

**APPENDIX A – STANDARD
SPECIFICATIONS – 2019
WATER UPDATES**



GARDEN CITY
— KANSAS —

2019



STANDARD SPECIFICATIONS

WATERMAINS

SECTION W-1

1.1 DESCRIPTION

This section covers construction of Watermains, including fittings, and other appurtenances normally used for water supply and distribution systems. This work consists of furnishing and installing pipe, fittings, valves, fire hydrants, construction of thrust blocks, testing, cleaning and disinfection of mains and other related work.

1.2 REFERENCES

- A. American National Standards Institute (ANSI), Latest Edition.
- B. American Society of Mechanical Engineers (ASME), Latest Edition.
- C. American Society of Testing Materials (ASTM), Latest Edition.
- D. American Water Works Association (AWWA) Standards, Latest Edition.
- E. Building Officials and Code Administrators (BOCA) International, Inc., Latest Edition.
- F. Factory Mutual (FM), Latest Edition.
- G. International Association of Plumbing and Mechanical Officials (IAPMO), Latest Edition.
- H. Kansas Department of Health and Environment (KDHE), Policies, General Considerations and Design Requirements for Public Water Supply Systems in Kansas, Latest Edition.
- I. UL, LLC, Latest Edition.
- J. Reduction of Lead in Drinking Water Act of 2014 (RLDWA).
- K. NSF International, LLC (NSF), Latest Edition

1.3 DEFINITIONS

- A. ANSI: American National Standards Institute
- B. ASTM: American Society for Testing and Materials
- C. AWWA: American Water Works Association
- D. CCS: Copper Clad Steel
- E. CI: Cast Iron
- F. CICL: Cast Iron Cement Lined
- G. DI: Ductile Iron
- H. DICL: Ductile Iron Cement Lined
- I. DIPS: Ductile Iron Pipe Size
- J. DR: Dimension Ration
- K. IPS: Iron Pipe Size
- L. MJ: Mechanical Joint
- M. NSF: NSF International
- N. PVC: Polyvinyl Chloride
- O. RJ: Restrained Joint
- P. SJ: Slip Joint

1.4 SUBMITTALS

- A. Product data including the following:
 - 1. Catalog cut and general bulletins.
 - 2. Materials of construction.
 - 3. Manufacturer's certification or affidavit of compliance in accordance with applicable ANSI/AWWA or ASTM standard.
 - 4. Certification of NSF 61 and/or NSF 14.
 - 5. Compliance with RLDWA in accordance with NSF/ANSI 372.
 - 6. Operation, Maintenance, and Installation Manual.
- B. Manufacturer's Instructions: Instructions for installation for all pipe, fittings, and accessories utilized.
- C. Testing Reports: Submit three copies to the City:
 - 1. Hydrostatic Test Reports.
 - 2. Bacteriological Sampling Test Reports.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit record documents to the City.
- B. Accurately record exact location of all buried piping and fittings.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and protect products per manufacturer's recommendations.
- B. Upon delivery, contractor shall inspect pipe and appurtenances for cracking, gouging, chipping, denting, and all other damage and immediately remove from the site. Replacement shall be provided with an acceptable material.
- C. The interior of all products shall be thoroughly cleaned of all foreign matter, and kept clean during construction operations. Protection of interior linings and exterior coatings shall be the contractor's responsibility.

1.7 COORDINATION

- A. Coordinate any connections to the existing system with the City.
- B. Review installation procedures and coordinate the installation of items that must be installed with or before main pipeline construction
- C. Determine if any authorization to use water from the public fire hydrants for construction, testing and flushing is needed. Contractor shall apply for a permit at the appropriate City office to authorize usage of water.
- D. Operation of existing system valves shall be performed by the City. Contractor may only operate valves if a utility company's representative is on site coordinating the operations.

1.8 MATERIALS

Compliance with the Reduction of Lead in Drinking Water Act (2014) is required and all applicable products must meet the lead-free requirements and conform to NSF 372.

A. PIPE

Pipe used in water main construction shall be as called out in the Special Provisions and shall be in accordance with the following specifications. Any other pipe acceptable for use on the projects shall be outlined in the Special Provisions. All pipe with “push on” joints shall have double insertion lines marked from the manufacturer.

POLYVINYL CHLORIDE (PVC) PIPE

- a. C900 PVC:
 - 1) Conform to ANSI/AWWA C 900.
 - 2) Pressure class 235 psi; DR 18.
 - 3) Gaskets meeting ASTM F477.
 - 4) Pipe shall be made from resin that will provide mechanical and physical properties that meet or exceed ASTM D1784.
 - 5) NSF 61 and/or NSF 14 product certified.
 - 6) Integral elastomeric-gasket bell end only.
 - 7) Fittings: Ductile iron conforming to fittings section below.

FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE

- 1) Conform to AWWA C900 PVC, DR-18, Pressure-Rated Pipe, Blue Color.
- 2) Joints shall be designed to meet the leakage test requirements of ASTM D3139.
- 3) NSF 61 and/or NSF 14 product certified.
- 4) Adhere to the pipe manufacturer’s most current calculations regarding tensile load limitations for trenchless application.
- 5) Testing shall be in accordance with the reference AWWA standards for pipe type.
- 6) Pipe shall be made from cell classification 12454 and/or PVC material code 1120 may also be included.
- 7) Pipe lengths shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer.
- 8) The fusion process shall be fused by qualified technicians holding current qualification credentials. Pipe supplier’s procedures shall be followed at all times.
- 9) Each joint shall be recorded and logged by an approved monitoring device.
- 10) Contractor shall adhere to the pipe manufacturer’s most current calculations regarding tensile load limitations for trenchless application.

Pipe Dia. (in)	Dimension Ratio (DR)	Max. Working Pressure (psi)	Pipe O.D. (in)	Max. Pull-in Force Tightest (lbs)
4	18	235	4.80	13,400
6	18	150	6.63	21,900
8	18	150	9.05	37,800
10	18	150	11.10	56,800
12	18	150	13.20	80,300

- 11) Adhere to the pipe manufacturer's most current recommendations regarding radius of curvature for pipe used for trenchless application.

Pipe Diameter (in)	Minimum Radius of Curvature (ft)
4	100
6	144
8	189
10	231
12	275

DUCTILE IRON PIPE

- 1) ANSI/AWWA C151/A21.51, ANSI/AWWA C150/A21.50 and ANSI/AWWA C115/A21.15, Pressure Class 350.
- 2) Joint Type: Push-on (buried piping), flanged (exposed piping and fittings), mechanical (buried fittings) or restrained, as required per Drawings.
- 3) Interior Lining: ANSI/AWWA C104/A21.4, cement-mortar lined.
- 4) Exterior Coating: ANSI/AWWA C110/A21.10, ANSI/AWWA C115/A21.15, ANSI/AWWA C151/A21.51 asphaltic coating for buried piping; coated with primer approximately one (1) mil thick.
- 5) Bolts: 304 stainless steel.
- 6) Fittings: Ductile iron conforming to "Fittings: Ductile Iron" below

PIPELINE ACCESSORIES – Subsidiary to Water Main Construction

a. Tracer Wire

- 1) Utilize on all open trenched non-ferrous pressure pipelines.
- 2) Material: Blue No. 10 CCS wire, minimum; coated, plastic insulated as manufactured by Copperhead or approved equal. The insulation shall be heat, oil, and gasoline resistant.
- 3) Shall run along the centerline of the pipe and taped to the pipe.
- 4) Electrical tape shall cover splice locations so that no bare wire is exposed.

- 5) Splices in the tracer wire shall be connected with snake bite locking wire connectors as manufactured by Copperhead or approved equal.
- b. Tracer Wire Test Station
- 1) Shall be installed adjacent to all fire hydrants along the waterline and at blow-off assemblies or valves near the ends of the waterlines. Any exceptions to locations of test stations shall be approved by the ENGINEER.
 - 2) At each test station, the tracer wire shall be connected to a one pound zinc or magnesium anode. Anodes shall also be attached to the tracer wire at both the beginning and end of the proposed waterline. Anodes shall be buried at the same elevation as the pipeline at each location. The anodes shall be connected to the CCS wire which shall be extended to the test station.
 - 3) Test station shall be galvanized or polypropylene material "condulet" style with removable solid cover having two leads extending from the face.
 - 4) The test shall be attached to a 1-inch conduit (36" length minimum).
 - 5) In concrete environments, such as sidewalks in downtown areas, the contractor shall use the flush style test station.
 - 6) Manufacturer: AGRA Industries, Farwest Corrosion Control Company, or approved equal.
 - 7) Model / Manufacturer:
 - a) Copperhead Industries, LLC; Monticello, MN.
 - b) Farwest Corrosion Control Company; Downey, CA.
 - c) Substitutions: Under provisions of Section 01600.
- c. Polyethylene Encasement
- 1) Polyethylene encasement shall be manufactured of virgin polyethylene material conforming to ASTM D-1248 for Polyethylene Plastics Molding and Extrusion Materials.
 - 2) Polyethylene encasement shall conform to ANSI/AWWA C105/A21.5.
 - 3) Utilize with the following:
 - a) On all ductile iron pipe, valves, and fittings that are in contact with flowable fill or concrete.
 - b) On all ductile iron pipe, valves, and fittings in buried service.
- d. Underground Warning Tape
- 1) Tracer tape shall be aluminum foil encased in an impervious mylar plastic coating on both sides and be at least 5 mils thick and three inches wide.
 - 2) The tape shall be blue in color and contain the message "Caution-Buried Water Line Below" printed in black.

RESTRAINING DEVICES

- a. Utilize to restrain mechanical joint in lieu of concrete thrust blocking.
 - 1) DIP/C900 Pipe:
 - a) Ductile iron gland per ASTM A536 .

- b) Gripping wedges and follower gland meeting the requirements of ANSI/AWWA C110/A21.10.
 - c) Bolt hole size and spacing to match fitting.
 - d) Twist-off nuts shall be same size as tee-head bolts.
 - e) Appropriate spacers shall be provided with set screws to accommodate pipe on which installed.
 - f) Gland shall have pressure rating equal to that of the pipe on which it is used.
 - g) Corrosion resistant.
 - h) Joint to be field installable, field removable, and reinstallable.
 - i) Sized per C900 PVC and DIP listed above.
 - j) Model / Manufacturer:
 - k) Series RomaGrip for PVC and Series RomaGrip for DIP by Romac Industries; Bothell, WA.
 - a) For 12" and smaller diameter, use Grip Ring Pipe Restraint 4" to 12"
 - b) For pipe larger than 12" diameter use RomaGrip MJ Restraining Gland
- 2) Schedule 80 Pipe:
- a) Ductile iron gland per ASTM A536.
 - b) Bolt hole size and spacing to match fitting.
 - c) Twist-off nuts.
 - d) Gland shall have pressure rating equal to that of the pipe on which it is used.
 - e) Corrosion resistant.
 - f) Joint to be field installable, field removable, and re-installable.
 - g) Sized per Sch. 80 PVC listed above.
 - h) Model / Manufacturer:
 - i) Roma Grip for PVC, Romac Industries, Inc., Bothell, WA.

FITTINGS

- a. Ductile Iron:
 - 1) Buried Service, 3-inch through 24-inch diameter:
 - a) Conform to the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11.
 - b) Joint Type: Mechanical or restrained, as required.
 - c) Interior Lining: Cement-mortar lined per ANSI/AWWA C104/A21.4.
 - d) Gasket Material: Rubber. Gaskets to be NSF 61 product certified
 - e) Exterior Coating: Asphaltic coating per AWWA C110, C151, and C153.
 - f) Bolts: Stainless steel.
 - g) Pressure Class:
 - h) 3-inch thru 24-inch: Pressure Class 350.
 - 2) Exposed piping:
 - a) Joint Type: ANSI/AWWA C110/A21.10, Flanged
 - b) Interior Lining: ANSI/AWWA C104/A21.4, cement-mortar lined.

- c) Gasket Material: Rubber, 0.125 inch thick, full face. Gaskets to be NSF 61 product certified
 - d) Exterior Coating: Coated with primer and painted in accordance with Section 09900.
 - e) Bolts: Stainless steel.
 - f) Pressure Class:
 - g) 3-inch thru 24-inch: Pressure Class 350.
- b. Fusible Polyvinyl Chloride (PVC):
- 1) Shall conform to the same sizing convention, diameter, dimensional tolerances and pressure class of the piping being joined.
 - 2) Shall be manufactured from the same manufacturer supplying the pipe.
 - 3) Standard fusible sweeps or bend angles shall not be greater than 22.5 degrees, and shall be used in nominal diameters ranging from 4-inch thru 16-inch.
 - 4) NSF 61 and/or NSF 14 product certified.
- c. Flange Adapter:
- 1) Utilize to allow for ease of installation or dismantling piping in the future.
 - 2) Ductile iron, ASTM A536.
 - 3) Flange: ANSI/AWWA C110/A21.10 (bolt pattern to match flanged pipe).
 - 4) Exterior coating: Coated with primer and painted. Coordinate painting requirements with City and Engineer.
 - 5) Set screws: Shall have a Rockwell hardness of C40-45 converted from Brinnell or AISI 4140, high strength, low alloy steel; 190,000 psi minimum tensile strength, heat-treated and zinc plated, square-head design, to coincide with manufacturer's torque requirements.
 - 6) Bolts: Stainless steel.
 - 7) Model/Manufacturer:
 - a) DIP piping: Series 1000 EZ Flange by Ebba Iron; Eastland, TX.
 - b) PVC piping: Series 2100 Megaflange by Ebba Iron; Eastland, TX.
- d. Pipe Couplings:
- 1) Utilize to allow for connection of plain end pipelines under pressure with relatively close outside dimensions.
 - 2) For pipe sizes from 2 inches to 12 inches:
 - a) Sleeve: ASTM A53, ASTM A512 or carbon steel having a minimum yield of 30,000 psi.
 - b) Followers: Ductile iron ASTM A536.
 - c) Gasket: Nitrile (Buna-N). Gaskets to be NSF 61 product certified.
 - d) Bolts: Stainless steel.
 - e) Finish: Fusion bonded Flexi-Coat Epoxy per AWWA C213 and NSF 61 product certified

- 3) For pipe sizes from 14 inches to 60 inches:
 - a) Sleeve: Carbon steel having a minimum yield of 30,000 psi.
 - b) Followers: AISI C1020 steel.
 - c) Gasket: Nitrile (Buna-N). Gaskets to be NSF 61 product certified.
 - d) Bolts: Stainless steel.
 - e) Finish: Fusion bonded Flexi-Coat Epoxy per AWWA C213 certified to NSF 61 product certified for use in potable water.
 - 4) Model / Manufacturer:
 - a) 411; Smith-Blair, Inc., Texarkana, Arkansas.
- e. Transition Couplings:
- 1) Utilize to allow for connection of pipelines under pressure with differing outside diameters.
 - 2) Sleeve: Carbon steel per ASTM A53C or having a minimum yield of 30,000 psi.
 - 3) Flanges (2 inches to 12 inches):
 - a) Ductile iron ASTM A536 or carbon steel having a minimum yield of 30,000 psi.
 - 4) Flanges (14 inches to 60 inches):
 - a) AISI C1020 steel.
 - 5) Gasket: Nitrile (Buna-N). Gaskets to be NSF 61 product certified.
 - 6) Bolts: Stainless steel.
 - 7) Finish: Fusion bonded Flexi-Coat Epoxy per AWWA C213 and NSF 61 product certified.
 - 8) Model / Manufacturer:
 - a) 415; Smith-Blair, Inc., Texarkana, Arkansas.
- f. Pipe Seals:
- 1) Utilize where noted on the Drawings to allow for pipeline penetration through walls and floors.
 - 2) Modular Pipe Seal Elements: EDPM.
 - 3) Pressure Plates: Molded of glass reinforced nylon.
 - 4) Bolts and Hardware: Stainless steel.
 - 5) Model / Manufacturer:
 - a) Innerlynx S-316; Advance Products and Systems, Inc., Lafayette, LA.

B. VALVES

GATE VALVES

- a. General:
- 1) Same size as pipe in which installed, unless noted otherwise on drawings.
 - 2) Manufacturer's name or initial and working pressure cast on valve body.
 - 3) Open when turned counterclockwise.
 - 4) Factory tested to double working pressure.

- 5) Hardware: Stainless steel.
- 6) Buried Service:
 - a) 2-inch and larger: Mechanical joint, resilient wedge-type gate valve (flanged x mechanical joint for connection to tapping sleeves) conforming to ANSI/AWWA C111/A21.11, unless noted otherwise on Drawings.
 - b) Provide mechanical joint gasket for PVC, HDPE, and DIP where applicable.
 - c) Operation: 2" square AWWA wrench nut.
 - d) Installation: Valve shall be set and jointed to the pipe in the manner specified for pipe laying and jointing. Valves shall be set with operating nut vertical. Valve, boxes shall be centered and plumb over the operating nut and shall be set so that no shock or stress will be transmitted to the valve.
- 7) Service above grade/within structure:
 - a) 3-inch and larger: Flanged faced resilient wedge-type gate valve and drilled to conform to ANSI/AWWA C110/A21.10.
 - b) Operation: Hand wheel: Cast iron ASTM A126 CL.B.
- 8) Cast iron wedge symmetrical and fully encapsulated with molded rubber with no exposed iron.
- 9) Non-rising, stainless steel (Type 304) stem.
- 10) Triple rubber O-rings on stem. Top two O-rings can be replaced with valve fully open and under pressure.
- 11) Suitable for 250 psi maximum working pressure.
- 12) Manufactured and tested per ANSI/AWWA C509.
- 13) NSF 61 Product Certified
- 14) All internal and external exposed iron surfaces of valve body and bonnet shall be coated in accordance with ANSI/AWWA C550.
- 15) Models/Manufacturer:
 - a) Resilient Wedge Gate Valve: 2"-12": Model 2360; 14"-48": Model 2361 by Mueller Co., Decatur, IL.
 - b) Resilient Wedge Gate Valve: 2"-12": Model 65 by American AVK Co., Minden, NV.
 - c) Substitutions: with approval of City/Engineer.

BUTTERFLY VALVES - Butterfly valves shall be used only when adequate cover cannot be achieved on a waterline or within valve vaults, and only after approval of the City/Engineer.

- a. 2-inch and larger:
 - 1) Type: Resilient-seated wafer butterfly valve.
 - a) Shall be rated to 150 psi.
 - b) Zero leakage bi-directional shutoff.
 - 2) Satisfactory for applications involving:
 - a) Frequent throttling service and/or frequent operation.
 - b) Operation after long periods of inactivity.
 - 3) Comply with AWWA C504.
 - 4) Body & Disc:
 - a) Material: Ductile iron, ASTM A536.

- b) Seat: ASTM A276 Type 316 Stainless Steel or EPDM.
- c) Wafer Style.
- d) Integral stainless steel clamp ring and self-locked screws.
- 5) Shaft: One piece 304 Stainless Steel, ASTM A276.
- 6) Seat Molding Material: EPDM.
- 7) Operator:
 - a) Shall be permanently lubricated screw-type operator, totally enclosed and of waterproof construction. Overload protection shall be incorporated into the operator allowing the application of 450 foot-pounds input torque at full-open and full-closed positions without damage to the operator or valve.
 - b) Above Ground: Handwheel.
 - c) Underground: 2" Square wrench nut and valve box.
- 8) Operation:
 - a) Open counter-clockwise
- 9) Finish:
 - a) Epoxy
- 10) To conform to NSF 372, Reduction of Lead in Drinking Water Act (2014), as applicable.
- 11) NSF 61 product certified.
- 12) Manufacturer:
 - a) Dezurik, Inc; Sartell, MN.
 - b) Substitutions: with approval of City/Engineer.

DIP CHECK VALVES

- a. Type: Swing Flex Check Valve. Must conform to AWWA C-508.
- b. Materials of Construction:
 - 1) Valve body and cover: ASTM A536 ductile iron.
 - 2) Disc: Buna-N, ASTM D2000-BG
 - 3) Full body flanged type domed cover and valve disc being only moving part.
 - 4) Valve body shall have full flow equal to nominal pipe diameter at any point through valve.
 - 5) Top access port shall be full size, allowing removal of the removal of the disc without removing the valve from pipeline.
 - 6) Disc shall be of one-piece construction, precision molded with integral O-ring type sealing surface and contain steel and nylon reinforcements. The flex portion shall be warranted for 25 years.
 - 7) Flanges: Class 150, ANSI B16.5.
 - 8) NSF 61 product certified.
 - 9) Finish: The exterior and interior of the valve shall be coated with an NSF/ANSI 61 product certified fusion bonded epoxy coating.
 - 10) To conform to NSF 372, Reduction of Lead in Drinking Water Act (2014), as applicable.
 - 11) Manufacturer:
 - a) Val-Matic Valve and Manufacturing Corp.; Elmhurst, IL.
 - b) Henry Pratt Company; Aurora, IL.
 - c) Dezurik, Inc; Sartell, MN
 - 12) Substitutions: with approval of City/Engineer

AIR RELEASE/VACUUM VALVES

- a. Shall be a combination air valve for water and conforming to ANSI/AWWA C512.
- b. Shall operate under pressure to automatically allow entrapped air to escape from pipeline.
- c. Shall be of the type that releases large amounts of air, gases, and vapor during the filling of the system and allows large amounts of air into the system when the system drains to prevent vacuum damage to pipeline and accessories.
- d. Working pressure: up to 150 psi (minimum).
- e. Body: Composite (reinforced nylon)
- f. Thermal Protection:
 - 1) To be installed on all air release/vacuum valves inside buried structures.
 - a) Exterior cover: Black PVC fabric 13 oz – water proof.
 - b) Insulation: Closed cell foam – 0.58” thick.
 - c) Interior cover: Black PVC fabric 13 oz – water proof.
 - d) Fastening system: Fastened strap system with Velcro.
 - e) Closure system: Teflon coated draw string.
 - f) Manufacturer: A.R.I.
- g. Connection: Threaded or Flanged
- h. Manufacturer: A.R.I. – Substitutions with approval of City/Engineer.
- i. Air release valve must terminate 1 foot above grade through screened, downward facing piping.

LINE STOP

- a. Line stop must conform to AWWA C-509 and/or C-515.
- b. Utilized for temporarily plugging of pressurized pipe without disrupting pressure or service.
- c. Fitting and Accessories:
 - 1) Full encirclement, pressure retention type split tee.
 - 2) Two steel weldments: upper flange saddle plate and lower saddle plate.
- d. Model/Manufacturer:
 - 1) Hydra-Stopper by Hydra-Stop, Inc.
 - 2) Substitutions: with approval of City/Engineer.

BALL VALVES

- a. Ball valves must conform to AWWA C-507 and/or AWWA C-800.
- b. Brass:
 - 1) Type: Threaded NPT lead-free ball valve.
 - 2) Materials of Construction:
 - a) Body: Lead free brass
 - b) Lever and grip: Steel, zinc plated w/PVC.
 - c) Stem: Brass C36000

- d) Stem packing: PTFE.
- e) Seat: PTFE.
- f) Ball: Lead-free brass chrome plated.
- 3) Shall be NSF 61 product certified.
- 4) Manufacturer:
 - a) Apollo Valves, Matthews, NC.
 - b) Substitutions: with approval of City/Engineer.
- 5) To conform to NSF 372, Reduction of Lead in Drinking Water Act (2014) as applicable.
- c. PVC:
 - 1) Type: True Union full port ball valve.
 - 2) Materials of Construction:
 - a) Handle, stem, union nut, ball, body seal carrier, seal carrier ring, and end connector: PVC, ASTM D1784, 12454-B.
 - b) Seat: Teflon.
 - 3) NSF 61 product certified.
 - 4) Maximum pressure: 250 psi.
 - 5) End type: Threaded or solvent welded socket.
 - 6) Manufacturer:
 - a) Hayward Industrial Products, Clemmons, NC.
 - b) Substitutions: with approval of City/Engineer.

INSERTION VALVE

- a. Insertion Valves shall conform to AWWA C509 and/or AWWA C-515.
 - 1) Utilized for installation of a valve on a pressurized pipe without disrupting pressure or service.
 - 2) Capable of pressure-tight assembly to exterior of the pipe in which flow is to be stopped at a working pressure not to exceed 250 psi.
 - 3) Valve shall be provided with sacrificial anodes.
 - 4) Shall be resilient rubber seal 360 degrees around gate.
 - 5) Restraint fasteners shall provide a 360 degree attachment.
 - 6) To conform to NSF 372, Reduction of Lead in Drinking Water Act (2014), as applicable.
 - 7) NSF 61 product certified.
 - 8) Materials of construction:
 - a) Body: Two piece (upper and lower) ductile iron.
 - b) Bonnet body: Ductile iron.
 - c) Gate: Ductile iron.
 - d) Gate rubber: EPDM.
 - e) Stem: Stainless steel, 1 CR 12.
 - f) Gasket: EPDM.
 - g) O-rings: Buna-N
 - h) Hardware: Stainless steel.
 - i) Coating: Epoxy
 - 9) Model/Manufacturer:
 - a) Insta-Valve 250 by Hydra-Stop, Inc., Burr Ridge, IL.
 - b) Substitutions: with approval of City/Engineer.

TAPPING SLEEVES & VALVES – Tapping sleeves shall be fabricated from 304 stainless steel or its equivalent, CF8 cast stainless steel. They shall have a pass through bolt design and provide a 360° seal around the pipe. Sleeves shall be manufactured to meet the following minimum specifications. Tapping Sleeves shall be JCM 432, Rockwell 663 or approved equal. Tapping Sleeves & Valves will conform to AWWA C223. Tapping Sleeve outlet flange to conform to AWWA C-207.

- A. Body Construction: To provide the proper strength, support and safety factor for the valve, drilling machine operation and load forces, the outlet half (load bearing half) shall be 12 ga Stainless Steel and the back half (conforming half) shall be 14 ga Stainless Steel

<i>Dimensions</i>	
<i>Outlet Size</i>	<i>Length</i>
2" - 6"	15"
8"	21"
10"	27"
12"	30"

- B. Outlet Construction: For proper strength, support and rigidity for the valve, drilling machine operation and load forces, the outlet construction shall be Schedule 10 Stainless Steel pipe sized to accept full size cutters. Flanges shall be CF8 cast stainless steel or equivalent 304 stainless steel with a high-pressure hydro mechanical lip flange gasket set in a cavity. Flange outlets shall be indexed to accept tapping valves.
- C. Bolting System:
 - 1) The lugs shall have a pass-through bolt design, to avoid alignment problems and allow tightening from either side of the pipe.
 - 2) Bolts shall not be integrally welded to the sleeve.
 - 3) Lugs shall be triangular design with a maximum of 3" bolt center spacing.
 - 4) Outlet sizes 10" and 12" and pipe sizes larger than 12" shall have internal strengthening of lugs by means gussets.
 - 5) Bolts, nuts & washers shall be 304 Stainless Steel, the bolts shall be track head type and furnished with permanently lubricated heavy-hex nuts and stainless washers.
- D. Gasket: The full circumferential gasket shall be molded of synthetic rubber compounded for use with water, salt solutions, mild acids, bases, and sewage. The gasket shall have a gridded surface, be a full 1/4" thick with 304 stainless steel bridge plates molded flush into the gasket and have a raised hydro mechanical outlet seal to seal against line surges and water hammer. Gaskets to be NSF 61 product certified.
- E. Pressure Rating: The sleeves shall be rated at 150 psi hydrostatic with a test pressure of 200 psi on pipe with a full circumferential break.

VALVE BOXES

Valve Boxes shall conform to ASTM A-48.

- A. Products:
 - 6) Clay & Bailey 2194, Cast Iron Valve Box Cover or equal.
 - 7) Shall be stamped with the word "WATER".
 - 8) 6" PVC SDE-35 Pipe to grade level.
- B. Installation:
 - 1) Valve boxes shall be centered and plumb over the operating nut of the valve. Tops of valve boxes shall be set flush with the ground or street surface unless otherwise directed by the City/Engineer.

FIRE HYDRANT ASSEMBLY

- A. Fire hydrant shall conform to the ANSI/AWWA C502, as modified herein. Hydrants shall be of the "Compression" or "Toggle Joint" type with safety flange and safety stem coupling above the ground line so that they can be repaired without shutting off the water. Hydrants shall be of the dry top design with two or more "O" rings sealing the water from the operating mechanism. The portion of the hydrant above the ground line shall be painted red in accordance with the City's standards. Hydrants shall be furnished for 5' cover unless specified otherwise. Hydrant assemblies shall include an auxiliary gate valve, as specified above.
- B. Standard 3-way hydrant assemblies shall be furnished a 6" shoe, with 5-1/4" main valve opening, one 5" integral Storz Pumper connection, or one standard 4-1/2" pumper connection with 5" Storz adapter, and two 2-1/2" hose connections.
- C. Standard 2-way hydrant assemblies shall be furnished a 6" shoe, with 5-1/4" main valve opening, two 5" integral Storz Pumper connections, or two standard 4-1/2" pumper connection with 5" Storz adapters.
- D. Hydrants shall open by turning counter-clockwise (left). Operating Nuts shall be 1- 3/8" Pentagon, measured from point to opposite flat and tapering to 1-5/16" at the end and not less than 1-1/8" long.
- E. All hydrants shall stand plumb with the pumper connection facing the street. Hydrant shall be set with the ground line at the location indicated by the plans. Auxiliary valve box shall be at sidewalk/pavement grade or no higher than the hydrant traffic flange.
- F. Drainage shall be provided at the base of the hydrant by placing clean gravel under and around the base of the hydrant. Sufficient gravel shall be used to provide a minimum of one foot on all sides from the base of the hydrant to the point at least 6" above the drain opening. Hydrant shall be braced against unexcavated earth at the end of the trench with concrete backing as detailed on the plans. Hydrant installation shall be as shown on the Standard Drawing.
- G. Hydrants shall be Mueller Super Centurion (3way-A-423- SC250; 2way- A-425- SC200), Clow Medallion (3-way; 2-Pumper), or American AVK Nostalgic (Series 2780 – 3 way; Series 2736 – 2 way).
- H. Hydrants coating above ground shall be Fusion bonded epoxy inside and out. Below ground shall be Bitumen-Fusion bonded epoxy. Epoxy color shall be manufactures standard red. Epoxy shall meet or exceeds AWWA C550 (latest).

- I. Upper and Lower Stem:
 - a. 304 Stainless Steel

FLUSHING HYDRANT ASSEMBLY

- a. Type: Dry barrel.
- b. Maximum working pressure: 150 psi.
- c. Provide with break-off feature should be of the traffic breakaway type and allow 360° rotation of the flushing hydrant.
- d. Interior of the shoe shall be coated with HP epoxy.
- e. Inlet:
 - 1) Mechanical joint.
 - 2) Diameter: 2 inches, to match size of associated line.
- f. Provide one 2-1/2 inch hose nozzles with cap and chain for hydrant. Hydrant caps will have inside gaskets.
- g. Components shall turn counter-clockwise (left) to open.
- h. Cast on top of hydrant an arrow and the word "OPEN" in relief indicating the direction of turning to open the hydrant.
- i. Warranty: 1 year limited warranty on material and workmanship.
- j. Model/Manufacturers:
 - 1) Series 67 Post Type by American AVK Co., Minden, NV.
 - 2) Series A-411 Post Type by Mueller Co., Decatur, IL.
 - 3) Kupferle, St. Louis, MO.
 - 4) Substitutions: with approval of City/Engineer.

PIPE RESTRAINT

- a. All fittings shall be mechanically restrained.
 - 1) For 12" and smaller diameter, thrust blocks are not required.
 - 2) For larger than 12" diameter, thrust blocks are required in addition to mechanical restraint.
- b. When thrust blocks are installed, wrap the fitting with visqueen or approved equal.
- c. Thrust blocks shall be a 6 sack concrete mix with a 3500 psi compressive strength at 28 days.
- d. Reference Standard Drawing for thrust blocking specifications.
- e. Pipe restraint and thrust blocks shall be considered subsidiary to other items of work.

SERVICE ASSEMBLY - Where services are provided, the following shall be furnished based on the meter size required. Additional service sizes shall be handled on a case-by-case basis.

- A. 1" Service Assembly:
 - a. Service lines to be NSF 61 product certified and conform to NSF 372, Reduction of Lead in Drinking Water Act (2014), as applicable.
 - b. Service Saddle:

- 1) Brass Service Saddle for C900 PVC Pipe, AWWA/CC Tapered Thread
 - a) Ford S90 Style
- c. Corporation Stops:
 - 1) AWWA/CC Taper Thread Inlet by Grip Joint Outlet for Copper or Plastic Tubing (CTS) copper tubing size.
 - a) Ford F 1000-4-G
- d. Service Tubing:
 - 1) 3408 SDR9 200PSI CTS and shall be NSF certified.
- e. Curb Stops:
 - 1) Grip Joint for Copper or Plastic Tubing (CTS) Inlet by Meter Swivel Nut with locking wing and grip nut.
 - a) Ford B41-44W-G
- f. Angle Meter Coupling:
 - 1) Meter Swivel Nut by Male Iron Pipe Thread.
 - a) Ford L38-44
- g. Meter and Meter Radio:
 - 1) Solid state electromagnetic flow type for cold water service conforming to AWWA Standard C-715.
 - 2) Operating Range:
 - 1-inch: 0.4 to 55 gpm.
 - 3) Maximum Operating Pressure: 175 psi.
 - 4) Register: Hermetically sealed encoder register with low flow indicator.
 - 5) Materials of Construction:
 - External housing – Thermal plastic
 - Flowtube – Polyphenylene sulfide alloy
 - Electrode – Silver/silver chloride
 - Register cover – Tempered glass
 - 6) Inlet/Outlet: Threaded or flanged to match existing/proposed connections.
 - 7) Provide all AMI/AMR Compatibility to work with Cities existing AMI/AMR system.
 - 8) NSF-61 product certified.
 - 9) Low Lead certified.
 - 10) Units: Gallons.
 - 11) Manufacturer:
 - 12) iPERL - Sensus, Inc.; Morrisville, NC
 - 13) Warranty: Manufacturer shall provide a warranty of 20-year accuracy and a 20-year battery life guarantee.
- h. Angle Meter Coupling:
 - 1) Meter Swivel Nut by Grip Joint.
 - a) Ford L38-44-G
- i. Coupling:
 - 1) Male Adapter (straight coupling)
 - 2) Male IP Thread x CTS Grip Joint
 - a) Ford C84-44-G
- j. Meter Box and Lid:
 - 1) 21 inch Meter Box :
 - a) For underground service at water meters.

- b) Water meter pit height shall be 36 inches.
 - c) HDPE strong enough to hold incidental, non-deliberate traffic.
 - d) Meter pits shall be of high density polyethylene conforming to ASTM D3350.
- 2) Water Meter Pit Frame and Cover:
- a) Water meter pit frame and cover shall adequately fit over meter pit.
 - b) Service meter pit cover shall be removable cast iron flat lid.
 - c) Service meter pit cover shall be marked "WATER METER".
 - d) Provide hole in lid for meter radio as required.
 - e) Manufacturer:
 - f) SIP Industries, Model 5234, Houston, TX
- 3) Water Meter Pit Insulation
- a) Easy push-in, pull-out installation.
 - b) Be made to not absorb dirt or moisture.
 - c) Water-proof, flexible, 2" thick tough foam.
 - d) Insulation shall be supplied with flexible, non-conductive handle.
 - e) Manufacturer:
Insulation Pad by Infact Products, Nashville, TN.

B. 2" Service Assembly:

- a. Service lines to be NSF 61 product certified and conform to NSF 372, Reduction of Lead in Drinking Water Act (2014), as applicable.
- b. Service Saddle:
 - 1) Brass Service Saddle for C900 PVC Pipe, Iron Pipe Thread
 - a) Ford S91 Style
- c. Corporation Stops:
 - 1) Iron Pipe Thread Inlet by Grip Joint Outlet for Copper or Plastic Tubing (CTS) copper tubing size.
 - a) Ford FB1100-7-G
- d. Service Tubing:
 - 1) 3408 SDR9 200 PSI CTS and shall be NSF certified.
- e. Curb Stops:
 - 1) Grip Joint for Copper or Plastic Tubing (CTS) Inlet by Meter Flange with locking wing.
 - a) Ford BF43-777W-G
- f. Meter and Meter Radio:
 - 1) Floating ball type, magnetic drive and flanged tube design.
 - 2) Meter shall conform to AWWA C701 and C702 class II.
 - 3) Meter Body:
 - a) Maincase shall be of epoxy coated ductile iron.
 - b) Epoxy coating shall be provided as standard fusion-bonded and conform to NSF 372 – Drinking Water System Components – Lead Content.
 - 4) Performance:
 - a) Capable of up to 25% flow capacity in excess of the maximum flows as listed intermittently without affecting long-term accuracy.

- 5) Measuring Chamber:
 - a) Consist of measuring element, removable housing, and all-electronic register.
 - b) Measuring element shall be mounted on a horizontal, stationary, stainless steel shaft with sleeve bearings and be essentially weightless in water.
 - c) Measuring element comes integrated with the advanced floating ball technology design.
 - d) Measuring chamber shall be capable of operating within the above listed accuracy limits without calibration when transferred from one maincase to another the same size.
 - e) Measuring shall be so configured to capture all flows as specified above, without the requirement of an automatic valve.
- 6) Direct Magnetic Drive System:
 - a) The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register.
- 7) Electronic Register:
 - a) Shall not contain any mechanical gearing to display flow.
- 8) Features:
 - a) Pulse output frequency fully programmable
 - b) Integral data logging capability
 - c) Integral resettable accuracy testing feature
 - d) Large, easy-to-read LCD display
 - e) 10-year battery life guarantee
- 9) Maximum operating pressure: 200 psi
- 10) Units: Gallons.
- 11) Strainers:
 - a) Shall be integral and cast as part of meter's maincase.
 - b) Screen shall have minimum net open area of at least two times the pipe opening.
 - c) Screen shall maintain full unobstructed flow pattern.
 - d) Body shall be coated ductile iron fusion-bonded epoxy.
 - e) Stainless steel fasteners.
- 12) Straightening Vanes:
 - a) Straightening vane is required and shall be positioned directly upstream of the measuring element.
 - b) Shall be integral component of measuring chamber.
 - c) Shall be guaranteed against defects in material and workmanship for a period of one (1) year from startup.
- 13) Model/Manufacturer:

Omni C2; Sensus; Raleigh, NC., or equal.
- g. Coppersettors:
 - 1) For commercial property that cannot be shut off during regular business hours.
 - 2) Ball Valve Inlet with by-pass, locking wing.
 - a) Ford VBHH77-12BHC-44-77-W-G
- h. Meter Flange:

- 1) Meter Coupling for Flanged Meters. 2" Meter Flange x 2" CTS Grip Joint
 - a) Ford CF34-77-G
- i. Coupling:
 - 1) Male Adapter (straight coupling) Male IP Thread x Grip Joint
 - a) Ford C84-77-G
- j. Meter Box and Lid:
 - 1) 36 inch Meter Box :
 - a) For underground service at water meters.
 - b) Water meter pit height shall be 48 inches.
 - c) 36" Dia. Corrugated PVC or Polypropylene
 - 2) Water Meter Pit Frame and Cover:
 - a) Water meter pit frame and cover shall adequately fit over meter pit.
 - b) Service meter pit cover shall be removable cast iron flat lid.
 - c) Service meter pit cover shall be marked "WATER METER".
 - d) Provide hole in lid for meter radio as required.
 - e) Manufacturer:

SIP Industries, Model 6477, Houston, TX
 - 3) Water Meter Pit Insulation
 - a) Easy push-in, pull-out installation.
 - b) Be made to not absorb dirt or moisture.
 - c) Water-proof, flexible, 2" thick tough foam.
 - d) Insulation shall be supplied with flexible, non-conductive handle.
 - e) Manufacturer:

Insulation Pad by Infact Products, Nashville, TN.

1.9 TRENCH EXCAVATION AND BACKFILL

1. Trench excavation and backfill shall include all excavation, over excavation, backfilling, disposal of surplus and unsuitable material, and all other work incidental to the construction of trenches, including any excavation which may be required for valves, fittings hydrants, pipe restraint, thrust blocks or other structures forming a part of the pipeline.
2. Work performed under this section shall be in conformance with City of Garden City standards for excavation in Public Right-of-way.

1.10 INSTALLATION

A. GENERAL

1. The pipe shall be installed with a minimum of 4.0 feet of cover from final grade and pipe shall be installed in accordance with ANSI/AWWA C600 or C605 and the manufacturer's recommendations for installing the type of pipe used unless modified or changed in the Special Provisions. In addition, pipe installed beneath the streambed of non-navigable streams shall have a minimum cover of 5.0 feet and pipe installed beneath the streambed of navigable streams shall have a minimum cover

of 7.0 feet. The Contractor shall provide all tools and equipment including any special tools designed for installing each particular type of pipe used. Vertical separation between watermains and sanitary sewer forcemains shall be 24" with the forcemain always below the watermain.

2. The installed pipe shall be bedded and backfilled as shown in the City of Garden City, Standard Details – Water System. Pipe bedding shall be a minimum of 6" of compacted bedding below the pipe and 6" of compacted bedding above the crown of the pipe. The bedding material shall be compacted to the densities outlined in the Standard Details. Onsite sandy soils shall be acceptable for bedding.
3. Bedding Material shall be fine aggregate - Type A3 (Sand): Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136; within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

B. DEWATERING OF TRENCH

1. General – If water is encountered during trenching and excavating operations, remove or lower by means of one of the following dewatering systems as required.
2. Well points and pumps – This dewatering system requires the installation of well points and pumps, connecting pipelines and continuous operation in order to permit preparation of a satisfactory pipe bed or structural subgrade.
3. Cased wells and pumps – This dewatering system requires the use of individually cased wells and pumps, connecting pipelines and continuous operation in order to permit preparation of a satisfactory pipe bed or structural subgrade.
4. Discharge – Water from dewatering operations shall be discharged to the existing drainage course and shall be approved by City, Engineer and appropriate regulatory agency.
5. Permits – Secure a temporary Water Rights permit from the Kansas Department of Agriculture's Division of Water Resources or other appropriate regulatory agency prior to dewatering activity. Costs associated with the permit will be the responsibility of the Contractor
6. Duration – Continue dewatering until there is no danger of structure displacement due to buoyancy.

C. RESPONSIBILITY FOR MATERIAL

1. The Contractor shall be responsible for all material furnished by him and shall replace at his own expense all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all

materials and labor required for the placement of installed material discovered damaged or defective prior to the final acceptance of the work, or during the guarantee period.

2. The Contractor shall be responsible for the safe and proper storage of material furnished by him or to him and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipe and other accessories shall be kept free from dirt and foreign matter at all times.
3. Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material. When pipe laying is not in progress, as, for example, at the close of the day's work, all openings in the pipeline shall be closed by water-tight plugs. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

D. HANDLING OF PIPE:

1. All pipe furnished by the Contractor shall be delivered and distributed at the site by the Contractor. Pipe, fittings, specials, valves and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.
2. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.
3. Pipe shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be made by the Contractor, at his expense, in a manner satisfactory to the Engineer.

E. LAYING OF PIPE

1. Before installation, the pipe and pipe coating shall be inspected for defects. Any damage to pipe coatings shall be repaired with the same materials used for the original coating before laying the pipe.
2. All pipe shall be laid and maintained to the required lines and grades with fittings and valves at the required locations.
3. Wherever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plan is required, the Engineer shall have the authority to change the plans and order a deviation from the line and grade or arrange with the City's of the structures for the removal, relocation and reconstruction of the obstructions.
4. Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings and valves shall be carefully lowered into the trench piece by piece by suitable tools or equipment, in such a manner as to prevent damage to pipe materials and protective coatings and linings. Under no circumstances shall materials be dropped or dumped into the trench.
5. Every precaution shall be taken to prevent foreign material from entering the pipe

while it is being placed in the line. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a water-tight plug or other means approved by the Engineer.

6. Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints. If the pipe is shown curved on the plans and no special fittings are shown, the curves can be made by deflection of the joints with standard lengths of pipe.
7. Where field conditions require deflection or curves not anticipated by the plans, the Engineer will determine the methods to be used. No additional payment will be made for laying pipe on curves as shown on the plans, nor for field changes involving standard lengths of pipe deflected at the joints.
8. Maximum deflections at pipe joints shall not exceed the applicable specifications of AWWA or recommendations of the manufacturer. When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.
9. Pipe restraint shall be applied at all tees, Plugs, caps and at bends deflecting 11-1/4 degrees or more, or movement shall be prevented by attaching suitable tie rods or straps as approved by the Engineer. Poured concrete blocking shall be placed between solid ground and the fitting; the area of bearing on the pipe and on the ground shall be as shown on Standard Drawings. The blocking shall be so placed that the pipe and fitting joints will be accessible for repair.
10. The cutting of pipe for inserting valves or fittings or shall be done in a neat and workmanlike manner without damage to the pipe or coating and so as to leave a smooth end at right angles to the axis of the pipe. Torch cutting of pipe shall not be allowed.

1.11 PIPE JOINTING

A. RUBBER GASKET "PUSH-ON" JOINTS

1. Jointing of pipe with a rubber gasket "push-on" joint shall be as recommended by the manufacturer. The rubber gasket and gasket seat inside the bell shall be wiped clean with a cloth. A thin film of lubricant, furnished with the pipe and NSF 61 product certified, shall be applied to the inside surface of the gasket. The plain end of the adjoining pipe shall be wiped clean and inserted into the bell a sufficient distance to make contact with the gasket. The plain end shall then be forced "home" by the use of a crow bar, fork tool, or jack assembly. The pipes double insertion lines shall be utilized to ensure the proper insertion distance is achieved.

B. MECHANICAL JOINTS

1. The inside of the bell and the outside of the spigot of the mechanical joint fittings shall be brushed thoroughly with a wire brush to remove all loose rust or other foreign material and the cleaned surfaces shall be brushed with soapy water, made with a NSF 61 product certified soap, just prior to slipping the gasket over the spigot end and into the bell.

2. The spigot end of the pipe or fitting shall be accurately centered in the bell before jointing is begun. After the gasket is in place the gland shall be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. Bolts shall be partially tightened alternately around the socket maintaining approximately equal tension until the final tension is reached. The normal range of bolt torques to be applied to the bolts in the joints shall be as follows:

Bolt Size (inch)	Range of Torque (ft. lb.)
5/8	40 – 60
3/4	60 – 90
1	70 – 100
1 – 1/4	90 – 120

3. Torque loads may be applied with torque measuring or indicating wrenches, or they may be applied using regular socket wrenches, and checked by torque wrenches.
4. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation practice will not be permitted.

C. CONNECTIONS TO EXISTING MAINS

1. All connections to watermains in use shall be made by the Contractor unless otherwise provided in the Plans or Special Provisions. The Contractor shall furnish the fittings and all other materials required. The Contractor shall make all necessary excavations, to assure gradual transition between the new and existing water main, and all backfilling. When connections are made to an existing system, the exposed pipe interiors should be thoroughly wetted with a 1% or higher concentration chlorine solution before enclosure.
2. The Water Superintendent and the Contractor shall coordinate the interruptions of service and notification of customers affected.

1.12 TESTING

A. PRESSURE TEST

1. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 150% the working pressure at the point of testing or 150 psi, whichever is greater. A passing pressure test shall be defined as the maintaining pressure within two (2) psi of the specified test pressure for 2 hours after the air in the pipeline has been expelled and the pipe has been filled with water. Pressure gauge shall have 2 lb. measuring increments.
2. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer.

B. LEAKAGE TEST

1. A leakage test shall be conducted concurrently with the pressure test. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or section thereof, to maintain pressure within five (5) psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. If the leakage test is performed independent from the pressure test, the test duration shall be 2 hours.
2. No pipe installation, or segment thereof, will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{148,000}$$

Where: L = allowable leakage, gal/hour

S = length of pipe being tested, feet

D = nominal diameter of pipe, inches

P = average test pressure during test, psi

3. The formula is based upon an allowable leakage of 10.5 gpd/mi/in of nominal pipe diameter.
4. When testing against closed metal seated valves, an additional leakage per closed valve of 0.0078 gal/hour/inch of nominal valve size is allowed.
5. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the leakage test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer.

1.13 **DISINFECTING WATER MAINS**

A. DISINFECTION

1. Disinfection methods shall be in accordance with AWWA C651. When the disinfecting of water mains is not to be done by the Contractor, the Contractor shall coordinate such work with the Engineer.

B. PRELIMINARY FLUSHING

1. The main shall be flushed prior to disinfection, except when the tablet method is used. No site for flushing should be chosen unless it has been determined that drainage is adequate at that site. The flushing velocity shall not be less than 2.5 ft/sec. With 40 psi residual pressure, a 2-1/2" hydrant outlet nozzle will discharge approximately 1,000 gpm and a 4- 1/2" hydrant nozzle will discharge approximately 2,500 gpm.

C. FORM OF CHLORINE FOR DISINFECTION

1. The most common forms of chlorine used in the disinfecting solutions are calcium

hypochlorite granules or tablets and sodium hypochlorite solutions. The hypochlorite solutions shall be applied to the water main with a gasoline or electrically-powered chemical feed pump designed for feeding chlorine solutions. For small applications the solutions may be fed with a hand pump, for example, a hydraulic test pump. Feed lines shall be of such material and strength as to withstand safely the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the hypochlorite solution is applied to the main. Chlorine source shall be NSF 60 product certified.

- a. CALCIUM HYPOCHLORITE. Calcium hypochlorite contains 65 percent (65%) available chlorine by weight. A chlorine-water solution is prepared by dissolving the granules in water in the proportion requisite for the desired concentration.
- b. SODIUM HYPOCHLORITE. Sodium hypochlorite is supplied in strengths from 5.25 to 16 percent available chlorine in liquid form. The chlorine-water solution is prepared by adding hypochlorite to water.

D. METHODS OF CHLORINE APPLICATION:

- 1. During the application of any form of chlorine, prevent the treatment dosage from flowing back into the line supplying the water.
 - a. CONTINUOUS FEED METHOD. This method is suitable for general application.
 - i. Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly-laid pipeline. The water shall receive a dose of chlorine at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 25 mg/l available chlorine for 24 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water shall contain no less than 10 mg/l chlorine throughout the length of the main.

- 2. *Amounts of either a 10 percent sodium hypochlorite solution or 65 percent high test hypochlorite powder required per 500 feet of water line for a 25 mg/l chlorine content*

<u>Pipe Size</u>	<u>Ounces 10% Solution</u>	<u>Ounces 65% Compound</u>
4"	13.1	1.7
6"	26.2	3.8
8"	43.8	6.7
12"	96.3	15.1

- 3. SLUG METHOD. This method is suitable for use with mains of large diameter for which, because of the volumes of water involved, the continuous feed method is not practical.
 - a. Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly-laid pipeline. The water shall receive a dose of chlorine, also fed at a constant,

measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at no less than 300 mg/l. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it passed along the line, expose all interior surfaces to a concentration of at least 300 mg/l for at least three (3) hours. The application shall be checked at a tap near the upstream end of the line by chlorine residual measurements.

- b. As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect appurtenances.
4. **TABLET METHOD.** Tablet disinfection is best suited to short extensions (up to 3,500 feet) and smaller diameter mains (up to 12 inches). Because the preliminary flushing step must be eliminated, this method shall be used only when scrupulous cleanliness has been exercised. Tablet disinfection shall not be used if trench water or foreign material has entered the main during construction.
- a. **PLACEMENT OF TABLETS.** Tablets are placed in each section of pipe and also in hydrants, hydrant branches, and other appurtenances. They shall be attached by an adhesive, except for the tablets placed in hydrants and in the joints between the pipe sections. All the tablets within the main must be at the top of the main. If the tablets are fastened before the pipe section is placed in the trench, their position should be marked on the section to assure that there will be no rotation. In placing tablets in joints, they are crushed and placed on the inside annular space, or, if the type of assembly does not permit, they are rubbed like chalk on the butt ends of the sections to coat them with calcium hypochlorite.

*Number of 5 g Calcium Hypochlorite Tablets
Required for a dose of 25 mg/l (3.25 g chlorine/tablet)*

<i>Length of Pipe Joint</i>					
<i>Pipe Size</i>	<i>13'</i>	<i>18'</i>	<i>20'</i>	<i>30'</i>	<i>40'</i>
<i>4"</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>
<i>6"</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>2</i>
<i>8"</i>	<i>1</i>	<i>2</i>	<i>2</i>	<i>3</i>	<i>4</i>
<i>12"</i>	<i>3</i>	<i>4</i>	<i>4</i>	<i>6</i>	<i>7</i>

- b. **FILLING AND CONTACT.** When installation has been completed, the main shall be slowly filled with water, at a velocity of less than one-foot/second. This water shall remain in the pipe for at least 24 hours. If the water temperature is below 41° F, the water shall remain in the pipes for 48 hours.

E. FINAL FLUSHING

1. After the applicable retention period and confirmation residual testing, with a residual of not less than 10 mg/l, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than one mg/l. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline. Heavily chlorinated water is to be dechlorinated in accordance with AWWA C655 or Appendix D of KDHE's "Policies, General Considerations and Design Requirements for Public Water Supply Systems in

Kansas". Bacteriological testing shall be conducted on new water mains in accordance with AWWA C651 (Option A) following disinfection.

F. DISINFECTION AFTER CUTTING INTO OR REPAIRING EXISTING MAINS

1. The procedures outlined in this section apply primarily when mains are wholly or partially dewatered. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure present little danger of contamination and require no disinfection.
2. TRENCH "TREATMENT".
 - a. When an old line is opened, either by accident or by design, the excavation will likely be wet and badly contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.
3. MAIN DISINFECTION
 - a. SWABBING WITH HYPOCHLORITE SOLUTION.
 - i. The interior of all pipe and fittings used in making the repair (particularly couplings and tapping sleeves) shall be swabbed with a five percent (5%) hypochlorite solution before they are installed.
 - b. FLUSHING.
 - i. Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing from both directions is recommended. Flushing shall be started as soon as the repairs are completed and continued until discolored water is eliminated.
 - c. SLUG METHOD.
 - i. Where practicable, in addition to SWABBING WITH HYPOCHLORITE SOLUTION, a section of main in which the break is located shall be isolated all service connections shut off, and the section flushed and chlorinated as described in Section 4(b) above, except that the dose may be increased to as much as 500 mg/l, and the contact time reduced to as little as one-half hour. After chlorination, flushing shall be resumed and continued until discolored water is eliminated.
 - d. SAMPLING.
 - i. Bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures used can be determined. If the direction of flow is unknown, samples shall be taken according to AWWA C651 (Option A) on each side of the main break.

1.2 SEPARATION OF WATERMANS AND SEWERLINES/POLLUTION SOURCES

1. A minimum distance of 25 ft. (7.6m) shall be maintained between all potable water lines and all pollution sources, e.g., septic tanks, septic tank absorption fields, waste stabilization ponds, sewage contamination, wastewater, landfill leachate, and all CAFO facilities.

2. Under no circumstances shall a water line be extended through an area that is a real or potential source of contamination to the water line or water supply.
3. A minimum horizontal distance of 10 feet shall be maintained between parallel water and sewer lines. The laying of potable water lines and sanitary sewers shall be in separate trenches with undisturbed earth between them. If the 10 foot horizontal separation distance between a proposed waterline and sewerline cannot be maintained the engineer shall contact KDHE and additional protection shall be determined on a case by case basis. These provisions shall also apply to the separation of water lines and sanitary sewer manholes.
4. When a water pipe and a sanitary sewer cross and the sewer is 2 feet or more (clear space) below the water pipe, no special requirements or limitations are provided herein. At all other crossings, the sanitary sewer is to be constructed of one of the following materials (or approved equal) and pressure tested to assure water tightness pursuant to Chapter VI of the KDHE Minimum Standards of Design of Water Pollution Control Facilities:
5. Utilize PVC pipe conforming to ASTM D3034 with minimum wall thickness of SDR26, ASTM F679, or ASTM F794, with gasketed push-on joints in conformance with ASTM D3212. Joints in the sewer pipe shall be located as far as practical from the intersected water line.
6. Utilize ductile iron pipe Class 150 designed in accordance with ANSI/AWWA C150/A21.50 and manufactured in accordance with ANSI/AWWA C151/A21.51, with gasketed push-on joints or mechanical joints. Joints in the sewer pipe shall be located as far as practical from the intersected water line.
7. Where a water main is laid across or through an area where there is an existing sanitary sewer, which is not constructed of one of the above specified materials and is 2 feet or less below the water pipe, the existing sewer shall be encased in concrete with a minimum of 6 inch thickness for a 10 foot distance on each side of the crossing or the crossed section of sewer shall be replaced to meet the above requirements.
8. Under no condition will it be considered that encasement of the water main through an area of real or potential pollution would provide the protection needed to the water supply.
9. When pressure sewer lines (force mains) run parallel to water lines, the separation distance shall be as far as practical, maintaining a minimum horizontal separation distance of at least 10 ft. There shall be at least 2 ft. vertical separation at crossings with the water main always crossing above the sewer force main. These provisions shall also apply to the separation of water lines and pressure sewer line manholes and valves.
10. All separation distances are measured from edge of pipe to edge of pipe.

1.3 CERTIFICATION BY MANUFACTURER

1. When required by the Engineer, the Contractor shall furnish certification by the manufacturer of the pipe, fittings, valves, hydrants, and other appurtenances to be furnished on this project, certifying that the materials comply with the applicable specifications.
2. All pipe shall be clearly marked with type, class and/or thickness as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.

1.4 MEASUREMENT AND PAYMENT

A. GENERAL

1. Payment for work performed by the Contractor under this section of the Specifications will be made at the approved contract unit price for each of the items listed in the bid and measured as hereinafter specified. Such payment shall compensate the Contractor for all costs in connection with furnishing all labor, equipment and material required and performing the operations necessary to complete the items in accordance with the Contract Documents. All incidental work essential to completion of the project in a skillful manner, including cleanup and disposal of waste or surplus material, shall be accomplished by the Contractor at no additional cost to the City. Quantities listed in the bid are not guaranteed and are indicated only for convenience in comparing bids. Payment will be made for actual quantities constructed or installed as authorized by these Contract Documents; be they more or less than those listed; said quantities being measured and determined as follows.
2. Schedule all construction operations in order to ensure that the water supply, water treatment, and water distribution facilities are operating to maintain the required level of supply, treatment and distribution until final switch over to newly installed equipment is completed.
3. The existing water treatment processes shall remain in operation until new water system is completed, tested and approved by City and Engineer.
4. Any shutdown of operations to permit new construction or revisions shall be coordinated with and under the control of the City's operations personnel and Engineer.
5. Throughout project construction, coordinate the construction sequence with the Engineer and City. Coordinate any diversions from construction sequence.
6. Other construction sequence constraints may be necessary to follow the Kansas Department of Health and Environment (KDHE) requirements.
7. A minimum of 48 hours prior to making connections to existing systems which will interrupt services to the utility users, the Contractor shall notify the City's personnel and affected customers, stating the approximate time and duration of interruption of service and shall limit such interruption to a duration mutually agreeable to all parties.
8. Bypassing of untreated raw water through the proposed or existing system to the distribution system at any time shall not be allowed unless coordinated with City and Engineer.
9. Final grading, graveling, seeding, fencing, etc. shall be accomplished in a timely fashion.
10. Any construction around or through private access driveways shall be coordinated with homeowner/business, City and Engineer 48 hours prior to construction. Contractor must provide a means of access at all times.
11. No water utility user shall be without service for more than four (4) hours.
12. Testing and disinfection of all waterlines and equipment must be completed prior to initiating them into service.

B. WATERLINE

1. will be paid for at the contract unit price per linear foot installed and measured on the centerline of the pipeline installed (horizontal to existing grade—no additional length will be paid for required curvature of pipe) for the respective pipe size indicated on the Drawings. This item shall include all costs in connection with furnishing and installing all pipe, fittings, caps or plugs, reducers, clamps, sleeves, couplings, joint materials; restrained joints and special use fittings; seals; tracer wire; tracer wire access boxes; open trenching and over excavation of trench; stockpiling of topsoil; trench stabilization; dewatering as necessary; standard excavation; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing as required; fine grading and shaping trench bottoms; pipeline bedding; electronic monitoring; connecting to existing systems; thrust blocking or mechanical restraints; backfilling and compaction; coordinating with City on salvage or disposal of surplus and waste materials; providing fill dirt as necessary; flushing, disinfecting of the potable water mains; testing; grading; notification and coordination with adjacent landowners; borrow and disposal of soil as necessary; and all other incidental and appurtenant work required to complete this item. Water main fittings are to be considered subsidiary to “Waterline” payment.

C. VALVE ASSEMBLY

1. will be paid at the contract unit price for each unit constructed and installed in place. This item shall include all costs in connection with furnishing and installing valves, fittings, couplings, joint materials; restrained joints and special use fittings; seals; valve boxes, stem and barrel extensions; testing and adjusting the valve for proper operation; standard excavation; backfilling and compaction; stockpiling of topsoil; pit stabilization; dewatering as necessary; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; dewatering as necessary; shoring and bracing as required; fine grading; thrust blocking or mechanical restraints; backfilling and compaction; providing fill dirt as necessary; testing; removal and replacement of surfacing at valve location; concrete pad; and all other incidental and appurtenant work required to complete this item.

D. FIRE HYDRANT ASSEMBLY

1. will be paid for at the contract unit price for each such assembly installed. This item shall include all costs in connection with excavation required; discovery and protection of subsurface obstructions; removal and replacement of surface obstructions; furnishing and installing fire hydrant assembly; tee and pipe from main; fittings as necessary; auxiliary gate valve and valve box; blocking and porous drain; testing and adjusting hydrant for proper operation; grading; seeding; removal and replacement of sidewalk, paving, or gravel surfacing; and all other incidental and appurtenant work required to complete this item.

E. TAPPING SLEEVE, VALVE, AND VALVE BOX

1. will be paid at the contract unit price for each unit constructed and installed in place. This item shall include all costs in connection with furnishing and installing tapping sleeve and valves; cutting and tapping into existing waterline where applicable; fittings, couplings, joint materials; restrained joints and special use fittings; seals; valve box, stem, and barrel extensions; testing and adjusting the valve for proper operation; standard excavation; backfilling and compaction; stockpiling of topsoil; pit stabilization; dewatering as necessary; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; dewatering as necessary; shoring and bracing as required; fine grading; thrust blocking or mechanical restraints; backfilling and compaction; providing fill dirt as necessary; testing; removal and replacement of surfacing at valve location; concrete pad; and all other incidental and appurtenant work required to complete this item.

F. LINE STOP VALVE ASSEMBLY

1. will be paid for at the contract unit price for each line stop installed respective to the line stop size indicated on the Drawings. This item shall include all costs in connection with additional excavation and backfilling required; dewatering as necessary; discovery and protection of subsurface obstructions; removing and replacing surface obstructions; furnishing and installing line stop assembly; operation of line stop assembly as construction requires; removal of line stop assembly; coordination of line stop with other contracts; shoring and bracing as required; crushed rock; grading; removal and replacement of surfacing (any type); and all other incidental and appurtenant work required to complete this item. Contractor shall utilize existing valves if they can be located and are operable. Prior to installation each line stop location shall be coordinated and approved by City and Engineer.

G. CONNECTION TO SYSTEMS

1. will be paid for at the contract lump sum price. This item shall include all costs in connection with coordinating shutdown of existing/proposed system with City as necessary; open trenching and over-excavation of trench; stockpiling of topsoil; trench stabilization; dewatering as necessary; standard excavation and over-excavation; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing as required; fine grading and shaping trench bottoms; pipeline bedding; furnishing and installing all pipe, fittings, special use fittings; tapping sleeve and valve assembly; line stops/temporary isolations; testing and adjusting the valves for proper operation; caps or plugs; couplings; joint materials and restrained joints; crushed rock fill; concrete blocks; tracer wire; appurtenances necessary to connect to the existing/proposed water distribution system; concrete encasement as required; any removal and replacement of surfacing; curb and gutter replacement; valley gutter replacement; temporary surfacing (as necessary); thrust blocking; backfilling and compaction; grading; disposal of surplus and waste materials; grading; and all incidental and appurtenant work required to complete this item.

H. FLUSHING HYDRANT ASSEMBLY

1. will be paid for at the contract unit price for each such assembly installed. This item shall include all costs in connection with additional standard or over-excavation required; stockpiling of topsoil; standard and compacted backfill required; dewatering as necessary; discovery and protection of subsurface obstructions; removal and replacement of surface obstructions as necessary; furnishing and installing flushing hydrant assembly; storage; furnishing and installing new valves for all hydrant isolations; piping; saddles; fittings; furnishing and installing valve box and cover; grade adjustments as necessary; blocking and porous drain; testing and adjusting hydrant for proper operation; grading; removal and backfill of existing hydrants; abandonment of existing valves; and all other incidental and appurtenant work required to complete this item.

I. WATER SERVICE CONNECTION

1. will be paid for at the contract unit price for each such connection installed and counted in place. "Short Services" shall generally include all service connections located on the same side of the street as the new water main. "Long Services" shall generally include all service connections located on the opposite side of the street as the new water main. This item shall include all costs in connection with coordinating shutdown of existing system with City and homeowner as necessary; open trenching and over-excavation of trench; stockpiling of topsoil; trench stabilization; dewatering as necessary; standard excavation and over-excavation; backfill and compaction; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing as required; fine grading and shaping trench bottoms; pipeline bedding; furnishing and installing all pipe, fittings, service saddles; corporation stops; couplings, joint materials and restrained joints; connection to the proposed and existing service line; removal and replacement of surfacing or curb and gutter; concrete blocks; tracer wire; appurtenances necessary to connect to the existing water distribution system; concrete encasement as required; removal and replacement of existing surfacing as necessary; temporary surfacing (as necessary); thrust blocking; backfilling and compaction; grading; disposal of surplus and waste materials; and all incidental and appurtenant work required to complete this item including any tunneling, boring, or pushing of the service line. Abandonment of existing water service line shall be subsidiary to this item.

J. WATER SERVICE, METER SETTING

1. will be paid for at the contract unit price for each service setting installed and counted in place. This item shall include all costs in connection with coordinating shutdown of existing system with City and homeowner as necessary; stockpiling of topsoil; dewatering as necessary; standard excavation and over-excavation; backfill and compaction; discovery and protection of subsurface obstructions; shoring and bracing as required; placing a new meter pit in the location as designated by City; furnishing and installing all meter pits and lids; meter pit insulation; installing new meter yoke; pipe; couplings; valves;

curb stop; extensions; connection to proposed/existing service line; gravel; any additional removal and replacement of existing surfacing as necessary; testing; removal and disposal of existing meter pit material; backfill of any abandoned meter pits; matching surrounding surfacing of abandoned pits; and all other incidental and appurtenant work required to complete this item.

K. WATER METER VAULT

1. will be paid for at the contract lump sum price for the vault and appurtenances as indicated. This item shall include all costs in connection with furnishing and installing concrete structure, meter, valves, access hatch, bollards, handrail, steps, sample taps, couplings, and appurtenances; excavation and backfill required for installation; removing and replacing surface obstructions; discovery and protection of subsurface obstructions; grading; electrical; coordination with electrical utility; and all other incidental and appurtenant work required to complete this item.

L. METER RELOCATION

1. will be paid for at the contract unit price for each existing meter pit assembly (with appurtenances) relocation actually completed within project titled Part 2. This item includes standard excavation and over-excavation; dewatering as necessary; shoring and bracing as necessary; stockpiling of topsoil; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; grading; installing pipe, fittings, plugs, caps, and marking tape, and incidentals necessary to relocate the existing meter pit assembly out of the alignment of the proposed water main ; connection to existing water service lines; installation of bedding; standard and compacted backfill required; pavement (asphalt, concrete, or brick) or sidewalk removal and replacement; seeding; testing; coordination with start-up of the relocated water service meters and all other incidental and appurtenant work required to complete this item.

M. WATERLINE ABANDONMENT

1. will be paid for at the contract lump sum price. This item includes standard excavation and over-excavation; dewatering as necessary; shoring and bracing as necessary; stockpiling of topsoil; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; grading; installation of plugs, caps, and pipe removal; salvaging of materials; removal and replacement of sidewalk, paving, or gravel surfacing; and all other incidental and appurtenant work required to complete this item.

N. CONCRETE ENCASEMENT

1. each concrete encasement actually installed and counted in place. This item includes standard excavation and over-excavation; dewatering as necessary;

shoring and bracing as necessary; stockpiling of topsoil; tunneling under or removing and replacing surface obstructions; discovery and protection of subsurface obstructions; grading; installing concrete to the distances detailed on the Drawings; standard and compacted backfill required; pavement (asphalt, concrete, or brick) or sidewalk removal and replacement; and all other incidental and appurtenant work required to complete this item.

O. REMOVE AND REPLACE CONCRETE PAVEMENT

1. will be paid for at the contract unit price per linear foot, measured along the centerline of the pipeline installed. This item shall include all costs in connection with saw cutting existing pavement at the control joints of the existing concrete panels; removal of the entire existing panel and disposal of existing concrete surfacing and base course; standard excavation and over-excavation; stockpiling of topsoil; backfilling the removal area with suitable topsoil; discovery and protection of subsurface obstructions; grading; furnishing, hauling, placement, and curing of new concrete material; furnishing and placing reinforcement; aggregates; base material; fabric reinforcement where required; and all other incidental and appurtenant work required to complete this item. Curb and gutter removal and replacement shall be subsidiary to this item.

P. REMOVE AND REPLACE CONCRETE SIDEWALK

1. will be paid for at the contract unit price per linear foot, measured along the centerline of the pipeline installed. This item shall include all costs in connection with saw cutting existing sidewalk; removal and disposal of existing concrete surfacing; standard excavation and over-excavation; stockpiling of topsoil; backfilling the removal area with suitable topsoil; discovery and protection of subsurface obstructions; grading; furnishing, hauling, placement, and curing of new concrete material; furnishing and placing reinforcement; aggregates; base material; fabric reinforcement where required; and all other incidental and appurtenant work required to complete this item.

Q. REMOVE AND REPLACE ASPHALT PAVEMENT

1. will be paid for at the contract unit price per linear foot, measured along the centerline of the pipeline installed. This item shall include all costs in connection with saw cutting existing asphalt pavement; removal of the asphalt surfacing and disposal of existing surfacing and base course; standard excavation and over-excavation; stockpiling of topsoil; backfilling the removal area with suitable topsoil; discovery and protection of subsurface obstructions; grading; furnishing, hauling, and placement of new asphalt material; aggregates; base material; and all other incidental and appurtenant work required to complete this item. Curb and gutter removal and replacement shall be subsidiary to this item.

R. REMOVE AND REPLACE BRICK PAVEMENT

1. will be paid for at the contract unit price per linear foot, measured along the centerline of the pipeline installed. This item shall include all costs in connection with removal and stockpiling of existing brick pavers; saw cutting existing concrete base; removal and disposal of existing concrete sub-base; standard excavation and over-excavation; stockpiling of topsoil; backfilling the removal area with suitable topsoil; discovery and protection of subsurface obstructions; grading; furnishing, hauling, and placement, brick pavers; furnishing and placing reinforcement; aggregates; concrete sub-base material; fabric reinforcement where required; and all other incidental and appurtenant work required to complete this item.

S. AIR RELEASE ASSEMBLY

1. Air release assembly will be paid for at the contract unit price for each air release assembly installed. This item shall include all costs in connection with excavation, over excavation and backfill; compaction testing; dewatering as necessary; discovery and protection of subsurface obstructions; protection of surface obstructions; shoring and bracing as required; concrete; concrete reinforcement; concrete testing; manhole steps; manhole ring and cover; tap; corporation stop as required; piping and fittings; valves; air/vacuum valve insulation and jacket; bracing, marker post, and crushed rock fill; disposal of surplus and waste materials; and all incidental and appurtenant work required to complete this item. Subsidiary items include clearing and grubbing.

1.5 ACCEPTANCE OF WORK

- A. For all projects involving the City's water facilities, work shall not be formally accepted by the City until the Contractor provides the City with two (2) copies of as-built drawings in accordance with Section 10 (k) of the City's General Conditions. Actual field dimensions between fittings, valves, hydrants, and other appurtenances shall be documented on these drawings, to the satisfaction of the City of Garden City Water Department. In addition, dimensional ties will also be noted to physical aboveground features, which will locate the buried work.

Division of Environment
Curtis State Office Building
1000 SW Jackson St., Suite 400
Topeka, KS 66612-1367



Phone: 785-296-1535
Fax: 785-559-4264
www.kdheks.gov

Lee A. Norman, M.D., Secretary

Laura Kelly, Governor

February 24, 2020

MR. DOUG GOETZ
WILSON & COMPANY
P. O. BOX 1640, 1700 E. IRON AVE
SALINA, KS 67402-1640

Re: Standard Waterline Construction Specifications and Standard Details
Garden City, City of
PWS ID No's. Federal ID KS2005511 & State ID I7500
KDHE Project No. PW006955
Engineer Project No. 19-100-063-01

Reviewer Contact Information:

Phone: 785-296-5516

Email: dan.clair@ks.gov

Address: KDHE, BOW/PWS, CSOB, 1000 SW Jackson St., Suite 420, Topeka, KS 66612

Dear Mr. Goetz:

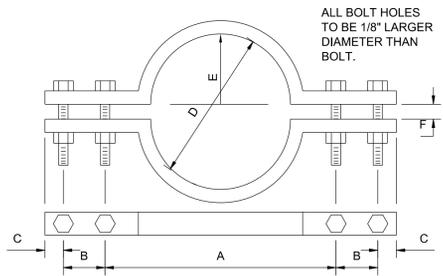
The revised set of standard waterline construction specifications and details for the referenced project have been reviewed and **are approved**. When submitting waterline projects on behalf of the City of Garden City that will follow these standard waterline construction specifications, it will not be necessary to submit a copy of these standard waterline construction specifications and details. However, please notify us in the cover letter used to transmit the waterline plans that you intend to use these standard waterline construction specifications and reference KDHE Project No. PW006955.

The review was primarily a functional drinking water engineering review to evaluate the project's conformance with KDHE's "Policies, General Considerations and Design Requirements for Public Water Supply Systems in Kansas," and other generally recognized drinking water design standards. The review did not cover items such as quality of material, structural soundness, and electrical and mechanical design features, unless noted in the review comments. Approval of the revised set of standard waterline construction specifications and details does not release the Public Water Supply System or its engineer from the responsibility that the design and construction of the completed project be in accordance with sound engineering practices and all applicable standards, be an operable facility and be in full compliance with all state and federal regulations. The submitted set of revised standard waterline construction specifications and details will be retained for our files.

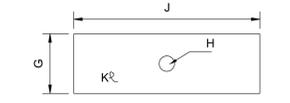
Please note that construction projects that will disturb one or more acres of land are required to secure, prior to the start of construction, authorization to discharge stormwater runoff under a construction stormwater general permit. Information regarding this authorization can be found on the Construction Stormwater Program web site: <http://www.kdheks.gov/stormwater>.

TIE ROD CLAMP DIMENSIONS		NOMINAL PIPE DIAMETER				
DIM.	CLAMP TYPE	4"	6"	8"	12"	16"
A	BELL	9.75	13.00	15.00	17.50	24.875
	BODY	7.50	9.50	12.75	16.625	21.875
B	BELL	3.50	4.00	4.75	4.625	4.50
	BODY	3.50	4.50	4.50	4.75	4.75
C	BELL	1.00	2.00	1.25	1.00	1.50
	BODY	1.00	2.00	1.50	1.25	1.50
D	BELL	6.75	10.25	12.25	14.50	19.75
	BODY	4.875	7.125	9.25	13.50	17.50
E	BELL	2.75	4.125	5.125	6.00	8.375
	BODY	1.8125	2.9375	4.00	5.50	7.50
F	BELL	1.25	2.00	2.00	2.50	3.00
	BODY	1.25	1.25	1.25	2.50	2.50
BOLT SIZES	BELL	3.0x0.5	3.5x0.5	4.5x0.5	4.5x.625	5.5x.625
	BODY	2.5x.375	3.5x0.5	4.0x0.5	4.5x.625	5.5x.625
BAR SIZE		1.5x0.50	2.0x0.5	2.5x0.5	2.5x.625	3.0x0.75

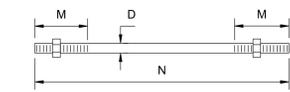
ALL DIMENSIONS ARE IN INCHES



TIE ROD CLAMP



WASHER DIMENSIONS			
G	H	J	K
WIDTH	HOLE DIA.	LENGTH	THICKNESS
3"	.875"	6.0"	.375"
3"	1.125"	7.0"	.500"

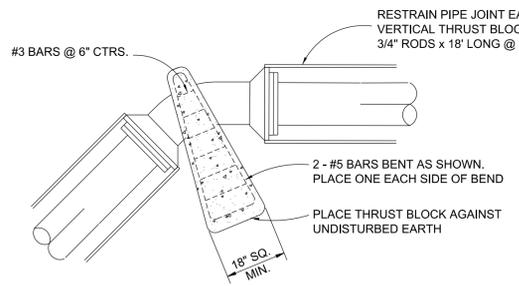


TIE-RODS

TIE-ROD DIMENSIONS		
D	M	N
ROD DIAMETER	THREAD LENGTH	ROD LENGTH
0.75"	6.00"	1'-11" & 20'
1.00"	6.00"	1'-11" & 20'

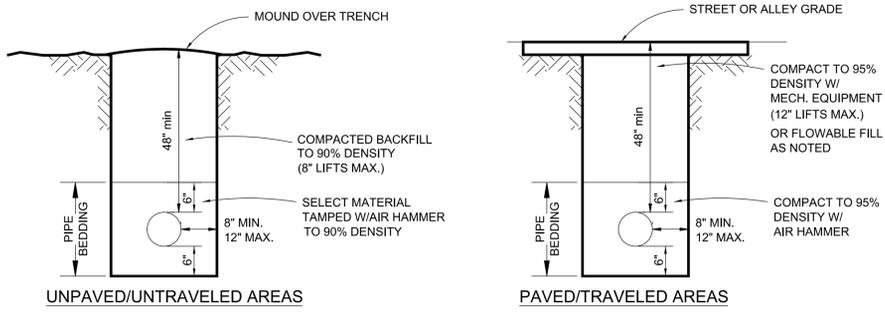
LENGTH OF TIED PIPE					
PIPE SIZE	TEE OR VALVE	PLUG OR 90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
4"	D	0.75	0.75	0.75	0.75
	L	6.00	6.00	2.00	1.00
	G	M.S.	M.S.	M.S.	M.S.
6"	D	0.75	0.75	0.75	0.75
	L	13.00	13.00	4.00	1.00
	G	M.S.	M.S.	M.S.	M.S.
8"	D	0.75	0.75	0.75	0.75
	L	22.00	22.00	6.00	2.00
	G	M.S.	M.S.	M.S.	M.S.
12"	D	0.75	0.75	0.75	0.75
	L	40.00	40.00	11.00	3.00
	G	M.S.	M.S.	M.S.	M.S.
16"	D	0.75	0.75	0.75	0.75
	L	60.00	60.00	18.00	5.00
	G	M.S.	M.S.	M.S.	M.S.

D = Diameter of tie rod
L = Length of tied pipe each way
G = Grade of steel of the rod
MS = Mild Steel, A-36
Nuts = A-307, Gr. A or B Hexagonal Heavy Series

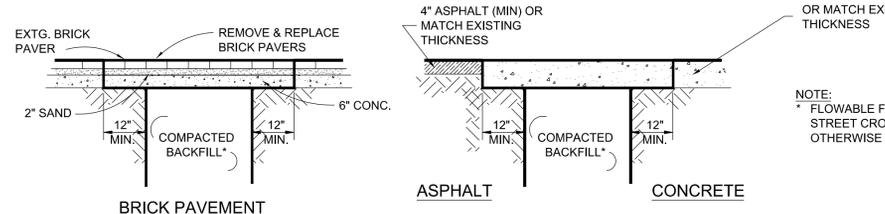


NOTE: RETAINER GLANDS WILL BE USED ON ALL VERTICAL BENDS

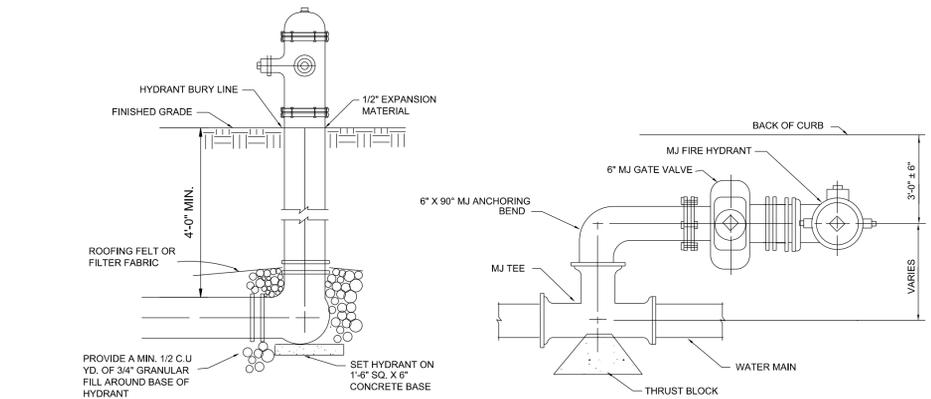
VERTICAL THRUST BLOCKS



TYPICAL TRENCH BACKFILL DETAILS

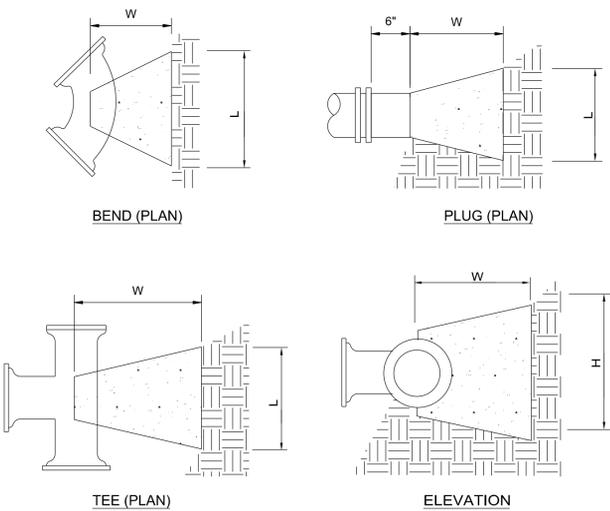


TYPICAL TRENCH PAVEMENT DETAILS



TYPICAL FIRE HYDRANT INSTALLATIONS

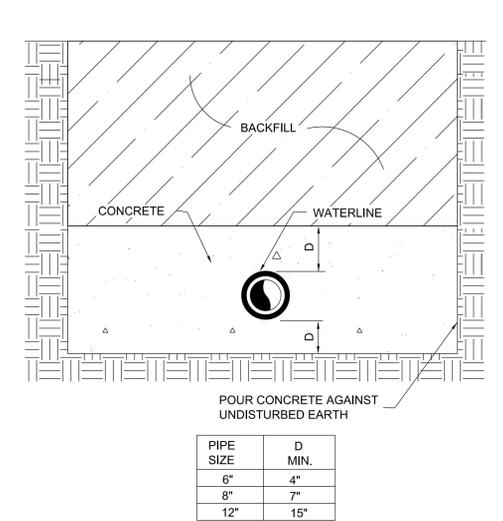
NOTE: AUXILIARY VALVE AND HYDRANT SHALL HAVE A FLANGE/FLANGE CONNECTION. IF FLANGE CONNECTION HYDRANT IS NOT AVAILABLE THEN MECHANICAL JOINT CONNECTIONS MAY BE USED PROVIDED THE PIPE STUB BETWEEN HYDRANT AND AUX. VALVE IS NO LONGER THAN 15". ALL HYDRANTS SHALL BE RESTRAINED W/PIPE TIES.



TYPICAL THRUST BLOCKING

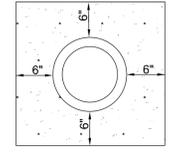
NOTE: TRACER WIRE (10 ga.) IS REQUIRED ON ALL PVC & PE WATERMAINS.

MINIMUM DIMENSIONS FOR THRUST BLOCKING							
FITTING	PIPE	LENGTH (L)	WIDTH (W)	HEIGHT (H)	FITTING	PIPE	LENGTH (L)
90° BEND	16"	10'-0"	4'-0"	4'-6"	11.25° BEND	16"	2'-6"
	12"	7'-6"	3'-0"	3'-6"		12"	1'-9"
	8"	5'-3"	2'-3"	3'-0"		8"	1'-3"
	6"	4'-0"	1'-6"	2'-3"		6"	1'-0"
45° BEND	16"	5'-0"	2'-6"	4'-6"	TEE	16"	6'-6"
	12"	4'-0"	2'-0"	3'-3"		12"	5'-3"
	8"	3'-6"	1'-9"	2'-6"		8"	3'-6"
	6"	2'-6"	1'-6"	2'-0"		6"	3'-0"
22.5° BEND	16"	3'-9"	2'-0"	3'-3"	PLUG	16"	6'-6"
	12"	2'-9"	1'-6"	2'-9"		12"	5'-3"
	8"	1'-9"	1'-6"	1'-9"		8"	3'-6"
	6"	1'-6"	1'-3"	1'-6"		6"	3'-0"



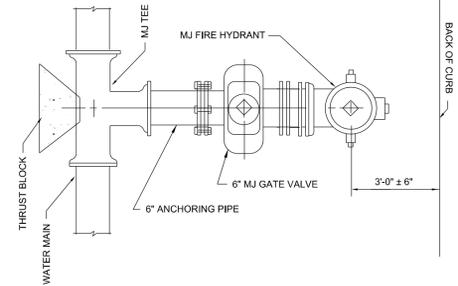
DEAD END ASSEMBLY

PIPE SIZE	D MIN.
6"	4"
8"	7"
12"	15"

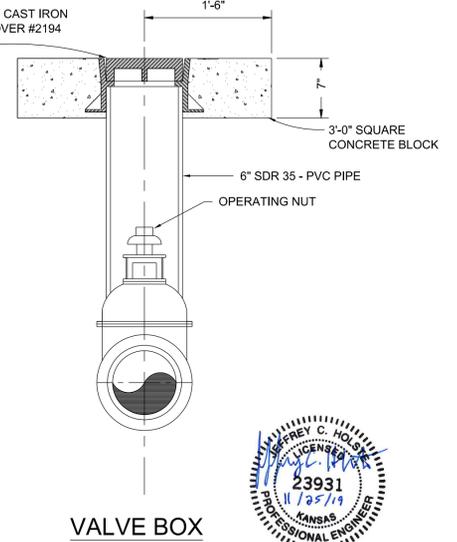


CONCRETE ENCASEMENT

NOTE: WHERE THERE IS LESS THAN TWO FEET OF CLEARANCE BETWEEN THE TOP OF THE SEWER LINE AND THE BOTTOM OF THE WATER PIPE, OR IF THE SEWER LINE CROSSES ABOVE THE WATER LINE, THE SEWER LINE SHALL BE ENCASED IN CONCRETE, PROVIDING A MINIMUM COVER OF SIX INCHES FOR A DISTANCE OF TEN FEET EACH SIDE OF THE WATER LINE



STRAIGHT INSTALLATION



VALVE BOX



City of Garden City, Kansas
Public Utilities Department
Water Division
106 S. 11th St., Garden City KS 67846

Engineering Department
City Administrative Center
301 N. 8th St.
Garden City KS 67846

Standard Details ~ Water System

City Engineer: Wilson & Company
Date: 10/02/2019
Scale: NONE

Revisions

Dr. By: JTA
Ck. By: DAG
Dr. No.: