics and Silver-Line Plastics (2" flexible polyethylene, ASTM D2737/SDR 9 CTS, 2.125" OD/1.653"ID, 200 PSI.)
2. Ductile Iron Fittings: To meet ANSI/AWWA C110/A21.10-08 or ANSI/AWWA C153/A21.53-06, mechanical joint, cement-mortar lined, bituminous coated; 12-inch to 24-inch fittings to be rated at 350 p.s.i.; 30-inch and larger fittings to be rated at 250 p.s.i.. "T" bolts shall be NSS Cor-Ten or NSS Cor-Blue or equal. Acceptable manufacturers are: Clow, Trinity, Union, Tyler, Griffin, Star, U.S. Pipe and Sigma.
3. PVC Fittings 6"-8": To meet AWWA C907-04, pressure class 150 or 200, if specified. Acceptable manufacturers are Ipex Blue Brute and Certainteed (for couplings only).
4. Valves:
  - a. Gate Valves: NRS resilient wedge for buried service, conforming at a minimum to AWWA C509-09 or AWWA C515-09 for 16" and larger; 2" square operating nut; open left; MJ X MJ; wedge rubber shall be molded and bonded in place to the wedge and shall not be mechanically attached with screws, rivets, or similar fasteners; wedge shall seat so the seating is equally effective regardless of direction of pressure unbalanced across the

wedge; waterway shall be full diameter, smooth and shall have no depressions or cavities in the seat area where foreign material can lodge and hinder closure or sealing, the valve body and bonnet shall be fusion bonded epoxy coated, inside and out, and the valve shall be provided with stainless steel bonnet and packing bolts, "T" bolts for the MJ fittings shall be NSS Cor-ten, Cor-Blue or equal. Acceptable manufacturer and series for 16" and larger gate valves are U.S. Pipe Metroseal 250, American Flow Control #2500, Clow RW, Mueller A-2361, and M & H Style 7000. For all other sizes less than 16", acceptable manufacturers are: Waterous series 500 and American Flow Control Series #500, both with fusion epoxy coating on the bottom side of the packing box, M & H style 4067, Stockham G-700 to G-704, Clow ULFM - AWWA R/W, U.S. Pipe Metroseal 250, Mueller Resilient Wedge Gate Valve #2360, Kennedy Ken-Seal II series, American Flow Control #2500 series or others which are equal.

b. Tapping Valves: Same as Gate Valves above except that it shall be equipped with a raised lip constructed in accordance with MSS-SP60 to provide for centering of the valve on the tapping saddle. Acceptable manufacturers and series are: Waterous series 500 and American Flow Control Series #500, both with fusion epoxy coating on the bottom side of the packing box, M & H style 4067, Stockham G-700 to G-704, Clow ULFM - AWWA R/W, U.S. Pipe Metroseal 250, Mueller Resilient Wedge Gate Valve #A2360, Kennedy Ken-Seal II series or others which are equal.

c. Butterfly Valves: Rubber-seated for buried service, conforming as a minimum to AWWA C504-06; 2" square operating nut; open left; MJ X MJ; butterfly shall seat so the seating is equally effective regardless of direction of pressure unbalanced across it, the resilient seat shall be attached to the body of the valve and not the butterfly, the valve interior shall be epoxy coated and the exterior shall be epoxy or bituminous coated. Acceptable manufacturers are: Pratt, Kennedy, or equal.

d. Gland Packs: All valves and mechanical joint manufacturers are to supply their domestic accessory gland pack with their fittings and/or valves. The manufacturers brand shall be clearly cast into the gland and also clearly printed onto any box or package in which the gland pack is shipped. If the gland pack and box are not so marked, a certification from

the valve and/or fitting manufacturer will accompany each shipment certifying that the specific gland pack shipped is approved by the manufacturer for use with the valve and/or fitting. Eagle gland packs from Russell Pipe may be accepted for use with D.I. fittings and valves in lieu of manufactured gland packs or certified substitutes. All glands must be ductile iron.

e. Tapping Sleeves: Manufactured from all stainless steel group 18-8, material 304 including sleeve, outlet neck, outlet flange, and all bolts and nuts; top of shell shall be a minimum of 11 Ga. plate and bottom of shell shall be a minimum of 14 Ga. plate; seal to be full circumferential gridded and approved for potable water; flanged outlets shall be indexed per MSS-SP 60 to accept tapping valves with an ANSI 150 lb. drilling IAW AWWA C207; neck to accept full sized cutter. Acceptable manufacturers and series are: Ford FTSS, JCM #432, Cascade CST-EX, Smith Blair #665 and 665 MJ, Power Seal Model #3490 AS and Model #3490 MJ, and Mueller H304 and Dresser Style 630.

f. Valve Boxes: All valve boxes shall be 6" C900 PVC DR18 water pipe. During construction the valve boxes shall extend from 2 to 3 feet above grade to remain visible to other construction trades and traffic. Once final grade has been established, the valve boxes shall be cut to grade. It shall be the contractor's responsibility to ensure the valve boxes are cut to grade. All valve boxes shall be vertical, clear of mud and debris and capped with a Clay & Bailey #2195 valve box cover. All valve boxes shall be installed upon the valve with the use of a Valve Box Adaptor II 6" PVC as manufactured by Adaptor Inc. or an approved equal. Acceptable manufacturers shall be the same as those listed for PVC pipe, 4"-12" under the Materials Section of this set of specs.

g. Fire Hydrants: Fire Hydrants shall be Mueller Super Centurion 250, A-423, American Darling 5-1/4" B-84-B, and Clow Medallion.

5. Concrete: All concrete work shall meet A.S.T.M. Standards C150 (type 1), C260, and C33. Concrete shall be Class A, 6 bag mix, 5-inch slump, 3,000 psi minimum compressive strength in 28 days.
6. Anchors, Inserts, Reinforcements: All thread rod shall be 3/4" stainless steel, group 18-8, material 304, minimum yield of 30 ksi, minimum tensile

70 ksi. Nuts shall be hex head, 3/4" stainless steel, group 18-8, material 304. "DUC-LUGS" shall not be used on 12" or larger fittings and valves. Cor-Ten anchor eye-bolts may be used in lieu of "DUC LUGS" on 12" and larger valves and fittings, anchor eyes or rods shall tie directly into bolt holes on fittings and valves. Stainless steel washers shall be utilized with all tie rods and nuts. Stainless steel all-thread rod shall only be joined with stainless steel extension nuts. DUC-LUGS shall not be used to extend stainless steel all-thread rod.

7. Casing Pipe:

a. Steel: Steel casing pipe wall thickness shall conform to the following schedule:

<b>CASING DIAMETER</b>	<b>MINIMUM WALL THICKNESS</b>
6, 8, 10, 12"	.188"
14, 16, 18"	.250"
20, 22, 24, 26, 28, 30"	.3125"
32 through 48"	.4375"

All pipe shall conform to all applicable requirements of AWWA C200-05 and AWWA M11, and if fabricated shall be constructed of A36 steel with a minimum yield point of 36 ksi; or if manufactured shall conform to Grade B with a minimum yield point of 35 ksi. It may be shipped in random lengths between 18 and 22 feet and shall have one end cut square and one end beveled. All casing pipe is to be joined with 360 degree welds. It shall be mill primed and coated with bituminous based coating before installation. Where coating is damaged during installation, it shall be repaired and replaced by thorough brushing or scraping to sound material and applying two coats of the coating material.

b. Concrete Pipe: Concrete pipe utilized for encasements shall be steel reinforced concrete pipe and shall conform to the material and installation specifications of the Missouri Department of Transportation.

8. Casing Spacers: The casing spacers shall have a bolt on shell made in two sections. All metal components shall be Type 304 (18-8) Stainless Steel. It shall have an elastomeric liner to isolate the shell from the carrier pipe. It shall have runners attached to the shell and be designed to

provide a minimum of .75 inches clearance between the carrier pipe's greatest outside diameter and the casing pipe's inside diameter. The chock runners shall be beveled with high abrasion resistance and a low friction coefficient.

Acceptable manufacturers and models are: PSI S8G-2 and PSI S12G-2, Power Seal #4810, Cascade CCS series, Advance Products & Systems Model SSI and BWM SS-8.

9. Pipe Restraints: All pipe restraints shall be ductile iron for use on ductile iron MJ fittings with ductile iron or C900 PVC pipe. All joint restraints shall have a minimum of 150 PSI pressure rating. Restraint systems that use set screws to hold the gland to the pipe are unacceptable. All T-bolts and studs shall be high strength, low alloy steel (Cor-Ten or equal).

Acceptable manufacturers and series are:

For DIP: EBAA Iron MEGALUG series for D.I. pipe only and Uni-Flange series 1400 for D.I. pipe.

For PVC: EBAA Iron series 1500 and 2500 bell restraints for C-900 PVC pipe and Uni-Flange series 1500 Circle-Lock.

For DIP or PVC: Tyler MJR; Romac Grip Ring; Uni-flange Block Buster 1300 series pipe restraints for DIP or PVC through 12" (except 1360 through 8" only); Smith Blair 981 pipe joint restraints for mechanical joint 4"-12" and Smith Blair 982 pipe joint restraints for bell and spigot joint 4" - 12" for C900 PVC and ductile iron pipe; JCM 610 Sur-Grip MJ fitting restrainer and JCM 620 Sur Grip bell joint restrainer for 4" - 12" C900 PVC; and Sigma One-Lok.

10. Pigs: All pigs shall be constructed from open cell polyurethane foam. They shall be of medium density ranging from 5 lb./cu.ft. to 8 lb./cu.ft. and be double dished. All pigs used shall be made for hand launching and specifically for the type and size of pipe being installed. Acceptable manufacturers and series are: Pipeline Pigging Products B-3 DD (Double Dish) 5 to 7 lb. and the KNAAP Polly Pig 5A DD (Double Dish) 5 to 8 lbs.