

DIVISION 15

WATERMAINS

15.01 Description:

The work shall consist of constructing a watermain with types of water pipe and joints specified by size or sizes and at the depths shown on the plans. This includes the furnishing of all labor, equipment, and materials except as hereinafter specifically provided.

All reference to American Water Works Association (ANSI/AWWA) standards shall be to the latest revision thereof.

15.02 Materials:

All materials shall be furnished by the Contractor and shall meet the following requirements:

The Contractor will furnish certification by the Manufacturer stating that the pipe, specials, valves, hydrants or other materials as required by the Engineer conform to the required specifications.

All stainless steel materials used in this Division shall conform to ASTM F-593 or F-594.

All watermain material shall be tested and certified by an independent testing agency to meet NSF Standard 61 requirements, indicating that there are no adverse health effects associated with the material.

15.02.01 Ductile Iron Pipe – Ductile iron pipe shall meet or surpass ANSI/AWWA C151/A21.50-816 (R86), as modified below.

All pipe shall be centrifugally cast and enameled with cement mortar on the inside (AWWA C104). The exterior and interior shall also be coated with a bituminous seal coat. The pipe, unless otherwise specified, shall be “Tyton,” “Belltite,” or “Super Belltite,” slip type coupled (AWWA C111). All pipe shall be marked with a “home” line.

Unless otherwise specified, pipe shall be ductile iron furnished as follows:

<u>Size</u>	<u>Ductile Iron Class</u>	<u>Ductile Iron Wall Thickness</u>
4 in.	53	0.32 in.

6 in.	53	0.34 in.
8 in.	53	0.36 in.
12 in.	53	0.40 in.
16 in.	53	0.43 in.
18 in.	53	0.44 in.
20 in.	53	0.45 in.
24 in.	53	0.47 in.

- 15.02.02 Concrete Water Pipe – Concrete water pipe shall meet or surpass ANSI/AWWA C-301 with a working pressure of one hundred seventy five (175) psi.
- 15.02.03 Watermain Fittings – All fittings shall be ductile iron watermain fittings in accordance with ANSI/AWWA C-153/A21.10 and with a minimum pressure rating of three hundred fifty (350) psi. Fittings shall have mechanical joints in conformance with ANSI/AWWA C-110/A21.10. They shall be bituminous coated as per ANSI 10-8.3 and have cement lining in accordance with ANSI/AWWA C104/A21.4 .
- 15.02.04 Brass Water Fittings – Corporation stops shall have Mueller threads. Curb stops shall be Minneapolis Pattern. Curb boxes shall be five feet-six inches (5'-6") depth, Mueller H-103000 or equal.
- 15.02.05 Hydrants – Hydrants for use by the Wyoming Fire Department shall be in strict conformity with the AWWA C502 Standard Specification or the latest revision thereof, and the following specifications:
- (a) The hydrant shall have a five and one-quarter (5-1/4") inch valve opening.
 - (b) The hydrant barrel shall have at least seven (7") inch inner diameter.
 - (c) The hydrant stem shall be at least one and one-quarter (1-1/4") inch in diameter and secured at both ends by pins and squared sockets.
 - (d) The inlet at the hydrant butt shall be mechanical joint ANSI-A21.11 standard six (6") inch.
 - (e) The hydrant shall have two – two and one half (2-1/2") inch National Standard hose coupling male screw thread outlets and one – four (4") inch standard male pumper connection.
 - (f) The hydrant shall have a bury length of six (6') feet from the invert of the inlet to the ground line.
 - (g) Each nozzle cap shall have a suitable gasket.

- (h) The hydrants shall be painted with #913 Yellow Machinery Enamel or fusion bonded epoxy coating above grade and with two coats of asphalt varnish below grade.
- (i) The hydrant operating nut and nozzle caps shall have a one and three-quarter (1-3/4") inch square by one (1") inch thick section for the wrench.
- (j) "O" ring stem packing in the hydrant top is acceptable only if a reservoir of grease is located between the rings. If the operating threads are in the hydrant top, then packing must be between them and the water passages. The "O" rings, if used, shall be of neoprene or silicone rubber.
- (k) The main valve of the hydrant shall be rubber.
- (l) The hydrant shall be capable of withstanding two hundred (200) foot-pounds of torque in both the opening and closing directions without causing permanent deformation of metal parts.
- (m) Approved hydrants shall be one of the following:
 - East Jordan Iron Works
 - US Pipe Metropolitan 250 (Model 94)
 - American AVK Company, High Pressure 250 psi, Nostalgic, Dry Barrel Hydrant (Model 2780)
- (n) The bronze valve seat shall be threaded into a bronze drain ring or shoe bushing to provide ease of removal of valve and valve seat, if necessary.
- (o) All hydrants shall be fully bronze mounted throughout with all moving parts of bronze or bronze bushed eliminating any iron to iron, or iron to steel or steel to bronze in contact points including threaded portion of stem.
- (p) Hydrant shall be designed that in case of accident or breaking of hydrant barrel, hydrant valve will remain closed by mechanical design.
- (q) Chains on outlets to be eliminated.
- (r) Hydrant weep holes shall be plugged.

15.02.06 Gate Valves – All gate valves between sizes three (3") inch and twelve (12") inch shall be of the resilient wedge type per Section 15.02.07.

15.02.07 Resilient Seated Gate Valves – Valves shall be resilient wedge type and are approved between sizes four (4") inch and sixteen (16") inch. All valves shall be manufactured and tested to the requirements of AWWA Standard C509 or C515 and UL 262. All valves shall have a two hundred fifty (250) psi design pressure rating and a test pressure of five

hundred (500) psi. A certification of manufacturer and testing shall be provided upon request. Valve body, bonnet and solid gate shall be of ductile iron in accordance with ASTM A536 and shall be totally encapsulated with epoxy coating.

Gate shall be ductile iron and shall be totally encapsulated in rubber. This rubber coating shall be permanently bonded to the ductile iron wedge casting and shall meet ASTM D429 tests for rubber to metal bonding.

The Valve stem shall be made of high strength Manganese Bronze with a minimum tensile strength of 60,000 P.S.I. and a 32,000 P.S.I. yield strength.

The stem seal shall have two “O” ring seals in the seal plate which shall be replaceable with the valve in the full open position at rated working pressure.

The valves shall open right unless located easterly of the Division Avenue centerline.

All Resilient Seated Gate Valves shall be one of the following unless approved in writing by the Engineer:

1. East Jordan Iron Works Flowmaster
2. American Flow Control Series 2500
3. American AVK Series 45 Resilient Seated Gate Valve

15.02.08

Butterfly Valves – All butterfly valves shall be of the tight closing, rubber seat type with rubber seats, which are bonded to the valve body. Metal-to-metal sealing surfaces are not permitted. Valves shall be bubble tight at rated pressures with flow in either direction and shall be satisfactory for applications involving valve operation after long periods of inactivity. Valve discs shall rotate ninety degrees from the full open position to the tight shut position. Valves shall meet the full requirements of AWWA Specification C504, Class 150-B. The manufacturer shall have manufactured tight closing rubber seated butterfly valves and buried service operators for a period of at least five years. All valves shall be Henry Pratt Company “Groundhog,” or approved equal.

- (a) Valve bodies shall be constructed of cast iron ASTM A-126 Class B, and shall have integrally cast mechanical joint ends (or shall be flanged, and flange drilling shall be in accordance with ASA B16-1). Two trunnions for shaft bearings shall be integral with each valve body. Body thickness shall be strictly in accordance with AWWA C504-66, Class 150-B.
- (b) All valve discs shall be constructed of ASTM A-436 Ni-Resist, Type 1.
- (c) Valve shafts shall be constructed of 18-8 type 304 stainless steel and shall be a one-piece unit extending full size through the valve disc and valve bearings. Stub shafts will not be acceptable.

- (d) Valve seats shall be of a natural rubber or synthetic compound. Bonded in seats must be simultaneously molded in, vulcanized and bonded to the body and the seat band must withstand seventy five (75) pounds pull under test procedure ASTM D-429, Method B. Valves with seats affixed to the disc shall not be acceptable. Valves employing ring-type rubber seats not permanently affixed to the body shall not be acceptable.
- (e) Valves shall be fitted with sleeve type bearings. Bearings shall be corrosion resistant and self-lubricating. Bearing load shall not exceed two thousand five hundred (2,500) p.s.i.
- (f) Valve operators shall be of the traveling nut-type designed to withstand three hundred (300) foot pounds of input torque at full open or closed positions without damage to the valve or operator. All operators shall be fully gasketed and grease packed, and designed to withstand submersion in water to ten (10) p.s.i. Valves shall open with a clockwise (counter clockwise) rotation of the AWWA nut and shall require a minimum of thirty (30) turns to move from fully open to fully closed.
- (g) All surfaces of the valve shall be clean, dry and free from grease before painting. The valve interior surfaces, except seating surfaces, shall be evenly coated with black asphalt varnish in accordance with Federal Specification TT-V-51 A and AWWA C504.

Hydrostatic and leakage tests shall be conducted in strict accordance with AWWA C504, Section 13.
- (h) Four (4") inch, six (6") inch, and eight (8") inch valves shall have mechanical joint connections. Twelve (12") inch, sixteen (16") inch, and twenty (20") inch valves shall have flanged connections.
- (i) Valves twelve (12") inch and larger shall be housed within a manhole structure suitable in size to allow room for maintenance on the valve.

15.02.09 Tie Rods, Clamps, Nuts, Eye Bolts and Appurtenances – All tie rods and nuts furnished as an alternative to restrained join pipe shall be stainless steel, ASTM F593 and F594. Eye-bolts and nuts shall be three-quarter (3/4") inch diameter and shall be stainless steel. Clamps and other appurtenances which are not ductile iron, cast iron or stainless steel, shall be coated as specified herein.

15.02.10 Other Materials – Other materials shall conform to those Divisions of the Standard Construction Specifications of the City of Wyoming, which describe work in which the materials will be used or as specified on the plans or in the proposal items or shall conform to standards approved by the City of Wyoming Engineering Department.

15.03 Furnishing Material:

The Contractor shall furnish all watermain material such as: ductile-iron pipe, hydrants, valves, valve boxes, and special castings. The Contractor shall provide all the protection for this material until it has been incorporated in the completed project. The Contractor shall be responsible for transporting all test hydrants to the job site from the Public Works Building inventory.

15.04 Construction Methods:

15.04.01 Excavation – Excavation shall be done in accordance with Division 13 with the following additions:

- (a) Alignment – Alignment of the trench shall be as shown on the plans unless otherwise authorized by the Engineer.
- (b) Depth – Depth of the watermain shall be five feet nine inches (5'-9") below proposed centerline of the street or the existing ground whichever is lower, to centerline of pipe unless specified on the plans or approved by the Engineer.
- (c) The Width of the Trench may vary according to several controlling conditions, but in all cases, shall be of ample width to permit good workmanship. The minimum width of trench shall be thirty (30") inches for pipe less than ten (10") inches in diameter; for larger sizes of pipe, the maximum width of trench shall be not more than two (2') feet greater than the inside diameter of the pipe, except as otherwise specified or directed.

15.04.02 Alignment Changes – The data shown on the plans is indicative of adjacent and/or interfering structures and features, but is not guaranteed to be complete or exact in location and detail. Insofar as it is possible, the Contractor shall do the work in the locations shown on the plans, with minor adjustments approved by the Engineer. Deflections in pipes and fittings shall be made insofar as possible with sufficient number of joints being deflected to allow for clearance of underground structures. The maximum deflection permissible shall be limited to that allowed in the deflection tables herein.

15.04.03 Interruption of Water Service – The Contractor shall not operate any valve in any watermain in service, excepting that in case of emergency he shall, with the approval and under the direction of the Engineer, operate such valves as directed to relieve the emergency. In case of emergency shutoff, the Contractor shall immediately notify the Fire Department, City Water Department and consumers affected, of the time and probable duration of each shutoff.

In other cases, the Contractor shall request the Engineer to notify the Fire Department, City Water Department, and consumers affected. Said notification shall be at least twenty four (24) hours prior to the shutoff. The Contractor may be asked to help in notification of residents affected. The City Public Works Department will then have

valves opened and closed on mains in service where necessary, in conjunction with the Contractor’s work, subject to such limitation as to time and place as requirements of the water system shall impose.

The City of Wyoming shall provide all temporary water services to houses as required. The Contractor shall be responsible for only the hoses that he damages. In no instance shall the Contractor connect or make a temporary water service connection.

The Contractor shall be responsible for all costs for City of Wyoming crews to locate and operate valves, either to shut off or turn on watermain as a part of construction associated with the project. Contractor shall be responsible for all costs associated with City of Wyoming performing temporary shut downs, emergency or planned as part of construction.

All watermain alterations or other work which necessitates the shutting off of watermains shall be performed in accordance with the following schedule:

- | | | | |
|-----|---|--|---|
| (a) | <u>Residential Area</u>
(no schools affected)
Monday - Saturday | <u>Shut-off</u>
8:00 a.m.
1:00 p.m. | <u>Turn-on</u>
11:30 a.m.
4:30 p.m. |
| (b) | <u>Residential Area</u>
(schools affected)
Monday - Friday

Friday night to
Saturday morning

Saturday only | 7:00 p.m.

7:00 p.m.

8:00 a.m.
1:00 p.m. | 6:00 a.m.

7:00 a.m.

11:30 a.m.
4:30 p.m. |
| (c) | <u>Commercial or Industrial Area</u> – Saturday only or at off-peak business hours. All businesses are to be contacted as to most convenient time for shutoffs. | | |

15.04.04 Pipe Installation:

- (a) Manner of Handling Pipe, Etc. – Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work.

All pipe fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

- (b) Grade – The Contractor shall always check the lines and grades from the stakes and any irregularity thus discovered shall be referred to the Engineer for correction before proceeding with the work.
- (c) Defective Pipe – Before lowering and while suspended, the pipe shall be inspected for defects. Any defective, damaged, or unsound pipe shall be rejected. Furthermore, all pipe and special castings shall be carefully examined for defect and no pipe or special casting shall be laid which is known to be defective. If any such pipe or special casting having obvious defects shall be discovered to be defective after being laid, it shall be removed and replaced with sound pipe or a sound casting by the Contractor, at his own expense. Defects discovered in pipe through testing process shall be subject to terms identified in Appendix A, “Defective Pipe”.
- (d) Pipe Kept Clean – All dirt or other foreign matter shall be removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying.

Whenever work is stopped for the day, a standard plug shall be securely placed water tight in the end of the pipe. No tools or other articles shall be stored in the pipe at any time.

- (e) Cutting Pipe – The Contractor shall cut the pipe in a neat, straight and uniform manner whenever necessary for placing valves, hydrants, special castings, or closure pieces without damage to the pipe and without extra cost to the City. The Contractor shall, without additional compensation, use all pieces of pipe cut for the proper location of valves, hydrants, specials, or other purposes, and shall cut off cracked portions of pipe as directed by the Engineer. The area adjacent to cuts made on slip joint pipe shall be beveled before assembly of the joint.

Cast iron pipe shall not be cut with a chain cutter, chisels, or any tool or machine that will cause damage to the pipe or the cement lining. The method of cutting pipe shall be subject to the approval of the Engineer.

- (f) Bell Ends to Face Direction of Laying - Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying; and for lines on an appreciable slope, bells shall, at the direction of the Engineer, face up-grade.
- (g) Storage – All sections of pipe shall be stored off of the ground surface and in such a configuration that the pipe is not susceptible to being flooded with water or debris deposited inside the pipe. It is recommended that the pipe be thoroughly cleaned once delivered to the job site, and the ends sealed or capped to prevent dust or animal intrusion.

(h) Permissible Deflection in Mechanical Joint and Slip Joint Pipe:

Maximum Deflection - Full Length Pipe								
Maximum Permissible Deflection per Length (Inches)					Approximate Radius of Curve Produced by Successive Offsets (Feet)			
Size of Pipe	12 ft Length	16 ft Length	18 ft Length	20 ft Length	12 ft Length	16 ft Length	18 ft Length	20 ft Length
3	21	28	31		85	110	125	
4	21	28	31		85	110	125	
6	18	24	27		100	130	145	
8	13	18	20		130	170	195	
10	13	18	20		130	170	195	
12	13	18	20	22	130	170	195	220
14	9	12	13-1/2	15	190	250	285	320
16	9	12	13-1/2	15	190	250	285	320
18	7-1/2	10	11	12	230	300	340	380
20	7-1/2	10	11	12	230	300	340	380
24	6	8	9	10	300	400	450	500
30	6	8	9	10	300	400	450	500
36	5	7	8		330	440	500	
42	5	6	7-1/2		340	450	510	
48	5	6	7-1/2		340	450	510	

- (i) Railroad Crossing – Whenever the line of the pipe shall cross any railroad or lie close to any railroad track, all of the precautionary construction measures required by the railroad officials shall be followed by the Contractor.
- (j) Cast Iron Sleeves – In connecting ductile iron pipe together with a cast iron sleeve, a spacer shall be placed to fill the space. The spacer shall be a piece of ductile iron pipe of the same diameter and type as the adjoining pipes and shall be cut straight and uniform and free of defects and damage. Such sleeves shall be a minimum of eighteen (18”) inches in length for all size watermain.

15.04.05 Jointing Mechanical Joint Pipe

- (a) Preparation of Pipe Ends – The last eight inches outside of the spigot and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint, and then painted with a soap solution made by dissolving one-half cup of granulated soap in one (1) gallon of water, or any other approved lubricant. The retaining gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end of the pipe to be joined. The rubber gasket

shall be painted with the lubricant and placed on the spigot end with the thick edge toward the gland.

- (b) Alignment of Pipe in Bell – The spigot shall be centered in the bell, the pipe forced “home,” and brought into true alignment; it shall be secured there with earth carefully tamped under and around it, excepting at the bell holes. Care shall be taken to prevent dirt from entering into the joint space.
- (c) Bolting of Joint – The entire section of the pipe shall be pushed forward to seat the spigot end in the bell. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The retaining gland shall be moved along the pipe into position for bolting, all of the bolts inserted, and the nuts screwed up tightly with the fingers. The torque limits for various sizes of bolts shall be as follows:

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

Nuts spaced one hundred eighty (180°) degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. When tightening bolts, it is essential that the gland be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This may be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. Repeat this cycle until all bolts are within the above range of torques. If effective sealing is not attained at the maximum torque indicated above, the joint should be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation practice is to be avoided.

15.04.06 Jointing Slip Joint Pipe

- (a) Preparation of Pipe Ends – After the pipe is lowered in the trench and positioned for jointing, the inside of the bell and the outside of the spigot end of the jointing pipe must be wiped clean to the guide line stripe. The gasket is then inserted in the groove in the bell by flexing so that it is in the proper position. A liberal coating of the special lubricant is applied to the outside of the spigot end from the plain end to the guide line.
- (b) Alignment of Pipe in Bell – The spigot end is centered in the bell and pushed or forced home. The smaller sizes of pipe can be pushed or forced into place by hand; larger sizes will require the use of mechanical assistance. Only lubricants

furnished by, or approved by, the City shall be used. The lubricant shall be non-toxic, tasteless and odorless.

The condition of the trench bottom must be such that correct position and location of the pipe to be jointed is in a straight line assuring a joint maximum tightness and permanent seal.

15.04.07 Setting Valves, Valve Boxes and Specials

- (a) General – Gate valves, butterfly valves, and specials shall be set and jointed to new pipe in the manner heretofore specified for cleaning, laying and jointing pipe.
- (b) Valve Boxes – Cast iron valve boxes shall be firmly supported and maintained plumb over the operating nut of the gate valve, with box cover flush with the pavement, or at such other level as may be directed. Any valve box which is to remain in the pavement area shall be securely set vertically in place with material consistent with the surrounding pavement (bituminous or concrete).

All geared valves and such other valves as may be designated on the plans shall be set in valve chambers with the operating nuts readily accessible for operation through the valve chamber opening.

- (c) Valve Chambers – All valve chambers shall be constructed to conform to the requirements of Division 16.

15.04.08 Setting Hydrants

- (a) Location – Hydrants shall be set at the locations shown on the plans, or as directed by the Engineer.
- (b) Position of Nozzles – All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle pointing normal to the curb.

Hydrants having hose nozzles at an angle of forty five (45°) degrees shall be set normal to the curb. The nozzles shall be a minimum of sixteen (16”) inches above the established curb grade, or a minimum of fourteen (14”) inches above the finish grade of topsoil, or as directed by the Engineer. Hydrant extensions necessary to achieve proper height above finish grade shall be included within the Hydrant unit price without additional compensation.

- (c) Hydrants Removed for the Extension of a Watermain – When a hydrant is removed for the extension of a watermain, the hydrant shall become the property of the City of Wyoming if greater than two years old. Hydrants shall be removed and delivered to the City of Wyoming Public Works building for storage.

(d) Anchorage for Hydrant – The bowl of each hydrant shall be tied to the pipe tee with an approved restraining method as shown on the plans or as directed by the Engineer. The hydrant assembly shall be rodded from the watermain tee to the hydrant valve. On the hydrant side of the valve, the pipe shall be 100% restrained using an approved method. If the hydrant is an excessive distance from the hydrant valve, the Engineer may verify in writing or on the plan specific distances required for proper restraint. Thrust blocking is not an approved method of restraining hydrants. The cost of restraining shall be included in the price bid for setting hydrant and no extra payment will be made.

15.04.09 Plugging Dead Ends – All dead end watermains shall have a hydrant within the immediate proximity for proper flushing. The dead ends shall be mechanical joint and shall be closed with Standard C.I. plugs. Plugs shall be joined and made watertight.

15.04.10 Anchorage of Bends, Tee and Plugs – On all watermain work four inch diameter or larger, all hydrants, bends, tees, plugs and other fittings shall be securely rodded or restrained as approved by the Engineer by one of the following approved methods:

1. Rods
2. Thrust Blocks
3. Mega-lugs
4. TR Flex Joint
5. Field Lock Gasket

Blocking against the trench bottom and walls by the use of concrete foundations, concrete encasements, thrust blocks of Grade C concrete as per Standard Detail may also be required. However, thrust blocks will only be permitted at such locations where the Drawings specifically indicate that they will be allowed, or as approved by the Engineer. The size and shape of the foundation, thrust block or other approved support shall be approved by the Engineer.

Approval of restraining method by the Engineer shall not relieve the Contractor from his responsibility for the adequacy and limits of restraint.

Installation of each restraining method shall be per the manufacturers recommendations.

On concrete water pipe, welded type tied joints shall be used on full bevel adapters and bends to eleven degrees and on any joint within eight feet either way from them. The welded type tied joint shall consist of four 5 inch long pieces of 5/16 inch rod welded in between the spigot and bell at each joint to be tied. The four pieces of rod to be welded shall be placed ninety degrees apart from each other or at quarter points around the pipe's circumference at each joint to be tied. The welds are to be made without overheating the rubber gasket. Grout is to be poured in a diaper around the pipe after the welding of the joint is completed.

The cost of restraining and/or providing the concrete foundations, and for all work in connection therewith and incidental thereto shall be included in the price bid for the laying of the pipe and no extra payment will be made.

- 15.04.11 Hydrostatic Testing, Chlorination and Bacteriological Testing – Please refer to the most recent testing procedures located in Appendix A at the end of Section 15. Appendix A is the required procedure that shall be followed for pressure testing and chlorinating new watermains.

All watermains will be pressure tested and chlorinated by the City of Wyoming staff. At no time shall the Contractor attempt to test or chlorinate watermain. Contractor shall be responsible for providing all hoses and manpower necessary for City of Wyoming to test watermain. Contractor will be billed for all costs associated with the City of Wyoming to pressure test and chlorinate watermain per Section 15 Appendix A.

- 15.04.12 Laying Water Services – Proposed water services will be placed in the same trench as the sanitary sewer lateral where possible. The Contractor shall backfill the lateral trench to five feet six inches (5'-6") below finish grade prior to installation of the water service. Following the installation of the water service, the Contractor shall complete the trench backfill. All water services shall be direct taps and corporation stops at the watermain. No saddles will be allowed without prior approval of the Engineer (exception: two-inch (2") tap on a six-inch (6") main).

Water services shall be laid perpendicular to the watermain unless otherwise directed by the Engineer. The curb stop shall normally be two (2') feet from the sidewalk, toward the street, or eight (8') feet from the street right-of-way line toward the street. The curb stop shall be installed on an approved block or brick support so that the valve can be operated normally after backfilling. The service shall be sealed shut by using a copper connection or cast iron plug.

All copper joints or connections shall be formed on tubing cut square and flared with suitable tools. The flare shall be made large enough to form a seal at the fittings more than one-sixteenth of an inch from the end of the pipe. All joints shall be proven to be drop tight by visual inspection when under test pressure.

- 15.04.13 Lowering of Water Services – All existing water services which have less than four (4') feet of cover due to street cuts shall be lowered so as to have five and one-half (5-1/2') feet of cover as directed by the Engineer. The Contractor shall insulate the section of service from the main down to five and one-half (5-1/2') foot depth with a suitable pipe wrap.

- 15.04.14 Tapping for Water Services – Taps at the main (2" or less) shall be made either by the City or the Contractor as stated on the proposal, but no taps shall be made until a permit has been issued. The tap shall be installed with the main under pressure using an approved tapping machine. Methods to minimize or eliminate corporation shavings from entering the watermain shall be implemented per tap manufacturer's recommendations. Tapping machines with flushing mechanisms shall be open during tapping process to minimize shavings entering the main. The tap shall be installed along the horizontal axis of the pipe. The flow arrow shall point away from the main. Only those taps for which permits have been issued shall be made.

Taps made without a flushing mechanism on the tapping machine shall be done with one valve closed on the main to create a one-way flow of the main. At the end of each day of tapping, the main shall be flushed of all shavings and the valve re-opened.

All taps over two (2") inches shall be made by the City.

15.04.15 Watermain Relocation – This item includes all labor and material necessary to relocate watermain as per Standard Detail.

15.04.16 Backfilling

(a) Backfill material shall be placed on sections of the watermain only after such sections have been approved by the Engineer for backfilling.

(b) Class II material shall be placed under and around the watermain until it is completely covered to a depth of at least one (1') foot. This portion of the backfill shall be placed in layers not more than twelve inches in thickness, and each layer thoroughly compacted without displacing the pipe. The balance of the backfill including that around valve chambers and other structures, shall be free from large stones and lumps and shall be placed in layers not more than twelve (12") inches thick, each layer being fully compacted.

(c) When the watermain is to be constructed in clay soil, or in soil which is unsuitable for backfilling, the trench shall be backfilled with Class II sand and compacted as specified.

(d) When watermain location is in an easement and outside of current and future right-of-way, or outside of parking areas or areas subject to vehicular traffic, the Contractor may request approval from the Engineer to backfill the watermain with a two (2') foot envelope around the pipe. Beyond the two (2') foot envelope, native backfill material may be used, if approved by the Engineer.

15.04.17 Cleaning Up – The Contractor shall remove surplus excavated materials and materials for construction as the work progresses, and shall render the street suitable, safe, and convenient for traffic. Before final acceptance of the work, the Contractor shall clean the street surface, walks, gutters, fences, lawns, private property, right-of-way, and structures, leaving them in as good condition as originally found, and shall remove all machinery, tools, surplus materials, temporary buildings and other temporary structures from the site.

15.05 Method of Measurement:

15.05.01 Place Watermain of the size or sizes shown shall be measured in lineal feet along the centerline of the watermain in place from end to end of the line of pipe including the lengths of specials and valves.

15.05.02 Furnish and Lay Water Services – shall be measured on a unit basis, and shall include tapping the watermain, laying the service, and setting the stop box.

- 15.05.03 Furnish and Place Standard Valve Chamber, Setting of Valves, Setting Six (6") Inch or Eight (8") Inch Valves Including Setting C.I. Valve Boxes, Tap for Water Service Including Furnishing Corporation Stop, Setting Five (5") Inch Hydrants, and Place Specials – shall be measured in units as shown in the proposal.
- 15.05.04 Watermain Relocation – shall be measured by linear feet in place, from end joints of the pipe to be relocated, including the lengths of specials and valves. Or, if so shown on the plans or in the proposal, each location of such work shall be measured as a unit. Said cost shall include any required insulation.
- 15.05.05 Other Items – shall be measured in place in the units shown in the proposal.
- 15.06 Basis of Payment:
- 15.06.01 Lay Water Pipe or Furnish and Lay Water Pipe – of the size or sizes shown shall be paid for at the contract unit price which payment shall be payment in full for the furnishing of all labor, equipment, and completing the watermain ready for use.
- 15.06.02 Furnish and Lay Water Services – shall be paid for at the contract unit price which payment shall be payment in full for the furnishing of all materials, labor and equipment, and completing the water service ready for use.
- 15.06.03 Furnish and Place Standard Valve Chamber, Setting of Valves, Setting Six Inch or Eight Inch Valves Including Setting C.I. Valve Boxes, Tap for Water Service Including Furnishing Corporation Stop, Setting Five Inch Hydrants, and Place Specials – shall be paid for at the contract unit price for each of the items which payment shall be payment in full for the furnishing of all labor, equipment, and completing the work.
- 15.06.04 Watermain Relocation – shall be paid for at the contract unit price which payment shall be payment in full for any unclassified excavation for removing existing watermain, for furnishing and placing relocated watermain, furnishing and placing necessary compacted sand backfill, restoration of surface, and for all labor, equipment, and material and all else required in connection therewith and incidental thereto.
- 15.06.05 Other Items – shall be paid for at the contract units shown in the proposal which payment shall be payment in full for all required furnishing of materials, labor, and equipment necessary to complete the work.