

SECTION 8A

WATER

8A.1 DESCRIPTION

- A. General:** This work consists of furnishing and installing water mains, water service lines, and appurtenances. This includes all equipment, tools, materials, labor, and other incidentals to provide water mains and water service lines complete and ready for immediate and continuous use. The work includes all necessary excavation, backfilling, compaction, testing, clean up, and restoration required for a complete installation of water mains, water service lines, and appurtenances. **All connections to the City water system, directly or indirectly, need to be designed and constructed in accordance with City Criteria.**

Standard specifications for corrosion protection of metallic fittings, valves, hydrants and other miscellaneous metallic pieces associated with the installation of plastic pipe are provided in Section 8B Corrosion Protection – Plastic Pipe Systems. Specifications regarding tracer wire, coatings for metallic pieces, for fasteners and for field coating repairs are included in Section 8B Corrosion Protection – Plastic Pipe Systems.

B. Related Work:

Section 7	General Conditions
Section 8B	Corrosion Protection – Plastic Pipe Systems
Section 9	Sanitary Sewer
Section 11	Utility Excavation and Backfill
Section 18	Erosion Sediment and Water Pollution Control
Section 19	Incidental Work
Section 41	Utility Trench Resurfacing
Section 56	Class M6 Concrete for Curb and Gutter and Flatwork
Section 92	Temporary Traffic Control
Section 112	Select Granular Backfill
Section 200	Controlled Low Strength Material
Section 203	Submittals

- C. License and Permit Requirements:** Shall comply with Section 7 General Conditions.

Water main flushing activities shall be conducted in accordance with this Section and in accordance with the following additional requirements.

Water main flushing activities shall be conducted in compliance with the "General Surface Water Discharge Permit for Temporary Discharge Activities Under The South Dakota Surface Water Discharge System (SDG07000)". A copy of the permit is available through the South Dakota Department of Agriculture and Natural Resources

(SD DANR). The contractor is required to furnish the "Notice of Intent (NOI) To Obtain Coverage under the SWD General Permit for Temporary Discharge Activities and A Temporary Water Rights Use Permit" to SD DANR as required under the permit, obtain SD DANR authorization, and furnish a separate copy of the authorization to the respective owner and Public Works Director at the preconstruction conference.

The contractor is responsible for performing any self-monitoring activities including sampling, testing and reporting as may be determined to be required under the authorization. Payment for obtaining the necessary authorization to discharge, and for all compliance activities and obligations by the contractor shall be absorbed into the item to which it relates. No additional payment will be made.

D. Submittals: Shall comply with Section 203 Submittals

Submittals shall be required unless otherwise specified in the Construction Plans, Detailed Specifications or Special Provisions.

8A.2 MATERIALS

A. Compliance Requirements Between Section 8A Water and Section 8B Corrosion Protection - Plastic Pipe Systems: All materials specified within this specification shall meet the requirements of Section 8B Corrosion Protection - Plastic Pipe Systems. Materials referenced within specification Section 8A Water do not imply that the stock material item is in compliance with Section 8B Corrosion Protection - Plastic Pipe Systems. The supplier and Contractor are responsible for complying with specification Section 8A Water and Section 8B Corrosion Protection - Plastic Pipe Systems collectively.

B. Pipe: Water pipe shall be polyvinyl chloride (PVC) up to and including 24 inches in diameter, unless another water pipe material is pre-approved for use by the Public Works Director. Water pipe larger than 24-inches in diameter shall be ductile iron pipe or steel pipe unless indicated otherwise.

1. PVC Pressure Pipe, 4 Inches Through 24 Inches: Shall conform to the requirements of AWWA Specification C900, pipe thickness dimension ratio (DR) DR18 (235 psi pressure class) or DR14 (305 psi pressure class), cast iron outer diameter (CIOD) as designed and called for in the approved construction plans and meet one of the below standards. Installation procedures shall conform to AWWA C-605 standards.

a) PVC Bell and Spigot Pipe: PVC bell and spigot pipe shall have bell ends with elastomeric gaskets. Pipe joints shall use the Rieber joining system, which has the gasket formed into the pipe during the pipe manufacturing process. Every pipe and coupling shall pass the AWWA C900 hydrostatic proof test requirements.

Acceptable Products:

- NAPCO Pipe & Fittings, AWWA C900/IB PVC Pressure Pipe;

- JM Eagle, Blue Brute™ C900;
- Diamond Plastics, C900 or C900/Trans-21™;
- Northern pipe Products C-900;
- Or approved equal.

b) Restrained Joint Coupling PVC Pipe: Utilize non-metallic couplings with locking splines. High strength, flexible thermoplastic splines shall be inserted into mating, precision machined grooves in the pipe and coupling to provide full 360-degree restraint with evenly distributed loading. Couplings shall be designed for use at or above the pressure class of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the zero leakage test requirements of ASTM D 3139. Every pipe and coupling shall pass the AWWA C900 hydrostatic proof test requirements.

Acceptable Products:

- NAPCO Pipe & Fittings, LLC Certa-Lok™ C900/RJ;
- Or approved equal.

c) Restrained Joint Integral Bell (RJIB) PVC Pipe: Shall have integral bells with a non-corrosive joint restraint mechanism that is specifically designed and constructed to restrain the bell/spigot pipe joint. The joint restraint mechanism shall provide full 360 restraint with evenly distributed loading. Fluid-Tite™ profile shaped gaskets meeting the requirements of ASTM F477 shall be utilized. Every pipe shall pass the AWWA C900 hydrostatic proof test requirements.

Acceptable Products:

- NAPCO Pipe & Fittings, LLC Certa-Lok™ C900/RJIB;
- Or approved equal.

d) Restrained Joint Thermally-Fused PVC Pipe: Shall have been pre-approved for use by the Public Works Director and shall conform to the construction plans and detailed specifications prepared by the Engineer of Record. Pipe fusion process shall be in accordance with the Engineer as well as the manufacturer of the pipe. Pipe joints shall be designed to meet the zero leakage test requirements of ASTM D 3139. Fusion joints shall have met all the qualification requirements of AWWA C900. Fusible pipe shall comply with all AWWA C900 hydrostatic pressure integrity test requirements. All fusible pipe shall be marked in accordance with the requirements of AWWA C900 and the manufacturer's requirements. Unless otherwise specified, fusible PVC pipe lengths shall be assembled by means of thermal butt-fusion per the pipe supplier's written instructions.

Acceptable Products:

- Underground Solutions, Inc., Fusible PVC® Pipe;
- Or approved equal.

2. **Ductile Iron Pipe:** Shall have been pre-approved for use by the Public Works Director and shall conform to detailed specifications prepared by the Engineer of Record including cathodic protection requirements. Ductile iron pipe shall conform to the requirements of AWWA Specifications C150 and C151, Pressure Class 350 for 3 inches through 12 inches diameter, Pressure Class 250, or greater for 14 inches through 20 inches diameter, and Pressure Class 200, or greater for 24 inches and larger diameter, unless specified otherwise on the plans or Detailed Specifications. Ductile iron pipe shall be coated on the outside with a minimum bituminous coating thickness of 1-mil unless coating or thickness is otherwise specified within the contract documents. Ductile iron pipe shall be cement-mortar lined in accordance with AWWA C104. Linings shall be full thickness to the end of the spigot and to the seat of the bell, or shall be tapered for a length of not more than two inches.
 - a) Bituminous coating is not corrosion protection coating.
 - b) Rubber gasket joints for all Ductile Iron pipe shall meet the requirements of AWWA C111. Installation procedures shall conform to AWWA C600 Standards.
3. **Steel Pipe:** Shall have been pre-approved for use by the Public Works Director and shall conform to detailed specifications prepared by the Engineer of Record including cathodic protection requirements.
4. **Water Service Line Pipe:** Water service line pipe 1-inch minimum through 2-inch maximum diameter pipe size shall be:
 - a) **Type "K" Soft Copper Tubing:** Shall be US Government Type K Soft Tubing in minimum 60 - foot single or double pancake coils for 1 inch and 1 ½ inch diameter material. The minimum center coil diameter shall not be less than 16 inches. Tubing material for 2-inch material shall be supplied in 20 - foot lengths with ends of tubing to be cut off evenly. The use of 2-Inch coiled material requires prior approval by exception by the Public Works Director.
 - 1) **Tracer Wire:** Tracer wire is required to be connected via heavy duty cast bronze ground clamp to the customer side water service line in accordance with the Section 8B Corrosion Protection - Plastic Pipe Systems.
 - 2) **Tracer Wire Access Box:** Tracer wire access box is required in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems.
 - b) **High Density Polyethylene Pipe (HDPE):** HDPE shall conform to the applicable requirements of the current versions of AWWA C901, ASTM D2737, ASTM D2239, ASTM D3350, ASTM D4976, NSF 61, and shall meet the following:
 - 1) **Size:**

- I. 1-1/2-inch, and 2-inch Copper Tubing Size (CTS) pipe. 1-inch CTS HDPE pipe is no longer approved for buried water service line because the inner diameter is less than the inner diameter of 1-inch copper as specified.
- II. 1-inch, 1-1/2-inch, and 2-inch Iron Pipe Size (IPS) pipe. IPS pipe may be used provided all appurtenant water service line fittings including curb stops and corporation stops are appropriately sized for the use of IPS pipe.

2) Material:

- I. **CTS:** Polyethylene HDPE Standard Dimension Ratio (SDR) 9 for CTS pipe, PE4710, 250 psi water service line pipe.
- II. **IPS:** Polyethylene HDPE, Standard Inside Dimension Ratio, (SIDR) 7 for IPS pipe, PE4710, 250 psi water service line pipe.

3) Pipe Marking: Shall include the minimum of the following:

- I. **CTS:** HDPE, DR9, CTS, 250 psi, PE4710, AWWA C901, ASTM D2737, NSF61.
- II. **IPS:** HDPE, SIDR7, IPS, 250 psi, PE4710, AWWA C901, ASTM D2239, NSF61.

4) Color:

- I. **CTS:** Blue with white lettering.
- II. **IPS:** Blue with white lettering.

5) Stainless Steel Solid Sleeve Stiffener Inserts: Are required at all HDPE water service line connections whenever HDPE is inserted into a compression fitting. Stiffeners shall be appropriately sized for use of CTS and IPS. City shall inspect all HDPE pipe ends for presence of stiffeners prior to final installation in the appurtenance.

6) Tracer Wire: Is required in accordance with the Standard Specifications including Section 8B Corrosion Protection - Plastic Pipe Systems.

7) Tracer Wire Access Box: Is required in accordance with the Standard Specifications including Section 8B Corrosion Protection - Plastic Pipe Systems.

8) Bedding Material: Shall comply with Section 11 Utility Excavation and Backfill.

- 9) Certifications Manufacturer:** Shall certify that the materials used to manufacture HDPE Water service line meets the above requirements.

Acceptable Products:

- Centennial Plastics, CenCore;
- Cresline CE Blue®;
- JM Eagle Pure-Core;
- ADS Polyflex® Potable water service pipe;
- Or approved equal.

- 5. Water Service Pipe, Larger Than 2 Inches:** Shall meet the specifications for PVC water pipe or ductile iron pipe as specified for water pipes in this specification.

- C. Fittings:** Fitting types applicable to this specification include but are not limited to bends, crosses, tees, reducers/increasers, plugs, caps, couplings, sleeves, and clamps.

- 1. Ductile Iron Water Main Fittings:** Shall be ductile iron with 350-psi pressure rating and rubber gasket joints meeting all applicable requirements of the latest edition of AWWA C110, C111, and C153. Push-on joint fittings shall be furnished with restraining lugs. The lug pattern for all sizes shall accommodate gripper-type restrainers. All internal and external ferrous surfaces shall be coated per Section 8B Corrosion Protection - Plastic Pipe Systems. Unless specified otherwise in the plans or detailed specifications the following fitting joint shall be provided:

- a) Fittings 8 inches and smaller shall be push-on joint. If the fitting is required to be restrained per the construction plans, then the fitting may be mechanical joint.
- b) Fittings 10 inches and 12 inches shall be push-on joint or mechanical joint. If the fitting is going to be restrained then it shall be a mechanical joint.
- c) Fittings 14 inches and larger shall be mechanical joint.

- 2. PVC Water Main Fittings:** May be used in-lieu of ductile iron fittings for PVC pipe installations 12-inch and smaller. PVC fittings shall not be used for Ductile iron pipe or PVC pipe greater than 14-inch. PVC fittings shall meet all applicable requirements of the latest edition of AWWA C900 pipe thickness DR18 (235 psi pressure class) or DR14 (305 psi pressure class), CIOD and AWWA C907. Fitting DR shall correspond to the pipe DR. The PVC fitting bell ends shall have elastomeric gaskets. Installation procedures shall conform to AWWA C605 Standards.

- 3. Couplings:** Straight, transition, repair, and restrained couplings may be used as necessary. Type of coupling shall be in accordance with the pipe material being coupled, as designed and called for in the approved construction plans and in

accordance with the manufacturer's written instructions and shall be coated and cathodically protected in accordance with the Standard Specifications including Section 8B Corrosion Protection - Plastic Pipe Systems.

Acceptable Products:

- a) Romac Style 501 as manufactured by Romac Industries, Inc., shall have ductile iron center rings and end rings meeting ASTM A536-80, Grade 65-45-12. Center rings shall be epoxy coated. Gaskets shall be styrene-butadiene rubber (SBR) or Nitrile, both of which shall be compounded for water service. Materials shall be NSF/ANSI Standard 61 approved for water service.
 - b) Hymax®2 Cathodic or Hymax Grip® Cathodic Coupling as manufactured Krausz for various uses, shall be an epoxy coated sleeve type design meeting the requirements of AWWA C219-17. End rings shall be either one or two bolt design. Gaskets shall be multi-range ethylene-propylene diene monomer (EPDM) or Nitrile, both of which shall be compounded for water service. Coupling working pressure shall be a minimum of 230 psi. Materials shall be NSF/ANSI-Standard 61 approved for water service.
 - c) 421 Top Bolt by Smith-Blair, 422 Top Bolt as manufactured by Smith-Blair, shall be an epoxy coated sleeve type design meeting the requirements of AWWA C219-17. Gaskets shall be SBR or Nitrile, both of which shall be compounded for water service. Coupling working pressure shall be a minimum of 260 psi. Materials shall be NSF/ANSI-Standard 61 approved for water service.
 - d) NAPCO Pipe & Fittings, LLC Certa-Lok™ C900/RJ Restrained Joint PVC pipe shall use non-metallic couplings specifically designed by the manufacturer for use with their pipe. Couplings for 12-inch and larger pipe shall be a minimum 12 inches in length. Restrained couplings are reserved for use with corresponding restrained pipe or fitting.
 - e) Solid DI MJ sleeve coupling shall comply with the Ductile Iron Water main fittings product requirements of this section;
 - f) Or approved equal.
- 4. Tapping Sleeve:** Shall be stainless steel, flanged branch ends, with test plugs for pressure testing. The sleeve shall be approved for use at pressures equaling or exceeding those of the pipe classification being installed. Stainless steel tapping sleeves shall have a 300 Series stainless steel shell with SBR or Nitrile gaskets, both of which shall be compounded for water service, a stainless-steel flange, and shall have 304 stainless steel nuts, bolts, and washers. Materials shall be NSF/ANSI-Standard 61 approved for water service.

Acceptable Products:

- Romac SSTIII;

- Smith Blair model 665;
- Robar 6606BB;
- Ford style FTSS;
- PowerSeal 3490-AS/CS;
- Or approved equal.

5. **Foster Adapters:** Are acceptable for uses as called for in the construction plans and as approved by the manufacturer except between the fire hydrant and auxiliary valve and shall be NSF 61, fusion bonded epoxy coated.

Acceptable Products:

- INFACT Corporation (Epoxy Coated);
- Or approved equal.

6. **Repair Clamps:** For use on water service line abandonments up to 2 inches only and shall be stainless steel single or multiple section clamps as required for the repair. The clamps shall be approved for use at pressures equaling or exceeding those of the pipe classification being installed. The clamps shall be used for repair of tap holes in accordance with the manufacturer's requirements. Stainless steel repair clamps shall be 300 series stainless steel with SBR or Nitrile gaskets, both of which shall be compounded for water service and shall have 304 stainless steel nuts bolts and washers.

Acceptable Products:

- Romac SS1, SS3;
- Smith Blair 261;
- Robar 5616, 5626, 5636;
- Ford FS1;
- PowerSeal;
- Or approved equal.

- D. **Valves: General:** Valves 24 inches and smaller shall be gate valves. Valves 30 inches and larger shall be butterfly valves or gate valves as specified on the construction plans or detailed specifications. All internal and external ferrous surfaces shall be epoxy coated. Restraint accessories shall be factory installed. 24-inch and larger gate valves shall be positioned horizontally with 90-degree operator nuts. All valves shall meet applicable requirements as set forth in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems.

1. **Gate Valves:** Shall conform to the requirements of AWWA Standard C509 and C515 with a minimum 250-psi pressure rating and shall have a ductile iron-body and bonnet, be resilient seated, utilize mechanical joints including gaskets and bolts, and include all accessories. Gate valves shall have ductile iron wedge fully encapsulated with a SBR rubber or Nitrile elastomer coating. Stems shall be non-rising, one-piece cast, forged or rolled bronze. Valves shall have 2-inch ductile iron operating nuts and shall open left, counterclockwise. Bonnet bolts and nuts shall be Series 300 stainless steel and shall be rust proofed after threading and final

tightening. Gate valves utilizing the ALPHA™ restrained joint in lieu of a mechanical joint are acceptable for use with 4-inch to and including 12-inch resilient wedge valves. Restraint accessories shall be factory installed. Gate valves utilizing the ALPHA™ restrained joint shall meet all other requirements for gate valves as specified in this specification.

2. **Butterfly Valves:** Shall conform to the requirements of AWWA C504, Class 250B pressure rating for buried installation. Butterfly valve box body and disk shall be ductile iron ASTM A-536. Shaft shall be stainless steel. Seat shall be Buna-N, field replaceable without special tools and shall provide tight shutoff as required by AWWA C504. Mating surfaces shall be stainless steel. Bearings shall be self-lubricating, corrosion-resistant, and shall be designed for horizontal and/or vertical shaft loading. Shaft seals shall be designed for the use of bi-directional, self-adjusting packing, replaceable without removing the valve shaft.

Actuator shall be designed for buried service and shall be grease-packed, totally sealed. Actuator shall be equipped with a mechanical stop-limiting device to prevent over-travel of the valve disc in the open and closed positions. Actuator shall be sized in accordance with the needs of the valve being actuated and shall be equipped with 2-inch operating nut, which is hex-mated to the input stem and shall open by turning counterclockwise. Actuator shall be calibrated to close and seal completely prior to bury.

E. Valve Boxes:

1. **Valve Box for Gate Valves 12 Inches and Smaller and All Butterfly Valves:** Shall be a 2-piece screw-type construction with five and one-fourth (5 1/4) inches riser and shall be adjustable from four and one half (4 1/2) feet to 6-feet, with the top section to be at least 24 inches in length. Drop lids shall be marked "Water" and are to be of all-metal construction.

Acceptable Products:

- Tyler 6850-666-S series heavy duty valve box with adapter;
- Or approved equal.

2. **Valve box for Gate Valves 14-inch to and Including 24-inch:** Shall be a 2-piece screw-type construction with five and one-fourth (5 1/4) inches riser and shall be adjustable from three (3) feet to four and one half (4 1/2) feet, with the top section at least 24 inches in length. Drop lids shall be marked "Water" and are to be of all-metal construction.

Acceptable Products:

- Tyler 6860 Series heavy duty valve box with #6 base and adapter;
- Or approved equal.

3. **Valve Box Adaptor:** A valve box adaptor shall be installed on the valve bonnet prior to installing the valve box. The valve box adaptor eliminates shifting of the valve box, protects the coatings, centers the valve box, and seals the valve box

with a resilient material. The valve box adaptor shall be installed per the manufacturer's recommendations.

Acceptable Products:

- Valve Box Adaptor II as manufactured by Adaptor Inc., for valves 12 inches and smaller and all Butterfly valves, or approved equal.
- #6 Base Adapter as manufactured by Adaptor Inc. for Valves greater than 14 inches and greater, or approved equal.

F. Fire Hydrants: Shall meet AWWA C502 and shall have 6-inch mechanical joint inlets. Hydrants shall have 5 ¼-inch minimum valve openings, having O-ring packings and oil chamber to hold soft oil for stem thread lubrication, and shall have all operating parts, including valve seat, removable through the barrel. Barrel and upper standpipe shall be ductile iron with breaker flange and operating stem at ground level. A steel breakaway coupling shall be installed on the operating stem so that, in case of breakage, no damage will result to the fire hydrant other than safety breakers.

Fire Hydrants utilizing the ALPHA™ design hydrant inlet base are acceptable for use. Restraint accessories shall be factory installed. Fire Hydrants utilizing the ALPHA™ design hydrant inlet base shall meet all other requirements for fire hydrants as specified in this specification and in Section 8B Corrosion Protection - Plastic Pipe Systems.

All internal and external ferrous surfaces shall be epoxy coated.

All hydrants shall be capable of being extended in 6-inch increments. However, the minimum hydrant adjustment shall be 12 inches.

Hydrants shall be constructed so that they will close with the existing water pressure acting on the hydrant. Drain valves shall be bronze and shall be positively operated by the main operating rod. All threads shall be National Standard threads. Operating nuts shall be 1 ½ inches point-to-flat, pentagon (National Standard). Hydrants shall open left, counterclockwise. Fire Hydrants shall have an internal travel stop nut.

Hydrants shall have two, 2 ½-inch nozzles and one, 4 ½-inch steamer nozzle, all with National Standard threads. The minimum distance from the hydrant breaker flange to the centerline of the lower nozzle shall be 16 inches. Caps shall be nut type and shall be provided with chains. Hydrants shall be epoxy coated fire hydrant red.

All Fire Hydrants shall have a minimum bury depth of 6 ft from the ground line to the top of connecting pipe (6 ½-foot distance from ground line to connecting pipe invert). All fire hydrants shall have a maximum bury depth of 8 ft from the ground line to the top of connecting pipe (8 ½-foot distance from ground line to the connecting pipe invert) to facilitate their installation per the grades and lines shown on the construction plans. Vertical adjustments along the hydrant lead shall be accomplished using vertical bends (45-degree, 22½-degree, or 11¼-degree).

The use of a Fire Hydrant Extension will not be an acceptable method of adjustment

for a new fire hydrant, provided the necessary information was communicated on the construction plans. If this information was communicated, and the hydrant requires adjustment for final grade, then the Contractor shall replace the fire hydrant with a new fire hydrant with the correct barrel length or install the appropriate vertical bends on the hydrant lead.

In cases where a fire hydrant extension will be installed, the Contractor shall furnish the appropriate extension and notify the City Utility Maintenance Department for installation. City crews shall install all fire hydrant extensions.

Acceptable Products:

- Mueller A-423;
- American Darling B-84-B-5;
- American AVK Series 27;
- Waterous Pacer, traffic model.

G. Water Service Line Valves and Fittings: Shall meet AWWA Standard C800. If HDPE water service line pipe material is being utilized, Contractor shall ensure that the appropriately sized appurtenances (curb stops, corporation stops, valves, fittings, etc.) are provided for the service line size (CTS or IPS) being installed. Water service line transition couplings from CTS to IPS shall not be used unless directly connected to the appurtenant fitting. Plastic HDPE valves and fittings are not allowed.

1. Water Service Line Copper Splicing Couplings: Shall be flared or compression style in CTS or IPS. Soldered joints shall not be used for water service lines installed underground. For new installations (not repairs) 1-inch through 1½-inch water service lines shall avoid the use of couplings except as required at fittings.

Acceptable Products:

- Mueller 110 Conductive Compression;
- Hayes-Tite;
- Or approved equal.

2. HDPE Transition and Repair Couplings: Shall be compression by compression style in CTS or IPS.

3. Curb Stop Valves: Shall be a ball valve type with a 300-psig working pressure rating. A double O-ring port seal shall be provided in the stem and the O-rings shall be supported in precision-machined grooves. The end pieces shall be O-ring sealed to provide additional protection against leaking. 90-degree valve operation, with internal movement restraint, is required. Drains are not permitted on valves. Buffalo type valve boxes are required and therefore the Minneapolis Pattern threads on the valve are not a requirement. All Curb stops that are connected to copper water service lines shall incorporate isolators per Section 8B Corrosion Protection - Plastic Pipe Systems.

Acceptable Products:

- Mueller 300 Curb Ball Valve with Mueller 110 Conductive Compression Connection (CTS or IPS);
 - Y. McDonald Minneapolis Pattern Ball Valves - 300 PSIG Water;
 - Ford B44 Series;
 - Or approved equal.
- 4. Corporation Stops:** Shall be ball valve type with a 300 pound per square inch (psi) working pressure rating. The inlet shall have a taper thread (AWWA Standard) and the outlet shall be a conductive compression connection. Corporation stops that are used to connect copper water services to metallic water mains shall be insulated per Section 8B Corrosion Protection - Plastic Pipe Systems.

Acceptable Products:

- Mueller 300 Corporation Ball Valve with Mueller 110 Conductive Compression Connection (CTS or IPS);
 - Y. McDonald Ball Valves - 300 PSIG Water with A.Y. McDonald McQuick Compression-Q Series;
 - Ford FB1000 Series;
 - Or approved equal.
- 5. Service Saddles:** For 1-inch through 2-inch water service pipe shall utilize a wide band/strap with a minimum of 2 bolts and nuts, per width of the band/strap, for securing the band/strap to the main. The saddle shall provide full support around the circumference of the pipe. Nuts and bolts shall be rolled thread stainless steel or silicone bronze. Gaskets shall be SBR, EPDM, or Nitrile compounded for water service. It shall be the Contractor's responsibility to ensure that saddles and corporation stops are compatible with the pipe on which they are to be installed. If a compatibility question arises, the Contractor shall inform the Engineer immediately.
- a) Saddles for 6-inch to 12-inch Mains:** Shall utilize a stainless steel, cast brass per ASTM B62, or bronze body. Stainless steel saddles shall be cathodically protected in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems. Cast brass or bronze saddles, including those which have stainless steel straps, shall be protected by being wrapped with petrolatum system coating in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems. Saddles shall be pre-sized if required or recommended by the saddle or pipe manufacturer. Pre-sized saddles will conform to the pipe outer diameter (O.D.) without placing undue stress on the PVC pipe. Not all of the following indicated saddles are pre-sized and it is the responsibility of the Contractor and supplier to ensure that the saddle is pre-sized if required or recommended by the saddle or pipe supplier.

Acceptable Products for Saddles for 6-inch to 12-inch Water Mains Shall Be:

1-inch Service Taps: Provide a minimum total band/strap width of 2 inches

along the axis of the pipe. Saddles for 1-inch taps on 6-inch to 12-inch mains shall be:

- Ford Style FS313, FS323;
- Romac Style 306, Style and 202BS with stainless steel straps;
- A.Y. McDonald Model 3845;
- Mueller BR2W series with double studs;
- Or approved equal.

1½-inch and 2-inch Service Taps: Provide a minimum total band/strap width of 3¼ inches along the axis of the pipe. Saddles for 1½-inch and 2-inch taps on 6-inch to 12-inch pipe shall be:

- Ford Style FS313, FS323;
- Romac Style 306, Style and 202BS with stainless steel straps;
- A. Y. McDonald Model 3845;
- Mueller BR2W series with double studs;
- Or approved equal.

- b) Saddles for 14-inch and Larger Water Mains:** Saddles for 14-inch and larger water mains shall utilize cast brass per ASTM B62 or bronze, stainless steel, or a high strength ductile iron body with a minimum 12 mils of fusion applied epoxy or Nylon 11 coating and a stainless steel band. Stainless steel and ductile iron saddles with stainless steel straps shall be cathodically protected in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems. Cast brass or bronze saddles, including those which have stainless steel straps shall be protected by being wrapped with petrolatum system coating in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems. Saddles shall be pre-sized if required or recommended by the saddle or pipe manufacturer. Pre-sized saddles will conform to the pipe outer O.D. without placing undue stress on the PVC pipe. Not all of the following indicated saddles are pre-sized and it is the responsibility of the Contractor and manufacturer to ensure that the saddle is pre-sized if required or recommended by the saddle or pipe supplier.

Acceptable Products for Saddles for 14-inch and larger water mains shall be:

1-inch Service Taps: Provide a minimum total band/strap width of 2 inches along the axis of the pipe. Saddles for 1-inch taps on 14-inch and larger pipe shall be:

- Ford Style FS323, FS333, and FC202;
- Romac Style 202B, 202BS, and 202NS;
- Mueller BR2S, BR2W, and DR2S with SS straps;
- Or approved equal.

1½-inch and 2-inch Service Taps: Provide a minimum total band/strap width of 3 inches along the axis of the pipe. Saddles for 1½-inch and 2-inch taps on 14-inch and larger pipe shall be:

- Ford Style FS323, FS333, and FC202;

- Romac Style 202B and 202BS, 202NS;
- Mueller BR2S, BR2W, and DR2S with SS straps;
- Or approved equal.

c) Curb Boxes: Shall be cast-iron. The box shall be capable of telescoping at a minimum, from 5 feet to a length of 6 feet. Lid shall be marked "water" and have a 13/16 inches (point to flat) pentagon brass nut. Risers shall be a minimum of 2 ½ inches in diameter.

Acceptable Products:

- Tyler 6500 Series, Buffalo Type;
- Or approved Equal.

d) Tapping Sleeves and Valve: Shall be used for water service lines 4-inch and larger and shall comply with the requirements of this specification.

H. Concrete Thrust Blocks: Shall be M-6 concrete as specified in Section 56 of the Standard Specifications. For fittings and joint restraining devices which utilize thrust blocks, incorporate an 8-mil thickness of polyethylene meeting AWWA C105 as a bond breaker. Joint tape for polyethylene shall be 3M Scotchwrap 50, or approved equal.

I. Joint Restraining Devices:

1. Joint Restraint Devices at Fittings: Shall be as follows:

a) Push-On (Ductile Iron Pipe to Ductile Iron Push-on Fitting) Acceptable Products:

- 1) EBAA Series 15PF00TD Tru-Dual®, (Split Ring);
- 2) Or approved equal.

b) Mechanical Joint (Ductile Iron Pipe to Ductile Iron Mechanical Joint fitting) Acceptable Products:

- 1) EBAA Series 1100 MEGALUG®, (Solid Ring), or approved equal.
- 2) EBAA series 1100SD Split MEGALUG®, (Split Ring) (use only for connection to existing ductile iron pipe), or approved equal.

c) Push-On (PVC Pipe to Ductile Iron Push-on Fittings) Acceptable Products:

- 1) EBAA Series 15PF00, (Split Ring);
- 2) Or approved equal.

d) Mechanical Joint (PVC Pipe to Ductile Iron Mechanical Joint Fittings)

Acceptable Products:

- 1) EBAA Series 2000PV MEGALUG®, (Solid Ring), or approved equal.
- 2) EBAA Series 2000SV MEGALUG® Split Restraint, (Split Ring), (use only for connecting to existing PVC pipe), or approved equal.

e) Push-on (PVC Pipe to PVC Push-on Fittings) Acceptable Products:

- 1) EBAA Series 2500 Restraint Harness for C900 PVC Fittings, (Split Ring);
- 2) Or approved equal.

2. Joint Restraint Devices at Pipe Bells: Also referred to as bell restraints, shall be as follows:**a) For Ductile Iron Pipe Acceptable Products:**

- 1) EBAA Series 1700 MEGALUG® Harness, (Solid Ring/ Split Ring) or approved equal.
- 2) In lieu of bell restraint devices, push on joints with the American Fastite Joint system with Fast Grip Gasket, or approved equal may be used when approved by the Engineer.

b) For PVC Pipe 4" to 12" Acceptable Products:

- 1) EBAA Series 1600 Split Serrated Restraint harness, (Split Rings);
- 2) Or approved equal.

c) For PVC pipe 14" to 30" Acceptable Products:

- 1) EBAA Series 2800 MEGALUG® Restraint Harness, (Solid Ring);
- 2) Or approved equal.

J. Insulation: Shall comply with Section 11 Utility Excavation and Backfill.**K. Temporary Water Service/Water Main Bypass Pipe:** And associated appurtenances that may come into contact with water shall meet the requirements of NSF/ANSI Standard 61: Drinking Water System Components-Health Effects and NSF/ANSI 372.

All PVC piping systems shall be manufactured in conformance with the most current edition of AWWA C900-16 Standards and shall meet NSF/ANSI Standard 61: Drinking Water System Components-Health Effects and NSF/ANSI 372.

L. Air Release Valves: Shall be as specified by the Engineer of Record.

8A.3 Construction Requirements

A. Materials Handling and Storage: The Contractor shall be responsible for the safe handling and storage of all materials furnished by them and shall replace, at their expense, all such materials found defective in manufacture or damaged in transportation, handling, or storage. Pipe, fittings, and accessories shall be loaded and unloaded by lifting with hoists or palletized to avoid shock or damage. Under no circumstances shall such materials be dropped. All material shall be stored in a neat and orderly manner.

Pipe shall be stored, to the greatest extent possible, in unit packages or bundles and shall be handled to prevent stress to bell joints and prevent damage to bevel ends. In addition, materials shall be handled and stored in accordance with manufacturer's recommendations.

The Contractor shall cover all PVC pipe and fittings in accordance with manufacturer recommendations. In the absence of manufacturer recommendations to cover, PVC pipe and fittings shall be stored to minimize direct rays of sun and UV exposure. This may be accomplished with a minimum of a light opaque material covering the pipe. The covering shall be positioned to allow adequate ventilation to prevent heat buildup. The submittal for this material shall identify the proposed method of storage. Pipe material that shows signs of UV impact including impacts such as chalking, faded colors will be removed from use on the project.

If, in the opinion of the Engineer, damage or defects to the factory applied external coatings on steel or ductile iron pipe and fittings (including fire hydrants) cannot be repaired, then the Contractor shall replace the damaged items with new materials. If in the opinion of the Engineer damage or defects to the factory applied external coatings on steel or ductile iron pipe and fittings (including fire hydrants) can be repaired, then the Contractor shall make repairs to damaged coating per Section 8B – Corrosion Protection – Plastic Pipe Systems.

B. Alignment and Grade: Pipe shall be laid true to the line and grade established on the construction plans. Where the construction plans indicate that the finished ground surface elevations are to be modified from the existing elevations by current or future construction, the Contractor shall exercise care to ensure that pipe, fittings, hydrants, valves and valve boxes are placed to the elevations indicated on the plans. Tolerances shall be within 0.5 feet for alignment and within 0.2-feet of the specified grade.

C. Underground Obstructions: The Contractor shall expose existing underground obstructions shown on the plans or located in the field and shall determine their elevations far enough in advance of pipe laying that the proposed water main can be installed without the use of fittings at or near the points of crossing. Wherever obstructions not shown on the plans are encountered during the progress of the work and interfere with the proposed horizontal or vertical alignment of the pipeline, the Engineer will change the plans and order a deviation in the line and/or grade, or may

arrange for the removal or relocation of the obstructions. The Contractor shall not deviate from plan line or grade without the Engineer's approval.

- D. Contaminated Materials:** If contaminated materials are encountered as defined in Section 11 "Unsuitable Backfill Material Excavation", Contractor shall immediately contact the Engineer of Record to confirm suitability of pipe materials and appurtenances.
- E. Water Main and Sewer Main/Storm Sewer Separation:** Shall comply with Section 11 Utility Excavation and Backfill.

F. Installation:

1. **Trenching:** Shall comply with Section 11, Utility Excavation and Backfill for Trenching Requirements.
2. **Minimum Cover:** Depth from top of pipe to finished grade shall be as follows:

Size of Pipe (In.)	Minimum Cover (Ft.)
12 or less	6
14 to 18	5 ½
20 or larger	5

In the event adequate cover cannot be achieved by alignment or grade adjustment, then, with prior approval of the Public Works Director, the water pipe may be insulated. Insulation shall comply with Section 11 and the Insulation Standard Detail in cases where minimum cover cannot be provided. Insulation may also be required if adequate separation between a storm sewer or culvert and the water pipe cannot be achieved.

3. **Cleaning:** Shall be done as necessary so that the interior of all water pipe and fittings is free from all dirt, concrete, or other foreign material before installation.
4. **Pipe Cutting:** Shall be done without damage to the pipe with saw or abrasive wheel and shall be smooth, straight, and at right angles to the pipe axis. Ends of pipe shall be dressed and beveled to remove roughness and sharp corners.
5. **Laying and Joining of Pipe:** Shall be in accordance with AWWA C900, AWWA C605, and with the pipe manufacturer's instructions, unless specifically required otherwise by these specifications. Laying and joining of ductile iron pipe shall be in accordance with AWWA C600, Installation of Ductile-Iron Water Mains and their Appurtenances, and with the pipe manufacturer's instructions, unless specifically required otherwise by these Specifications.

In most applications, pipe shall be laid with bell ends facing in the direction of laying. Each pipe length shall be inspected for defects prior to being lowered into the trench. All pipe and fittings shall be carefully lowered into the trench piece by

piece by means of pipe slings to prevent damage to the pipe and/or coating. Full lengths of pipe shall be installed except where connecting to appurtenances and fittings. The Contractor shall leave an appurtenance or fitting with a full length of pipe whenever possible.

Water main pipe shall not be installed in frozen ground or in water, and no water shall be allowed to run into or through the pipe.

During the course of construction, a water tight plug shall be kept in the end of the pipe so as to prevent any dirt and or water from entering during the progress of the work at all times. Any dirt, loose material or cement mortar, which may accumulate in the pipe, shall be removed as the work progresses.

- a) **Push-on Joints:** The spigot end of field-cut piping shall be cut square and then beveled. Joint surfaces shall be cleaned and lubricated immediately before completing the joint.
 - b) **Certa-Lok C900/RJ Coupling:** Certa-Lok C900/RJ grooved end pipe shall be inserted into Certa-Lok C900/RJ couplings only. Only insert plain-end pipe into Certa-Lok C900/RJ couplings outside of the restrained "L" length for the pipe system or utilize thrust blocking or other approved joint restraint devices.
 - c) **Restrained Joint Integral Bell (RJIB) PVC Pipe Joints:** The pipe end shall be cut off to remove the groove and the pipe end shall be beveled when connecting RJIB PVC pipe to connections including fittings, couplings, or mechanical joint bells.
 - d) **Mechanical Joints:** Joints shall not be over-tightened; if an effective seal is not obtained the joint shall be disassembled, cleaned thoroughly and reassembled. Where joint restraint devices are used with a mechanical joint, the holes shall be carefully aligned to permit installation of harness bolts. At mechanical joints, a beveled PVC spigot may not be used. Rather a non-beveled spigot shall be used for insertion into mechanical joint.
6. **Protection of the Work:** Whenever pipe laying operations are stopped temporarily during the work day or at the end of the work day, the contractor shall plug, with a water tight plug, all open ends, to prevent soil, water, or other matter from entering the pipe.
7. **Pipe Deflection:** Deflection or bending of the pipe or deflection of the pipe joint (bell and spigot) shall not be permitted except as approved by the Engineer. Changes in horizontal and vertical direction shall be achieved using standard fittings, fabricated fittings, and Couplings specifically designed and approved for use in joint deflection.

The Engineer may approve deflection of 12-inch diameter or smaller pipe or pipe joints if the Engineer of Record specifically designed for the deflection and the deflection is approved in writing by the pipe manufacturer specifically for the

project. A condition of approval is the City of Rapid City receiving a letter from the pipe manufacturer stating they have reviewed the proposed pipe or pipe joint deflections for (state the project name and City tracking number) and they approve and warranty the pipe for the proposed deflections. Deflection of pipe or pipe joints for diameters greater than 12 inch is strictly prohibited.

Restrained joint pipe and couplings may be deflected in accordance with the manufacturer's written recommendations. The Engineer of Record shall specifically indicate the use of restrained joint pipe and indicate the designed deflections on the construction plans.

- 8. Fittings:** Bends and tees shall be placed on a stable foundation, which may require the use of concrete pads of equal size or larger than specified for valves. Fittings shall be provided with thrust blocks, as specified herein.
- 9. Couplings:** Shall be placed on a stable foundation, which may require the use of concrete pads of equal size or larger than specified for valves. Couplings shall be approved by the pipe manufacturer for the use with the pipe and shall be installed according to the coupling manufacturer's recommendations.
- 10. Thrust Blocks:** Concrete thrust blocks are required at the locations indicated in the specifications unless there is an exception not to use them. If restrained joint pipe is being used, thrust blocks are still required at the locations indicated in the specifications unless there is an exception not to use them. Thrust blocks and joint restraints as redundant systems are not a requirement of the specification unless the construction plans call for redundant systems. Concrete thrust blocks shall be provided at tees, crosses, horizontal bends, plugs, caps, and fire hydrants, whether specifically indicated on the construction plans or not. Refer to the subsection "Joint Restraining Device Installations" for fittings that allow the use of joint restraints in-lieu of concrete thrust blocks.

Concrete thrust blocks shall have a thickness at the fitting equal to at least half the diameter of the pipe being installed but shall not be less than six (6) inches thick under any circumstances. They shall extend from the fitting to the undisturbed wall of the excavation. The Contractor shall insure that the concrete does not cover or render inoperable nuts or bolts on the fittings. All metal fittings, valves, or appurtenances shall have a polyethylene bond breaker (separation barrier) between the fitting and the concrete.

Concrete Thrust blocks shall be allowed to cure for 48 hours prior to activating the water main. If the water main needs to be activated prior to the concrete curing (48 hours), then the water main shall be restrained using joint restraining devices. Under this circumstance, the thrust block is still required and the cost of furnishing and installing the joint restraint device is incidental. If the water main needs to be activated prior to the concrete curing (48 hours) and joint restraints are applied, then thrust blocks shall be allowed to cure for a minimum of 4 hours prior to

backfilling.

Thrust Blocks shall be installed as shown on the construction plans and shall meet or exceed the minimum volume or bearing area requirements as specified on the construction plans or specifications for the water pressures and soil conditions.

In muck, peat, or similar weak soils, thrust loads shall be restrained by using joint restraining devices and thrust blocks, or by removal of the soil and replacement with a material of sufficient stability to resist thrust loads as determined by the Engineer.

11. Joint Restraining Device Installations: Shall be installed per the manufacturer's recommendations and for the appropriate water pressures and soil conditions as shown on the construction plans and/or described in the Detailed Specifications. Refer to Section 7 for the definition of "L" length for Joint restraining devices. Joint Restraining Devices shall be used at the following locations:

- a) All Valves and pipe joints within their corresponding "L" lengths shall be restrained with joint restraining devices;
- b) All Reducers/Increases and their corresponding "L" lengths shall be restrained with joint restraining devices;
- c) All Vertical Bends and pipe joints within their corresponding "L" lengths shall be restrained with joint restraining devices; and
- d) All Water Main Lowering and pipe joints shall be restrained. Water main lowering restraint shall include restraining all joints within the fitting's corresponding "L" length plus restraining all pipe joints which lie between the start of the lowering and the end of the lowering, regardless of whether or not the pipe joint is located within the fitting's "L" length.

12. Insulation: Shall comply with Section 11 Utility Excavation and Backfill.

13. Fire Hydrants and Auxiliary Valves: Fire Hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the street, with the pumper nozzle facing the street. At intersections, the pumper nozzle shall face the higher classification street. Hydrants shall be set with the bottom of the breaker flange 2 inches above the finished ground elevation as shown on the Standard Details, resulting in the centerline of the lowest nozzle being at least 18 inches above finished grade. In no case shall hydrants be set closer than 4-feet from curb or edge of pavement, measured from outside of hydrant barrel to back of curb or edge of pavement. In no case shall hydrants be set closer than 1-foot from the edge of a sidewalk, measured from outside of hydrant barrel to edge of sidewalk.

The Contractor shall set each fire hydrant on an 8-inch by 16-inch precast concrete pad with a 4-inch thickness and shall place a minimum of 1/3 cubic yard of Type 1 Bedding Material around the lower part of the hydrant to at least 6 inches above

the drain port to provide a drainage area for the hydrant barrel. The Contractor shall insure that the drain port at the base of the hydrant is open to allow for the hydrant to drain properly when closed. Cast in place concrete may be used in lieu of the pre-cast pad if the hydrant lead is not charged for at least 48 hours, the drainage ports are maintained and 4 hours cure time is allowed before backfilling. An appropriately sized thrust block shall be installed between the hydrant and the undisturbed trench wall. The thrust block shall meet the thrust block requirements on the construction plans and herein.

An auxiliary valve matching the size of the fire hydrant lead and a valve box shall be installed on the fire hydrant lead. Auxiliary valves shall be installed as detailed on the standard detail and shall be placed on an 8-inch by 16-inch precast concrete pad with a 4-inch thickness, and shall be fitted with a joint restraining device as approved by the Engineer. Cast in place concrete may be used in lieu of the pre-cast pad if the hydrant and hydrant lead are not charged for 48 hours, and 4 hours cure time is allowed before backfilling. If the auxiliary valve needs to be moved away from the fire hydrant to avoid a conflict it may be moved up to 7 feet away from the hydrant.

Tracer wire conduit shall be attached to the fire hydrant barrel section prior to backfill. The tracer wire access box may be installed after initial backfill. Refer to Section 8B – Corrosion Protection for Plastic Pipe Systems for tracer wire installation requirements.

In cases where a fire hydrant needs to be rotated or an extension needs to be installed, City Utility maintenance staff shall perform the work. Refer to Section 8A.2. "Materials" for further information regarding the use of hydrant extensions.

- 14. Valves:** Valve interiors and adjacent piping shall be cleaned of foreign material prior to making valve to pipe connection. Pipe/valve joints shall be straight and without deflection. All valves shall be placed on an 8-inch by 16-inch precast concrete pad with a 4-inch thickness, and centered on the valve. Cast in place concrete may be used in lieu of the pre-cast pad if the pipe and valve is not charged for 48 hours, and 4 hours cure time is allowed before backfilling. Valves shall be backfilled with Type 1 bedding material to one (1) foot above the valve. The Contractor shall check all operating mechanisms for proper functioning; valves, which do not operate easily or are otherwise defective, shall be replaced at the Contractor's expense.

When butterfly valves are being installed, the actuator shall be calibrated to close and seal completely prior to bury. Engineer shall inspect the butterfly valve for complete closure prior to bury. This inspection does not constitute final acceptance of the valve.

- 15. Valve Boxes:** Shall be installed straight and plumb directly over the valve stem and placed over a valve box adaptor. The top of the valve box shall be placed flush to $\frac{1}{4}$ inches below flush with the surfacing in paved or graveled areas and shall be flush with the finished grade in grass surfaced areas. Where the construction plans

indicate that the future grade at the valve location will be higher or lower than the existing grade at the time of valve installation, the Contractor shall provide the correct combination of extension pieces so that the valve box can be adjusted to the future finished grade without replacing the valve box.

A Valve Box Adaptor shall be installed on the valve bonnet prior to installing the valve box.

The Valve box shall be wrapped with polyethylene in accordance with Section 8B – Corrosion Protection for Plastic Pipe Systems details.

16. Tapping Sleeves and Valves for Taps 4 Inches and Larger: Where new 4-inch or larger water service lines or mains are to be connected to a main, the Contractor shall furnish all material necessary for connection to the water main, as specified herein. The Tapping Sleeve and valve shall be assembled in accordance with the manufacturer's instructions. Tapping Sleeves and valves shall be supported independently from the pipe prior to tapping and shall be provided with thrust restraint as specified for other fittings. The Tapping Sleeve requires the installation of a thrust block per specifications.

City Utility maintenance will perform all taps and the Contractor shall schedule all 4 inch and larger taps between 7:30 AM and 12:30 PM, Monday through Thursday, or as alternately scheduled by the City Utility Maintenance Group.

The Contractor shall obtain and pay for all applicable permits and fees.

17. Corrosion Protection: Shall be completed per Section 8B - Corrosion Protection for Plastic Pipe Systems or as outlined in the Detailed Specifications.

18. Dewatering: Shall be accomplished per Section 11 Utility Excavation and Backfill.

G. Disinfection: Disinfection shall comply with the requirements of AWWA C600, C605, and C651. All new water mains and appurtenances shall be disinfected before they are placed in service. All water mains taken out of service for inspecting, repairing, or other activity that might lead to contamination shall be disinfected before they are returned to service.

Unless specified otherwise in the detailed specifications or construction plans, or required by other provisions of this specification, disinfection shall be accomplished by the tablet method. The Contractor shall obtain the Engineer's approval prior to using a method other than the tablet method. The slug disinfection method, continuous feed method, or spray method shall be as specified by the Engineer of Record in accordance with AWWA C651. In the event that a condition arises during construction that triggers the need for one of these methods, the contractor shall refer to AWWA C651.

A submittal will be required to be submitted by the Contractor for approval by the

Engineer of the use of any of these methods.

1. **Preventative Methods:** The tablet method specified below may be used only if the pipes and appurtenances are kept clean and dry during construction. Therefore, the Contractor shall take precautions to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize the entrance of foreign material.

If dirt enters the pipe, it shall be removed and the interior of the pipe surface swabbed with a 1-percent to 5-percent hypochlorite disinfecting solution. If a water main is contaminated with sediment or debris, flushing will not be allowed as a method of cleaning the sediment or debris. If, in the opinion of the Engineer, the sediment and debris cannot adequately be removed by the Contractor, then the Contractor shall clean the interior of the pipe by mechanical means, such as a hydraulically propelled foam pig. Following mechanical cleaning the Contractor shall flush the line achieving minimum flushing velocities of at least 3.0 ft/s and shall then disinfect the pipe using either the continuous-feed or the slug method per AWWA C651.

All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks, meal periods, or weather events. If water accumulates in the trench, the plugs shall remain in place until the trench is dry. If, for any reason, the water pipe is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the water main is clean. The section exposed to floodwater shall then be filled with chlorinated potable water that, at the end of a 24-hour holding period, will have a free chlorine residual of not less than 25 milligrams per liter (mg/l). The chlorinated water shall then be flushed from the water main and after construction is completed, the main shall be disinfected using the continuous-feed or slug method.

2. **Disinfectant:** The tablet method requires that the pipes and appurtenances be kept clean and dry. This method may not be used if the pipes and appurtenances are not kept clean and dry. In the event the pipes and appurtenances are not kept clean and dry, the Engineer must be contacted.

Tablets shall be 5-gram calcium hypochlorite tablets conforming to AWWA B300 and shall contain between 65-percent and 70-percent available chlorine. Tablets shall be fresh and shall be stored in a cool, dry, and dark environment to prevent loss of strength, which occurs upon exposure to the atmosphere.

The contractor shall not use calcium hypochlorite intended for swimming pool disinfection, because this material has been sequestered and is extremely difficult to eliminate from the pipe after the desired contact time has been achieved.

3. **Dosage:** Unless otherwise specified, the Contractor shall place calcium hypochlorite tablets in each section of water pipe installed, including the hydrant branch, according to Table 8-1, below.

Table 8A-1
NUMBER OF 5-GRAM CALCIUM HYPOCHLORITE
TABLETS REQUIRED
(50 mg/l Dose)

Length of Pipe Section (Ft.)	Diameter of Pipe (In.)						
	4	6	8	10	12	14	16
13 or less	1	2	2	3	5	6	8
13 - 18	1	2	3	5	6	8	11
18 - 20	1	2	3	5	7	9	12
20 - 30	2	3	5	7	10	14	18
30 - 40	2	4	6	9	14	18	24

For pipes larger than 16 inches, refer to construction plans or detailed specifications for disinfection requirements. The Engineer of Record is responsible for establishing the disinfection requirements for pipes larger than 16 inches.

4. **Placing Tablets:** Tablets shall be adhered to the inside top section of each pipe length using a food-grade adhesive. Adhesives shall meet the requirements of a food-grade adhesive per either NSF/ANSI 51-2005: Food Equipment Materials or NSF/ANSI 61-2005: Drinking Water System Components - Health Effects. NSF/ANSI 61 lists several adhesives that are approved for drinking water contact. It is recommended to use an adhesive that sets quickly and isn't reactive with the water main's composition or with the disinfectant tablet. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. If the tablets are attached before the pipe section is placed in the trench, the tablets' position shall be marked on the pipe section to indicate the pipe has been installed with the tablets at the top.
5. **Filling and Contact:** The water main shall be filled slowly so that the water velocity is no greater than 1-foot per second (fps). Precautions shall be taken to assure that air pockets are eliminated. The water shall be allowed to stand in the pipe for at least 24 hours. Valves shall be positioned so that the strong chlorine solution in the treated main will not flow into water mains in active service. The Contractor shall not fill a main without the Engineer being present.
The chlorinated water shall remain in the pipe for at least 24 hours. The Contractor shall notify the Engineer at the end of the 24-hour retention period prior to flushing to allow the Engineer to check the chlorine residual in the pipe. If the chlorine residual is less than 25 mg/l, the Contractor shall, at his expense, disinfect the water main again by the continuous-feed method or the slug method, as approved by the Engineer.
6. **Flushing:** Within 48 hours of the end of the 24-hour retention period, the Contractor shall flush the heavily-chlorinated water from the main until the chlorine concentration in the water leaving the main is no higher than that prevailing in the system or is less than 1 part per million (ppm) as determined by the Engineer. In addition to the above requirements, a minimum flushing velocity of 3.0 fps and flushing duration of one minute per 100 feet of pipe being flushed shall be achieved

per Table 8A-2.

Table 8A-2

REQUIRED FLOW AND MINIMUM FLOW DURATION TO FLUSH PIPELINES

Pipe Diameter (In.)	Flow required to produce 3.0 fps Velocity in Main*	Fire Hydrants		Minimum Flushing Duration (minutes per 100 feet of pipe)
		Number of Fire Hydrants	Outlet Size (In.)	
4	120	1	2-1/2	1
6	280	1	2-1/2	1
8	480	1	2-1/2	1
10	740	1	2-1/2	1
12	1100	2	2-1/2	1**
14	1450	2	2-1/2	1**
16	1950	3	2-1/2	1**

Table 8A-2 shows the rates of flow required to produce a velocity of 3.0 fps in pipes of various sizes and the minimum flushing duration per 100 feet of pipe length.

For pipes larger than 16-inch, refer to construction plans or detailed specifications for requirements. The Engineer of Record is responsible for establishing flushing requirements for pipes larger than 16 inches.

* Requires a minimum 40-psi pressure in the main and the hydrant flowing to atmosphere.

** Assumes that the corresponding flow rate is being met.

Flushing shall be done in accordance with AWWA C651. Flushing shall be accomplished through use of hydrants or temporary fittings installed for the purpose; flushing through corporations and/or water service lines is prohibited. The Contractor shall obtain the Engineer's approval prior to installing special fittings for flushing.

Heavily-Chlorinated water used to disinfect water mains shall be neutralized prior to release. The Heavily-Chlorinated water shall be neutralized at the discharge from a hydrant using approved dechlorination equipment and materials. At the option of the Contractor, the Heavily-Chlorinated water may be contained and transported to an approved location for land application. The contractor shall remain responsible for meeting all the requirements of the Standard Specifications for required flow and minimum flow duration to flush pipelines and surface water quality standards. Neutralization of Heavily-Chlorinated water shall be incidental to the installation of all water mains.

Flushing shall be conducted in such a way as to prevent contamination of existing water mains and/or water service lines and to minimize traffic and pedestrian hazards and nuisance conditions. When possible, flushing shall be to the nearest storm sewer or drainage way. Flushing to the sanitary sewer is prohibited.

The Contractor will be responsible for any damage to fish and/or aquatic life caused by the chlorine residual. If Chlorine reaches or is detected in a stream,

river, or other waterway the Contractor will be in violation for that discharge. For more information, contact SD DANR Surface Water Quality Program at (605) 773-3351. Refer to section below, "Disposal of Chlorinated Water" for additional information regarding neutralizing chlorine residual.

7. **Sampling:** Per AWWA C651, the contractor shall sample for coliform bacteria contamination. After the water lines have been flushed, the contractor shall sample the water mains. Two consecutive samples of water from the end of the disinfected/flushed water main must be collected at least 16 hours apart. These samples must be submitted to the State Health Laboratory in Pierre, or another laboratory acceptable to the SD DANR and the Engineer. At least one set of samples shall be collected from every 1,200 feet of new water main, plus one set from the end of the main and at least one set from each branch. The samples shall be collected in the presence of the Engineer.

The samples must show the absence of coliform bacteria contamination before any taps may be made to the main or the main is activated and placed into service. Copies of all sample results shall be submitted to the Engineer within 48 hours of receipt thereof.

Because of the high risk of contamination during sampling, the Contractor shall use certified lab personnel or a trained sampler to collect all samples submitted for testing.

8. **Disposal of Chlorinated Water:** The Contractor shall apply a neutralizing chemical to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water as listed in Appendix B of AWWA C651. The Contractor will be responsible for any damage to fish and/or aquatic life caused by the chlorine residual. If Chlorine reaches or is detected in a stream, river, or other waterway the Contractor will be in violation for that discharge. For more information, contact SD DANR Surface Water Quality Program at (605) 773-3351.

H. **Pressure and Leakage Test for Mains and Water Service Lines 4 Inches or Larger:**

1. **General:** Pressure and leakage tests shall be performed on all newly installed water mains. The "Simultaneous Pressure and Leakage Tests" will be used unless otherwise specified. The testing methods specified in this section are specific for water pressure testing only; air pressure testing is prohibited due to the catastrophic nature of failure should failure occur.
2. **Test Restrictions:** The pressure shall be 150-percent of the working pressure at the point of test, but not less than 125-percent of normal working pressure at the highest elevation, whichever is greater. Test pressure shall not exceed pipe, valve, or thrust-restraint design pressures and shall not vary by more than 5 psi (plus 5 psi or minus 5 psi) for the duration of the test. The duration of the hydrostatic test shall be a minimum of 2 hours.

The Contractor shall anticipate the need to conduct multiple tests in areas of varying topography and shall conduct testing in such a manner and sequence that the pressure requirements indicated above are achieved.

3. **Pressurization:** Before applying the specified test pressure, each valved section of pipe to be tested shall be slowly filled with potable water and all air expelled from the pipe, valves, fittings, and hydrants. Where City water is not available, the Contractor shall furnish sufficient potable water to fill and test the pipe. The specified test pressure, based on the elevation of the lowest point of the section under test and corrected to the elevation of the test gauge, shall then be applied by means of a suitable pump connected to the pipe in a manner satisfactory to the Engineer and shall be sustained for the specified time.

The test pump shall be equipped with two (2) accurate pressure gauges, between the pump shut-off valve and water main being tested, both to show the line pressure reading during testing. When hydrants are in the test section, the test shall be made against closed hydrant valves. Pressure gauges shall have graduation marks, at minimum, for every 2 psi and be capable of interpreting pressure readings within 1 psi. The pressure reading deviation between the two pressure gauges shall not be greater than 2.0 psi. During the pressure test the pressure loss indicated between the two gauges shall not deviate more than 0.5 psi between the two gauges.

4. **Leakage:** Shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by the decrease in pressure for a test section over a period of time.
5. **Allowable Leakage for PVC Pipe and Ductile Iron Pipe:** The PVC pipe shall be pressure and leakage tested in accordance with AWWA C605. The ductile iron pipe shall be pressure and leakage tested in accordance with AWWA C600. No pipe installation, PVC pipe or ductile iron pipe will be accepted if the leakage is greater than that indicated in Table 8A-3.

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Table 8A-3
ALLOWABLE LEAKAGE IN GALLONS
PER HOUR PER 1000 FT OF PIPE
(GPH)

Pipe. Dia. (in.)	Average Test Pressure (PSI)					
	50 psi (gph)	100 psi (gph)	150 psi (gph)	200 psi (gph)	250 psi (gph)	300 psi (gph)
4	0.19	0.27	0.33	0.38	0.43	0.47
6	0.29	0.41	0.50	0.57	0.64	0.70
8	0.38	0.54	0.66	0.76	0.85	0.94
10	0.48	0.68	0.83	0.96	1.07	1.17
12	0.57	0.81	0.99	1.15	1.28	1.40
14	0.67	0.95	1.16	1.34	1.50	1.64
16	0.76	1.08	1.32	1.53	1.71	1.87
18	0.86	1.22	1.49	1.72	1.92	2.11
20	0.96	1.35	1.66	1.91	2.14	2.34
24	1.15	1.62	1.99	2.29	2.56	2.81
30	1.43	2.03	2.48	2.87	3.21	3.51
36	1.72	2.43	2.98	3.44	3.85	4.21

- 6. Acceptance:** Shall be determined on the basis of allowable leakage. If any test of installed pipe discloses leakage greater than that specified in Table 8A-3, the contractor shall, at the contractor's own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance. All visible leaks shall be repaired, regardless of the amount of leakage.

Any damaged or defective pipe, fittings, valves, hydrants, or joints discovered following the pressure test shall be repaired or replaced with approved material at the Contractor's expense, and the test shall be repeated until it is within the specified allowance.

- 7. Example:** A pipe segment is required to be tested at 140 psi. At the start of the test, pressure gauge number (#) 1 indicates an initial pressure of 141 psi and pressure gauge #2 indicates an initial pressure of 143 psi. Both gauges are recording the test pressure within 2 psi, and, therefore, the test may proceed. After completing the 2-hour test duration, pressure gauge #1 indicates a pressure of 134 psi and pressure gauge #2 indicates a pressure of 136.5 psi. The pressure decrease for pressure gauge #1 is 7 psi and the decrease for pressure gauge #2 is 6.5 psi. The 2 gauges record a pressure decrease within 0.5 psi of each other therefore the deviation of the pressure reading between the two gauges is acceptable.

If the pressure test had indicated a pressure loss of less than 5 psi then the "Pressure and Leakage Test" would have been considered as passing. Because in this example, the pressure loss is more than 5 psi, the Contractor may elect to re-pressurize the system and repeat the two-hour test or the Contractor may elect to measure the quantity of water required to pressurize the pipe segment so that the pressure loss is less than 5 psi. For this example, if the quantity of water required to pressurize the pipe segment so that pressure gauge #1 indicates a pressure of 137 psi (loss of 4 psi) and pressure gauge #2 indicates a pressure of

137.5 psi (loss of 4.5 psi), is within the quantity of water allowed per Table 8A-3 then the test would be considered as passing without having to repeat pressure test for 2 hours.

I. Pressure and Leakage Test for Water Service Lines Less Than 4 Inches: Pressure and leakage tests shall be performed on all newly installed water service lines if the water service line has one or more couplings installed between the corporation and the curb stop and/or one or more couplings installed between the curb stop and the Property Water Distribution System. The testing method shall be as specified in the currently adopted version of the Plumbing Code with the exception that air pressure testing is prohibited.

J. Water Main Closures and Temporary Service:

1. Water Main Closures: Shall be scheduled to minimize the inconvenience to the public. Consequently, water main closures shall be scheduled between 8:00 A.M. and 4:00 P.M. Monday through Thursday, when possible. Short duration closures (closures scheduled to last no longer than 2 hours) may be scheduled on Friday between the hours of 8:00 AM and 11:30 AM. Water main closures scheduled to begin prior to or continue beyond those times listed above, will require approval from the Engineer. In any case, water main closures will not be allowed until the Engineer gives his approval.

Temporary water for private residences affected shall be provided by the Contractor when the water main closure will exceed 8 hours. The Contractor shall notify all affected businesses that temporary water service shall be provided to them, if requested, regardless of the length of closure. When temporary service is to be provided to businesses, the Contractor shall obtain the name and phone number of a responsible contact person at each affected business and submit the information to the Engineer at least 48 hours prior to closure.

The Contractor shall obtain notification of closure cards from the Engineer and shall deliver the closure cards by hand to the affected properties at least 48 hours prior to closure of any water main, unless a shorter time of notice is approved by the Engineer.

Water main closures shall be considered incidental to the project and no separate payment will be made.

2. Temporary Water Service/Water Main Bypass Pipe: Piping shall be as specified and approved by the Engineer of Record. In the event that a condition arises during construction that triggers the need for temporary water service, Contractor shall be responsible for plan development and obtaining approval from the Engineer to commence this work. No additional payment shall be provided for temporary water and this work shall be considered incidental the water distribution pipe being installed unless specifically called out as a pay item by the Engineer of Record.

The work shall include a minimum of the following:

- a) The Contractor must provide a 24-hour contact person who has adequate parts and equipment on hand to make necessary repairs to temporary water service in a timely manner.
 - b) Temporary water main is required to be pressure tested, disinfected, flushed, and sampled prior to any service connections being made in accordance with AWWA C651 and this specification.
 - c) Temporary service connections shall be connected at the curb stop.
 - d) Provisions for freeze protection of the temporary system shall be provided if weather requires it.
 - e) Provisions for tamper protection shall be provided.
 - f) Adequate pipe supports shall be provided to prevent tipping, movement, or pipe deflection and shall be spaced so as to limit pipe deflection. Any deflection of the piping shall be limited to manufacturer recommendations.
 - g) Contractor shall provide a submittal for approval to outline the products and procedures to be used for the Temporary water service/water main bypass piping. The submittal shall be submitted with the requirements of this specification for approval. Submittal shall include temporary water main layout, sequence of operations, and all material and fitting specifications to be used in the temporary water setup. The submittal shall also include detail for temporary water mains crossing roads and driveway approaches as well as provisions for freeze and vandal protection.
 - h) When in service, the entire length of temporary water service/water main bypass piping shall be inspected by the contractor a minimum of 2 times per day. Documentation of this inspection shall be delivered to the Engineer upon request.
- 3. Operation of Valves:** Only City personnel shall operate valves on existing water mains. The Contractor may operate valves on newly installed water mains that are under his control, until such time as, they are accepted by the City for operation and maintenance.
- K. Air Release Valves:** Shall be constructed in accordance with the detailed construction plans and specifications.
- L. Abandonment and/or Salvage of Water Main and Appurtenances:**
- 1. **Water Mains:** The Contractor shall seal all open ends of water mains to be abandoned with a concrete plug having a length equal to the diameter of the pipe being plugged. All open pipe ends shall be abandoned and plugged. Maximum

pipe length between abandonments shall not exceed 450 feet.

2. **Fire Hydrants:** Fire hydrants and auxiliary valves are to be removed and salvaged, unless indicated otherwise on the construction plans or Detailed Specifications, and shall be delivered by the Contractor to the City Utility Maintenance Shop in good working condition. Any damage to the hydrant and/or appurtenances as a result of removing, salvaging, and delivering, shall be repaired by the Contractor at no cost to the City.
3. **Valves:** Unless indicated otherwise on the construction plans or Detailed Specifications, valves and valve boxes are to be removed, salvaged, and delivered by the Contractor to the City Utility Maintenance Shop in good working condition. Any damage to the valve as a result of removing, salvaging, and delivering, shall be repaired by the Contractor at no cost to the City.
4. **Valve (Authorized) to be Abandoned in Place:** Prior approval from the Engineer is required to abandon a valve in place. Valves shall not be abandoned in place on a water main that is in service and not abandoned. Valves indicated on the plans to be abandoned in-place shall be abandoned by closing the valve and removing the top valve box sections. The valve box sections shall be delivered to the City Utility Maintenance Shop. The resulting holes shall be backfilled with either low strength concrete material or material acceptable to the Engineer that prohibits settlement of the hole and shall be resurfaced with the appropriate material; i.e. seed, sod, asphalt, concrete, etc.
5. **Water Main Branch Connections:** Contractor shall coordinate all water main closures necessary to carry out this work with Utility Maintenance in accordance with this specification. Contractor shall expose the branch connection at the water main, and remove section of water main pipe containing the branch connection and all branch water main appurtenances such as Tapping Sleeves, in line tees or crosses, valves, etc. in its entirety. The contractor shall disconnect the branch pipe and plug the branch pipe per the specification for the abandonment of water mains. All debris associated with the abandonment shall be removed in its entirety. Contractor shall repair the in-line water main with new PVC pipe of the same size and equivalent pressure class and appurtenant coupling connections suitable for use as specified in this section. Couplings shall be restrained unless sufficient demonstration can be provided that the water main being repaired is unrestrained. This demonstration is the responsibility of the contractor. Corrosion protection continuity and tracing continuity shall be maintained with the abandonment in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems. City shall be present to inspect the repair prior to backfill.

Abandonments of water main branch connections on Steel water mains shall be as called for in approved construction plans and specified by the Engineer.

6. **Others:** When the construction plans indicate items are to be removed or salvaged, the Contractor shall deliver the items to the City Utility Maintenance Shop in good working condition. Any damage to the items as a result of removing,

salvaging, and delivering, shall be repaired by the Contractor at no cost to the City. Unless an item is indicated as salvaged, the item will be considered a Contractor obligation to remove and dispose of.

M. Water Service Lines and Fittings: Refer to Specification Section 8B Corrosion Protection - Plastic Pipe Systems for water service line cathodic protection requirements.

1. Permits: Will be required for all connections to the City's water distribution system and are obtainable from City Utility Maintenance.

2. Service Pipe:

a) Copper pipe shall be laid with sufficient waving as to prevent rupture in settlement. A "goose-neck" shape shall be constructed in the copper pipe leading from the corporation stop. Copper splicing couplings shall be as described in this specification.

b) PVC and ductile iron service pipe shall be laid in accordance with this specification for water mains. Minimum cover depth for water service lines shall be 6 feet.

c) HDPE water service line pipe shall be laid horizontally in a "snake-like" laying configuration to allow for both expansion/contraction movement of the pipe in the trench. Installation of the HDPE water service line shall be per these specifications, as specified in AWWA M55, and in accordance with the pipe manufacturers recommendations. HDPE shall not be placed in contact with concrete without the use of a sleeve. Tracer wire in accordance with Specification Section 8B Corrosion Protection - Plastic Pipe Systems shall be extended the entire length of the HDPE service.

1) New: HDPE may be used for new water service lines for installations either/both between the corporation stop and the curb stop and between the curb stop and the structure. New HDPE water service line installations shall not use couplings but shall be continuous for the length of the service. A HDPE stub that is installed in anticipation of future connection (for example, underneath a common utility trench) is considered new and may not be connected to via couplings. When HDPE is used for the water service line material, a roll of HDPE of sufficient length to serve the structure may be connected and stored for future use to avoid excavation back to the curb stop.

2) Repairs: A copper water service line may be replaced in its entirety with an HDPE water service line between the corporation stop and the curb stop or between the curb stop and the structure. Existing HDPE Water service lines may be repaired, and couplings may be used. Splicing couplings shall be as described in this specification. HDPE shall not be used for repair of existing copper water service lines if there will be remaining copper water

service line between the curb stop and the structure. HDPE shall not be used for repair of copper water service line if there will be remaining copper water service line between the corporation stop and the curb stop.

3. **Service Line Bedding:** Copper and HDPE service lines shall be bedded in accordance with Section 11 Utility Excavation and Backfill.
4. **Water Service Line Separation:** Shall be in accordance with Section 11 Utility Excavation and Backfill.
5. **Service Saddles:** Shall be installed for all connections to water mains. Unless specified otherwise on the Construction plans or Detailed Specifications, the Contractor shall furnish and install all service saddles.
6. **Corporation Stops:** Shall be provided by the Contractor, except for 1-inch corporation stops, which the City provides. The Contractor shall communicate the water main material type and size to Utility Maintenance at the time a tap is requested. Corporation stops that are used to connect copper water services to metallic water mains shall be the isolator style. City personnel, in all cases, will tap the water main and install all corporation stops. If a Contractor is installing a copper water service on private property but is not replacing the service to the main and the copper water services connects to a metallic water main then an insulating union for copper water services shall be installed near the curb stop or at the location where the new copper connects to the existing copper. This is only required for copper water services connecting to metallic mains.
7. **Water Service Lines Larger Than 2 Inches Diameter:** Shall be connected to the main with either an appropriately sized tapping sleeve and valve or a ductile iron tee as specified for water main fittings elsewhere in these specifications.
8. **Curb Stops and Boxes:** Shall be installed on all water service lines and shall be located entirely within the public ROW. The curb stop and box shall be located between the property line and 7-feet from the property line in the ROW, unless otherwise approved by the Engineer. Curb stop must be accessible and access to the curb stop shall not be limited by any fencing. If any curb box is farther from the property line than 7.1 feet, measured to the center of the box, then the box shall be reset to within the allowable tolerance. Curb Stop interiors and adjacent piping shall be cleaned of foreign material prior to making curb stop to pipe connection. Pipe/valve joints shall be straight and without deflection. All curb stops shall be placed on an 8-inch by 16-inch precast concrete pad with a 4-inch thickness and centered on the curb stop. Curb stops shall be backfilled to one (1) foot above the curb stop with the same material required to bed the water service line. The Contractor shall check all operating mechanisms for proper functioning. Curb stops, which do not operate easily or are otherwise defective, shall be replaced at the Contractor's expense. Curb boxes shall be installed straight and plumb directly over the curb stop. The curb box shall be wrapped with polyethylene in accordance with Section 8B – Corrosion Protection for Plastic Pipe Systems details. The top of the curb box shall be placed flush to ¼-inch below flush with the surfacing in

paved or graveled areas and 1-inch to 2 inches above finished grade in grass surfaced areas. Where the Construction plans indicate that the future grade at the curb box will be higher or lower than the existing grade at the time of installation, the Contractor shall provide a curb box that is applicable for the future finished grade without having to replace the curb box.

9. Water Service New Connections: Water service lines shall be laid directly from the premises served to the City's main and shall not be extended across one premises to another. Notwithstanding this subsection, and notwithstanding the normal exception process contained in this document, the Public Works Director may allow water service lines to be located in a manner that crosses premises if, and only if, the conditions of Ordinance 13.12 are satisfied.

- a) Where new water service lines are to be installed for undeveloped property or future buildings or additional services added to an existing building, the Contractor shall furnish all materials necessary for connection of new water service lines to the water main, except 1-inch corporation stops, as specified herein and shall obtain and pay permits and tapping fees as established by Ordinance.
- b) Where the new water service line is terminated, the water service line shall be capped and plugged water tight to prevent leakage if the curb stop is inadvertently opened. New service connections shall have curb stops left turned off at the time of installation and the termination point shall be marked with a minimum three 3-foot long steel fence post. The steel post shall be buried below the surface at least 8 inches. The post needs to be steel to facilitate location by magnetic locators.
- c) City personnel shall tap all City water mains. The Contractor shall schedule all service taps as follows:
 - 1) Winter Schedule: Between 7:30 AM to 3:00 PM, Monday through Friday.
 - 2) Summer Schedule: Between 6:30 AM to 4:00 PM, Tuesday through Friday.
 - 3) It is the Contractors responsibility to call Utility Maintenance to determine which schedule they are following if there are questions.
- d) Water Service New Connections for water service lines 4 inches or larger shall be made as described in the section for Tapping Sleeves.

10. Water Service Reconnections: Water service lines shall be laid directly from the premises served to the City's main and shall not be extended across one lot to another. Notwithstanding this subsection, and notwithstanding the normal exception process contained in this document, the Public Works Director may allow water service lines to be located in a manner that crosses lot lines if, and only if, the conditions of Ordinance 13.12 are satisfied.

- a) The Contractor shall furnish all materials necessary for reconnecting water service lines existing prior to reconstruction of a water main, except 1-inch corporation stops as specified herein. On City projects, all permits and tapping fees will be waived; however, the Contractor shall obtain a no-charge permit to work in the ROW. Permits will be required for all reconstructions to the Rapid City water system and are obtainable from City Utility Maintenance. On non-City projects, the new account set-up / inspection permit (tap permit) will be waived. However, the Right-to-Work permit and tapping fees are still applicable and are obtainable from City Utility Maintenance.
- b) City personnel shall tap all city water mains. The Contractor shall schedule all service taps as follows:
 - 1) Winter Schedule: Between 7:30 AM to 3:00 PM, Monday through Friday.
 - 2) Summer Schedule: Between 6:30 AM to 4:00 PM, Tuesday through Friday.

It is the Contractors responsibility to call Utility Maintenance to determine which schedule they are following if there are questions.

- c) Water service reconstructions for water service lines 4 inches or larger shall be made as described in the section for Tapping Sleeves.

11. Inspection: All water service installations and abandonments, regardless of whether or not the service is located on private property or in public ROW, shall be inspected by the City Utility Maintenance Group prior to the Contractor backfilling the trench. The Contractor shall notify the City Utility Maintenance Group a minimum of four (4) hours prior to the time he needs the inspection. Any trench backfilled without being inspected and approved by authorized City personnel shall be re-excavated by the Contractor to expose the work for the required inspection. Discrepancies shall be corrected by the Contractor and re-inspected by City personnel.

N. Abandonments of Water Service Lines and Appurtenances, 2 Inches and Smaller: Contractor shall coordinate all water main closures necessary to carry out this work with Utility Maintenance in accordance with this specification. Contractor shall expose the service connection at the water main and remove the service saddle and corporation stop in its entirety. The contractor shall disconnect the service from the corporation stop and crimp or plug the water service line openings. All debris associated with the abandonment shall be removed in its entirety. Contractor shall repair the water main with a repair clamp as specified and in accordance with the manufacturer's requirements. If there is a condition of the water main that prevents the use of a repair clamp, repair in accordance with "Abandonments of Water Service lines and Appurtenances, larger than 2-inch." City shall be present to inspect the repair prior to backfill.

The contractor shall expose the water service line at the curb stop and remove the curb stop and curb box in its' entirety. The Contractor shall disconnect the service from

the curb stop and crimp or plug the water service line openings. All open water service line pipe ends shall be crimped or plugged.

- O. Abandonments of Water Service Lines and Appurtenances, Larger Than 2-Inches:** Contractor shall coordinate all water main closures necessary to carry out this work with Utility Maintenance in accordance with this specification. Contractor shall expose the service connection at the water main, and remove section of water main pipe containing the service connection and all water service line appurtenances such as Tapping Sleeves, in line tees or crosses, service valves, etc. in its entirety. The contractor shall disconnect the service pipe and plug per the specification for the abandonment of water mains. All debris associated with the abandonment shall be removed in its entirety. Contractor shall repair the water main with new PVC pipe of the same size and equivalent pressure class of the water main being repaired and appurtenant coupling connections suitable for use as specified in this section. Couplings shall be restrained unless sufficient demonstration can be provided that the water main being repaired is unrestrained. This demonstration is the responsibility of the contractor. Corrosion protection continuity and tracing continuity shall be maintained with the abandonment in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems. City shall be present to inspect the repair prior to backfill.

The contractor shall expose the water service line at the curb stop or valve and remove the curb stop and curb box or valve and valve box in its' entirety. The Contractor shall disconnect the service from the curb stop or valve and plug the water service line openings in accordance with the specification for the abandonment of water mains.

Abandonments of Water Service Lines and Appurtenances, Larger than 2-Inch on Steel water mains shall be as called for in approved construction plans and specified by the Engineer.

- P. Reuse of Water Service Line Tap Hole, 2 Inches and Smaller:** In the case of a "Water Service Reconnection", where the existing water service line tap can be reused, the Contractor may do so by placing a new service saddle of equivalent service hole size over the existing service hole. If the service connection is $\frac{3}{4}$ -inch, a 1-inch service saddle shall be used over the existing service hole. The service hole will remain the original tapping size and shall not be drilled to a larger size. If the condition of the hole prevents the use of a new service saddle, the hole may not be reused and shall be abandoned in accordance with "Abandonments of Water Service Lines and Appurtenances, larger than 2-inch".
- Q. Water Service Repairs:** Service pipe of conforming material shall be repaired with like material, pressure class and size, unless minimum existing size is not approved for use by the current version of the adopted Plumbing code.
- R. Acceptance of Curb Stops and Main Valves:** As a condition for project acceptance, all curb stops and water main valves within the project boundaries shall be in proper operating condition. City personnel will inspect and operate each curb stop and water main valve as part of the final inspection. The Contractor shall correct any deficiencies discovered during the inspection.

8A.4 METHOD OF MEASUREMENT

- A. Water Main Pipe:** Installed pipe quantities shall be determined by measuring from centerline to centerline of all pipe and fittings. Measurements shall be to the nearest whole foot.
- B. Water Main Fittings and Couplings:** Fittings furnished and installed shall be counted on a per each basis. Measurement for concrete thrust blocks, cable and rods, and thrust restraint devices will not be made; such work shall be incidental to the respective work item. Corrosion protection devices and appurtenances tied to fittings shall be in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems and are incidental to the respective work item.
- C. Valves:** Shall be counted on a per each basis. Valve boxes and valve box adapters shall be included with the valves as a complete unit. Measurement for concrete blocks, cable and rods, and thrust restraint devices will not be made; such work shall be incidental to the respective work item. Corrosion protection devices and appurtenances tied to fittings shall be in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems and are incidental to the respective work item.
- D. Fire Hydrant and Auxiliary Valve:** Fire hydrants will be counted on a per each basis. Auxiliary valve, valve box, and valve box adapter shall be included with the hydrant as a complete unit. No separate payment will be made for auxiliary valves, boxes and adapters. Measurement for concrete thrust blocks, cable and rods, and thrust restraint devices will not be made; such work shall be incidental to the respective work item. Corrosion protection devices and appurtenances tied to fittings shall be in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems and are incidental to the respective work item.
- E. Fire Hydrant Lead:** The pipe for the hydrant lead from the main to the fire hydrant shall be measured from centerline to centerline of pipe and fittings. Measurements shall be to the nearest whole foot.
- F. Fire Hydrant Extensions:** Fire hydrant extension quantities shall be determined by measuring the vertical length of the extension. Measurement shall be to the nearest half foot.
- G. Fire Hydrant Bollards:** Fire Hydrant Bollards shall be counted on a per each basis. All materials for a complete installation shall considered as incidental to the respective work item.
- H. New Water Main Connections:** New water main connections shall be counted on a per each basis and shall include such items including but not limited to fittings, pipe, couplings, joint restraints, thrust blocks, concrete blocks, tracer wire, cathodic protection and all other appurtenant materials to facilitate the new water main connection per the standard specification. The bid item, New Water Main Connections, is intended for use where a tapping sleeve and valve is not used and where an in-line

tee must be cut into an existing main, a pipe is being connected to, or where a cap/plug with thrust block must be removed prior to connecting.

- I. **Water Service Lines:** Installed pipe quantities shall be determined by measuring from centerline to centerline of all pipe and fittings. Measurements shall be to the nearest whole foot.
- J. **Service Saddles:** Service saddles furnished and installed will be counted on a per each basis.
- K. **Service Corporation Stops:** Service corporation stops furnished by the Contractor will be counted on a per each basis. No measurement will be made for service corporation stops furnished by the City.
- L. **Curb Stops and Boxes:** Curb stops and boxes furnished and installed, will be counted on a per each basis.
- M. **Water Service New Connections:** New water service connections will be counted on a per each basis. The pipe used for connections shall be measured and paid for under the bid item for water service pipe.
- N. **Water Service Reconnections:** Water service reconnections will be counted on a per each basis. The pipe used for reconnections shall be measured and paid for under the bid item for water service pipe.
- O. **Thrust Blocks and Joint Restraints:** No separate measurement will be made for thrust blocks or joint restraint devices, such work will be incidental to the pipe.
- P. **Polyethylene Bond Breaker:** No separate measurement will be made for polyethylene bond breaker such work will be incidental to the pipe and fittings.
- Q. **Tapping Sleeves and Valves (Includes Tee, Valve, and Thrust Block):** Tapping Sleeves and valves furnished and installed will be counted on a per each basis.
- R. **Adjust Valve Box:** Adjust valve box shall be counted on a per each basis.
- S. **Adjust Curb Stop Box:** Adjust curb stop box shall be counted on a per each basis.
- T. **Abandonment of Water Main and Appurtenances:** No separate measurement will be made for abandonment of water mains and appurtenances, when called for on the construction plans; such work will be incidental to the project unless otherwise specified.
- U. **Abandonment Water Main and Appurtenances, Water Main Branch Connections:** Abandonment of Branch water main connections will be counted on a per each basis and shall include such items including but not limited to repair pipe, couplings, joint restraints, thrust blocks, concrete blocks, tracer wire, cathodic protection and all other appurtenant materials to facilitate the abandonment per the

standard specification.

- V. Salvaging Fire Hydrants, Valves and Valve Boxes:** No separate measurement will be made for salvaging and delivering salvaged materials including fire hydrants, auxiliary valves, valves and boxes; such work will be incidental to the project unless otherwise specified.
- W. Removal and Disposal of Pipe:** No separate measurement will be made for the removal of pipe materials to facilitate the progression of the work; such work will be incidental to the project unless otherwise specified.
- X. Abandonment of Water Services and Appurtenances, 2 Inches and Smaller:** Abandonment of Water Services and Appurtenances will be counted on a per each basis and shall include such items including but not limited to repair clamp, tracer wire, cathodic protection, and all other appurtenant materials to facilitate the abandonment per the standard specification.
- Y. Abandonment of Water Services and Appurtenances, Larger than 2 Inches:** Abandonment of Water Services and Appurtenances will be counted on a per each basis and shall include such items including but not limited to repair pipe, couplings, joint restraints, thrust blocks, concrete blocks, tracer wire, cathodic protection and all other appurtenant materials to facilitate the abandonment per the standard specification.
- Z. Reuse of Water Tap Hole, 2 Inches and Smaller:** Reuse of Water tap hole, 2 inches and smaller will be counted on a per each basis and shall include such items including but not limited to removal and disposal of existing saddle and furnish and install new service saddle.

8A.5 BASIS OF PAYMENT

- A. Water Main Pipe:** Payment will be at the unit price bid for the appropriate size of water pipe, furnished and installed, including trenching, excavation, Type 1 bedding material, compacting, backfilling, dewatering, sheeting or shoring, pressure and leakage testing, disinfection. Unless otherwise specified, no extra payment will be made for excavation deeper than that required to provide minimum specified cover. The cost of providing temporary water service and plugging abandoned water mains shall be incidental to the project.
- B. Water Main Fittings and Couplings:** Payment will be made at the unit price bid for the appropriate fitting, furnished and installed, including polyethylene bond breaker, and thrust blocks and/or restraints. Corrosion protection devices and appurtenances tied to fittings shall be in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems and are incidental to the respective work item.
- C. Valves:** Payment will be made at the unit price bid for the appropriately sized valve, furnished and installed, including valve box, valve box adapter, concrete blocks, cable and rods, and thrust restraint devices. Corrosion protection devices and

appurtenances tied to valves shall be in accordance with Section 8B Corrosion Protection - Plastic Pipe Systems and are incidental to the respective work item.

- D. Fire Hydrant and Auxiliary Valve:** Payment will be made at the unit bid price, complete, furnished and installed, including trenching, excavation and backfilling, dewatering, sheeting or shoring, and disinfection. Auxiliary valve, valve box, and valve box adapter shall be included with the hydrant as a complete unit and no separate payment will be made.
- E. Fire Hydrant Lead:** The pipe for the hydrant lead (branch) from the main to the fire hydrant shall be at the unit price bid for the appropriate size of water pipe, furnished and installed, including trenching, excavation, Type 1 bedding material, compacting, backfilling, dewatering, sheeting or shoring, pressure and leakage testing, disinfection. Unless otherwise specified, no extra payment will be made for excavation deeper than that required to provide minimum specified cover. The cost of providing temporary water service and plugging abandoned water mains shall be incidental to the project.
- F. Fire Hydrant Extension:** When a fire hydrant extension is necessary due to no fault of the Contractor, as specified herein, payment will be made under the bid item for the fire hydrant extension per price bid. City personnel shall install all Fire Hydrant Extensions. However, if the hydrant could have been installed or ordered with the correct barrel length such that an extension was not necessary, the Contractor shall furnish and install a new Fire Hydrant with the correct barrel length. Hydrant Extensions in these cases will not be permitted.
- G. Fire Hydrant Bollards:** Payment for Fire Hydrant Bollards will be at the bid price per each, complete and shall be considered full compensation for all labor, tools, equipment, materials and incidentals necessary to complete the item.
- H. New Water Main Connection:** Payment for new water main connection will be at the bid price per each, complete and shall be considered full compensation for all labor, tools, equipment, materials and incidentals necessary to complete the item.
- I. Water Service Lines:** Payment will be made at the unit price bid for the appropriately sized pipe, furnished and installed, including trenching, excavation and backfilling, compacting, dewatering, and sheeting or shoring. The cost for any connections between the new water service line and existing water service lines shall be included in the unit price bid for the appropriately sized pipe.
- J. Service Saddles:** Payment will be made at the unit price bid for the appropriately sized service saddle, furnished and installed.
- K. Service Corporation Stops:** Payment for Contractor furnished corporation stops will be made at the unit price bid for the appropriately sized corporation stops. No payment will be made for 1-inch corporation stops, which shall be furnished by the City Utility Maintenance Group. The Utility Maintenance Group will also furnish one-inch

isolator/insulated corporation ball valves when required.

- L. Curb Stops and Boxes:** Payment will be made at the unit price bid for the appropriately sized curb stop and box, complete, furnished and installed.
- M. Water Service New Connection:** Payment will be made at the unit price bid for connecting new water services up to 2 inches in diameter to the new water main, including fittings necessary to connect the water service line to the corporation stop. The cost of connecting water service lines 2 inches or greater shall be included in the unit price bid for the fitting required to connect the water service lines to the water main. Payment for Water Service New Connection shall include Right to Work permit, New Account Setup/Inspection permit (tap permit) and tapping fees, unless otherwise specified in the Detailed Specifications.
- N. Water Service Reconnection:** Payment will be made at the unit price bid for reconnecting existing water services up to 2 inches in diameter to the new water main, including fittings necessary to reconnect the water service line to the corporation stop. The cost of reconnecting water service lines 2 inches or greater shall be included in the unit price bid for the fitting required to connect the water service lines to the water main. On City projects, all permits and tapping fees will be waived. On non-City projects the New Account Setup/Inspection permit will be waived, however the Right-to-Work permit and tapping fees are still applicable.
- O. Thrust Blocks and Joint Restraints:** No separate payment will be made for thrust blocks or joint restraint devices, such work will be incidental to the pipe.
- P. Polyethylene Bond Breaker:** No separate payment will be made for polyethylene bond breaker such work will be incidental to the pipe and fittings.
- Q. Tapping Sleeves and Valves (Includes Tee, Valve, and Thrust Block):** Payment for Tapping Sleeves and valves will be at the bid price per each including sleeve and valve, complete and shall be considered full compensation for all labor, tools, equipment, materials and incidentals necessary to complete the item. Exploratory excavation to determine the existing pipe material and outside diameter of the pipe being tapped shall be considered as incidental to this bid item. The Contractor shall include payment for the "right to work" Permit, (tap permit), if applicable, and tapping fees in this bid item.
- R. Adjust Valve Box:** Payment for adjust valve box will be at the bid price per each, complete and shall be considered full compensation for all labor, tools, equipment, materials and incidentals necessary to complete the item.
- S. Adjust Curb Stop Box:** Will be at the bid price per each, complete and shall be considered full compensation for all labor, tools, equipment, materials and incidentals necessary to complete the item.
- T. Abandonment of Water Main and Appurtenances:** No separate payment will be made for abandonment of water mains and appurtenances, when called for on the

construction plans; such work will be incidental to the project unless otherwise specified.

- U. Abandonment of Water Main and Appurtenances, Water Main Branch Connections:** Shall be paid for under the per each entitled "Abandonment of Water Main and Appurtenances Branch Connection".
- V. Salvaging Fire Hydrants, Valves and Valve Boxes:** No separate payment will be made for salvaging and delivering salvaged materials including fire hydrants, auxiliary valves, valves and boxes; such work will be incidental to the project unless otherwise specified.
- W. Removal and disposal of Pipe:** No separate payment will be made for the removal of pipe materials to facilitate the progression of the work; such work will be incidental to the project unless otherwise specified.
- X. Abandonment of Water Services and Appurtenances, 2 Inches and Smaller:** Will be paid for under the per each entitled "Abandonment of Water Services and Appurtenances, 2 inch and smaller".
- Y. Abandonment of Water Services and Appurtenances, Larger than 2 Inches:** Will be paid for under the per each entitled "Abandonment of Water Services and Appurtenances, Larger than 2 inches".
- Z. Reuse of Water Tap Hole, 2 Inches and Smaller:** Reuse of Water tap hole, 2 inches and smaller will paid for as "Reuse water tap hole, 2 inches and smaller".

END OF SECTION