



CITY OF BATTLE CREEK

ADDENDUM # 1

IFB# 2019-044B

TITLE: 2019 Water Main Project

ADDENDUM ISSUED: 4/1/19

NOTE! City Hall now has Security on the 1st floor. Please allow extra time to get through Security when dropping off your bid.

The following changes, additions and deletions have been provided:

ADDED attached Notice to Bidder for Columbia Ave Water Services page.

REPLACE page 27-39 Special Provision with the attached revised Special Provision Addendum 1.

Due date and time remain the same.

This addendum must be acknowledged or your bid may be deemed non-responsive.

NOTICE TO BIDDER
Columbia Ave Water Services

cef/City of Battle Creek

April 2019

DESCRIPTION

Only Michigan Department of Transportation approved trenchless methods will be permitted when replacing water main services along Columbia Ave.

Acceptable methods can be found here:

<https://mdotjboss.state.mi.us/webforms/GetDocument.htm?fileName=3701.pdf>

Specifically, impact moling will be prohibited. Pulling new service line by utilizing existing service line is acceptable along with other approved methods.

**CITY OF BATTLE CREEK
REVISED SPECIAL PROVISION
FOR
WATER MAIN
ADDENDUM #1**

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February 2019

I General

1 Description

This work shall consist of installing and placing into operation water mains, water services, valves, hydrants, fittings, and other appurtenances of the required class and the specified sizes; and shall include excavation and backfilling. The Contractor shall furnish all labor, equipment and materials necessary to properly complete the work as shown on drawings and as specified herein.

All work and materials shall be in accordance to the requirements per Section 823 of the 2012 *Standard Specifications for Construction* by the Michigan Department of Transportation.

II Construction Materials and Products

1 Shop Drawings

- a Shop drawings and manufacturers detailed literature shall be submitted to the Engineer for approval before any work may begin. These drawings shall detail the thrust restraint design for all fittings and pipe. Restraint shall be restraint joint pipe mechanism based on "Thrust Restraint Design for Ductile Iron" Sixth Edition 2006 as published by the Ductile Iron Pipe Research Association. Thrust blocks shall not be considered for calculating restraint design. The design shall be based on 150 psi or two times the working pressure, whichever is greater.

2 Pipe and Fitting Identification

- a Each pipe, fitting or special section shall have plainly and permanently marked thereon:
 - Pipe class.
 - Thickness class.
 - Manufacturer's name or trademark.
 - On bends, the angle turned thereby.
 - Identification of specials to show proper location in line.
 - On beveled pipe, amount of bevel and point of maximum bevel.
 - Each end of each bevel end pipe, fitting, or special shall be marked with a stripe of paint, approximately 1½ inches wide and 2 feet long applied along the top centerline.
 - The Contractor shall be responsible for the handling and storing of all materials per manufacturer's recommendations and to prevent deterioration and contamination from exposure to the weather and other conditions.
 - All damaged parts upon delivery or from storage shall be replaced at no cost to the owner.

3 Ductile Iron Pipe

- a AWWA C151 minimum thickness Class 52 Pipe, cement – mortar lined and bituminous coated inside and outside in accordance with AWWA C104.
- b Joints:
 - i. Slip-on compression type joint or mechanical joint meeting AWWA C111
 - ii. Rubber gaskets shall conform to ANSI A21.11, AWWA C111, and AWWA C115
 - iii. In contaminated areas gaskets shall be nitrile or fluoroelastomer.
- c Fittings:

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- i. Full Body meeting AWWA C110
- ii. Compact meeting AWWA C153
- iii. All fittings to have mechanical joints meeting AWWA C111 and restrained.

See Appendix A, City of Battle Creek Approved Material Listing for joint restraints, ductile iron pipe, and pipe fittings.

4 Polyvinyl Chloride (PVC) Pipe

- a AWWA C900 DR18 PVC pressure pipe water main shall be manufactured from compounds conforming to PVC cell classification of 12454 as defined in ASTM D1784. Pipe shall be blue in color and carries approval of ANSI/NSF Standard 61. PVC pressure pipe will only be allowed up to 12 inches in diameter. PVC pipe shall not be installed in areas of known contamination.
- b Joints
 - i Slip-on compression type joint shall conform to ASTM F477 and ASTM 3139
 - ii Restrained joints shall utilize either JM Eagle Eagle Loc 900™ restrained joint system or Northern American Certa-Lok™ restrained joint system or approved equal.
- c Fittings
 - i Full Body meeting AWWA C110
 - ii Compact meeting AWWA C153
 - iii All fittings to have mechanical joints meeting AWWA C111 and restrained.

See Appendix A, City of Battle Creek Approved Material Listing for joint restraints, PVC pipe, and pipe fittings, and saddles. Saddles shall be required on all Water Services connections to PVC pipe.

5 Valves and Boxes.

Resilient Wedge Gate Valves.

Required on 4" mains to 12" mains, or as directed by the Engineer.

- a. All gate valves shall conform to the latest revision of AWWA Standard C509 or C515 covering resilient seated gate valves. Valves shall be rated 250 psi. All ferrous components shall be ductile iron.
- b. Gate valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- c. The valves shall be non-rising stem, opening by turning stem Left (counter clockwise) and provided with a 2" square operating nut with the word Open and an arrow cast in metal to indicate the direction to open. Operating nut shall be constructed of ductile iron and shall have four flats at the stem connection.
- d. The wedge shall be of ductile iron completely encapsulated with rubber. The wedge shall be symmetrical and seal equally well with flow in either direction.
- e. The sealing rubber shall be permanently bonded to the cast iron wedge to meet ASTM tests for rubber metal bond ASTM D429.
- f. Valves shall be supplied with o-ring seats at all joints. No flat gaskets allowed.
- g. Stems shall be cast bronze with integral collars in full compliance with AWWA. The stem stuffing box shall be o-ring seal type with 2 o-rings located above the thrust collar and 1 o-ring below. The 2

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o-rings above the collar shall be replaceable with the valve fully open and at its full working pressure.

- h. There shall be 2 low torque thrust bearings located above and below the thrust collar. The stem nut shall be independent of the wedge and shall be made of solid bronze. There shall be a smooth, unobstructed waterway free of all pockets, cavities and depressions in the seat area.
- i. The body and bonnet shall be coated with fusion bonded epoxy both interior and exterior, complying with AWWA C550 and be NSF 61 approved. Each valve shall have the manufacturers' name, pressure rating and the year manufactured, cast on the body.

See Appendix A, City of Battle Creek Approved Material Listing for resilient wedge gate valves.

b Butterfly Valves.

Required on 16" mains or larger, or as directed by Engineer.

- i. Butterfly valves shall comply with the latest revision of AWWA Standard C-504 Class 150B.
- ii. Butterfly valves shall be built to withstand a 150 psi working pressure.
- iii. Butterfly valve bodies shall be cast iron ASTM A126 Class B with mechanical joint ends complete with accessories (rubber, bolts, and glands).
- iv. Butterfly valve discs shall be ductile iron ASTM A536 Grade 65-45-12. All internal cast iron parts exposed to flowing water shall be coated with black asphaltic.
- v. Butterfly valve body seating surface shall be stainless steel ASTM A276, Type 304. The mating seating shall be natural rubber or "Buna N Rubber" meeting the requirements of ASTM D2000. Seating shall be a 360 degree resilient seat fully field adjustable and field replaceable without valve disassembly.
- vi. Butterfly valve shafts shall be single solid stainless steel ASTM 276, Type 304. The shaft and disc shall be connected by means of O-ring sealed taper pin held in place by a self-locking nut. The disc shall be held in the center of the valve by factory set thrust rings or collars. Shaft seals shall be of O-ring type or V-type packing.
- vii. Installation is for buried service. The valve shall be key operated with a 2" square operating nut open left (counter clockwise) and shall be located on the main side nearest to the edge of road or curb.

See Appendix A, City of Battle Creek Approved Material Listing for approved product listing for butterfly valves.

c Valve Boxes.

All buried valves shall be provided with valve boxes. Valve boxes shall be cast iron, 2-piece with screw type extension sleeve adjustment and suitable for the depth of cover required by the drawings. Valve box shafts shall be 5-1/4 inches in diameter and shall have a minimum thickness at any point of 3/16 inch. Valve box bases shall encapsulate the entire valve stem assembly, but not rest directly on the valve. Covers shall be of a round plug type suitable for easy removal, and shall have cast thereon the word "WATER."

- i. All parts of valve boxes, bases and covers shall be coated by dipping in hot asphalt varnish.

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See Appendix A, City of Battle Creek Approved Material Listing for approved product listing for valve box castings.

d Service boxes.

Service boxes for 1 inch curb stops shall be two-piece 6500 Series Tyler Union 95-E which has a maximum height of 64 inches. Services deeper than 64 inches must utilize one of the following extensions: Tyler 151, 152, 153, or 154.

Service box for 2 inch curb stop shall be cast iron, 2-piece with screw type extension sleeve adjustment and suitable for the depth of cover required by the drawings. Valve box shafts shall be 5-1/4 inches in diameter and shall have a minimum thickness at any point of 3/16 inch. Valve box bases shall encapsulate the entire curb stop assembly, but not rest directly on the curb stop. Covers shall be of a round plug type suitable for easy removal, and shall have cast thereon the word "WATER."

1 inch services shall be installed with a "Vadle Curb Box Lock" as per the manufactures recommendation and be included in the cost of other items.

See Appendix A, City of Battle Creek Approved Material Listing for approved product listing for valve box castings.

6 Fire Hydrant Assemblies.

- a. Hydrants shall conform to AWWA C502, as amended to date. All hydrants shall be "breakable" or "traffic" design, with replaceable sections or components of the barrel and stem.
- b. Hydrants shall have a compression type shut-off, opening against the pressure and which will remain closed in the event of accident, damage or breaking of the hydrant barrel.
- c. Hydrants are to have a minimum 5¼ inch valve opening with a 6 inch mechanical joint inlet and a 6 inch mechanical joint auxiliary gate valve between the water main and the hydrant. Auxiliary gate valves shall be provided with a valve box.
- d. Hydrants shall be provided with two or more drain outlets, which are part of the main valve mechanism. The drain outlets are to be tapped and the drain plugs are to be threaded brass and installed at the time of delivery. Removal of drain plugs shall be done by the Contractor prior to backfill unless groundwater is encountered or the Engineer directs otherwise. Where necessary for drainage, aggregate meeting the requirements for MDOT Class 4G, 34R, or 34G as specified in Section 902 of the MDOT 2012 Standard Specifications for Construction, shall be placed at the base of the hydrant.
- e. Hydrants shall have O-ring packing.
- f. Hydrants, including tops and nozzle caps, shall be painted chrome yellow.
- g. Hydrants shall open left (counter-clockwise). Hydrants shall have two standard 2½ inch hose nozzles and one 4½ inch pumper nozzle with National Standard Fire Hose threads and shall be equipped with caps, cap gaskets and chains.
- h. Operating nuts are to be pentagon in shape, measuring 1½ inches from flat to point. Height of the nut shall be at least 1 inch.

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- i. Hydrants shall be designed so that the direction of the nozzles can be reoriented without digging up the assembly.
- j. Hydrants shall be designed so that an extension to the barrel can be added above ground without excavation. Extensions shall be available in 6 inch increments.
- k. Hydrants shall be designed so that no excavation is needed to remove the main valve and movable parts of the drain valve.
- l. The bronze valve seat shall be threaded into a bronze drain ring or shoe bushing to provide ease of removal of the valve and valve seat on any hydrant that requires removal of the valve seat to replace the valve.

See Appendix A, City of Battle Creek Approved Material Listing for approved product listing for valve box castings.

7 Water Service Connections.

- a. Copper pipe service connections of 1 inch or 2 inch, shall be in accordance with ASTM Specification B88, or Federal Specification WW-T-799; "Type K", soft tempered copper or HDPE pipe in accordance with ASTM F876, F877, F2023, F2657, constructed per AWWA C 904, and meet ANSI/NSF Standard 61 & 14.
- b. Plastic service connections of 1 inch or 2 inch shall be SDR 9 in accordance with ASTM D2737, constructed per AWWA C 901, and meet ANSI/NSF Standard 61. Pipe dimensions shall meet copper tubing size standards.
- c. Corporation stops shall be bronze, AWWA C-800 Table 1 standard inlet with AWWA standard outlet for compression fitting.
- d. Curb stops shall be bronze, AWWA C-800 standard for compression fittings.
- e. Service clamps for 2 inch service connections shall be of the double strap type, ductile iron, with all stainless steel or galvanized parts, similar to Romac Style 202NU.
- f. Fittings for copper water services shall be of the compression type. Soldered joints shall not be used where pipe is buried.

See Appendix A, City of Battle Creek Approved Material Listing for approved product listing for valve box castings.

8 Pipe location devices

- a. All buried PVC and HDPE piping to have an electrically conductive [14 gauge] tracer wire with HDPE jacket to locate the pipe from grade level. All grade level connection points for the purpose of locating buried pipe to be identified and submitted to the municipality.
- b. Tracer wire to be secured to the PVC or HDPE pipe at [10 ft.] maximum intervals.
- c. Tracer wire intersections shall be electrically isolated from ground and continuity provide per manufacture's recommendation.
- d. Subsurface waterproof connectors specifically designed for buried service to be used.

9 Manhole Covers.

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Covers shall meet the requirements of MDOT "Q" cover and the City of Battle Creek's Standard Water Main Detail sheet that includes the city logo and the words "WATER" imprinted into the casting.

10 Pipe Testing.

At the discretion of the Engineer, pipe shall be tested for conformity with AWWA and ASTM specifications. The Engineer may choose one pipe per 1,000 feet of construction. The entire costs of testing shall be the Contractor's responsibility, whether performed by an independent testing lab or as part of the manufacturer's quality control.

11 Disinfection Materials.

- a. **High Test Calcium Hypochlorite (HTH, "Perchlor", "Maxochlor", "Pittchlor").** - Powder and water shall be mixed to form a 1 percent chlorine solution (10,000 ppm), pumping solution at a constant rate into the water main while bleeding off the water at the extreme end.
- b. **Liquid Chlorine.** - Liquid chlorine conforming to AWWA B-301 may be applied to the water main much the same way as the hypochlorite solution listed above.
- c. **Chlorine Gas.** - Chlorine gas shall not be used.

III Construction Methods

1 Scope of Work

This section consists of excavation and backfill; placement of pipe, fittings and appurtenances; and disinfection of the completed water system per Section 823 of MDOT 2012 Standard Specification for Construction, AWWA C600 and C605 along with the following specifications. It is the Contractor's task to proceed with the construction as rapidly and as expeditiously as possible and to present the City with a complete, sound, and operable piping system.

- a. The city will notify customer of shutoffs outside the project limit, but necessary to complete the work. The contractor will be required to notify residences within the project limits via door hangers that the city will provide, but contractor must complete the information for times and durations of shutoffs along with providing contact information for coordination of work.
- b. Contractor will be allowed to operate valves within the project limits and as designated by the Engineer until acceptance of the completed water main system.
- c. Salvaged material shall be made available to the City of Battle Creek at a designated location within the project limits or other location as agreed to in the Progress Meeting. Written notification of the material's availability shall be from the Contractor to the Project Engineer, at which the city will be given 14 days to remove the salvaged material after which it becomes the property of the Contractor. Salvage material includes, but not limited to, hydrants, manhole castings, valves, boxes, and other appurtenances.

2 Trench Excavation.

Water pipe shall be laid according to Utility Trenches detail F or G, as shown on MDOT Standard Plans R-83-B unless otherwise noted. Pedestrian crossings shall be erected and maintained by the Contractor where designated by the Engineer. The Contractor shall provide access to homes, commercial, industrial, etc. establishments as soon as backfill is completed. Said access shall always be provided during periods when the Contractor is not performing construction operations.

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No trench shall be left open and unattended when pipe work is not being executed within the trench unless under an emergency in which case the trench shall be closed by fencing, barricading, or other methods until the emergency is resolved. In no case shall the trench be left open overnight or on a weekend or holiday.

Undercutting unstable soil conditions within the trench shall be per Section 402.03.A of the current MDOT Standard Specifications for Construction and as directed by the Engineer.

3 Dewatering.

Dewatering of trenches shall be included as part of the water main installation with no separate payment. Dewatering shall be performed as necessary and shall conform to Section 402 of the current MDOT Standard Specifications for Construction, with the following additional requirements.

- a The Contractor shall perform his dewatering operations whenever groundwater conditions create an unstable trench bottom. An unstable trench bottom is defined as "Conditions that prevent placement of pipes true to line and grade."
- b The method of dewatering will be subject to review by the Engineer.
- c The City will be responsible for temporary service of an individual water supply where these supplies are cut off due to lowering of the water table during construction. The Contractor shall not lower the water table unnecessarily.
- d All dewatering wells that have a bore hole diameter of two inches or more shall be plugged and abandoned by the following method or any method that has been approved in writing by the Michigan Department of Public Health, in accordance with the State of Michigan's "Mineral Well Act," Public Act 315 of 1969.
- e Once the casing and screen have been removed from the bore hole, an injector pipe shall be installed in the bore hole to the bottom of the gravel pack material. Neat cement or bentonite slurry shall be pumped through the injection pipe until the material is five feet above the gravel pack material or four feet below the existing gravel level. The remainder of the bore hole shall be plugged with native soil.
- f Any water removed from the trench or the water main shall be disposed of in such a way as not to damage property, create a public nuisance or a health problem. Contaminated water removed as part of the dewatering process shall be done to MDEQ Part 201 Standards.

4 Joint Restraint.

Follow approved shop drawings and manufacturer's recommendations based on "Thrust Restraint Design for Ductile Iron" Sixth Edition 2006 as published by the Ductile Iron Pipe Research Association and AWWA Manual M23, "PVC Pipe Design and Installation". Thrust blocks may be incorporated into the restraint system, but will not be considered for calculating restraint design

5 Installation of Pipe and Fittings

Before installation, the pipe shall be inspected for defects and any section of pipe or fittings found to be defective, before or after laying, will be rejected and replaced with sound pipe without additional expense to the City.

Water pipe shall be laid according to Utility Trench Detail F or G, as specified, on MDOT Standard Plans R-83-B with a cover depth of no less than 5.5 feet. The interior of the pipe and fittings shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging the ends or by other approved methods. When work is not in progress,

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the open ends of the pipe and fittings shall be securely closed so that no trench water, earth, animals, or other substances will enter the pipes.

No pipe or fittings shall be placed in water or when the trench or weather conditions are unsuitable for work except by permission of the Engineer.

The full length of each section of pipe shall rest solely upon the pipe bed, with recesses provided to accommodate the bells and joints.

Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed tolerances recommended by the pipe manufacturer. If the alignment requires deflections in excess of the manufacturer's recommendations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide the angular deflection required. Frequent or abrupt changes in the slope of the pipe, even if necessary to follow the existing ground surface elevations, will not be permitted.

Pipe shall be placed with bell ends facing in the direction of laying, unless otherwise approved by the Engineer.

Pipe shall be placed with at least 10-foot horizontal clearance from existing sewers and shall have a minimum clearance of 18-inches, as measured from outside edges of pipes, when crossing sewers.

Jointing of the various pipe materials and types shall be made in accordance with the manufacturer's recommendations.

6 Cutting Pipe

Cutting pipe for inserting valves, fittings, etc. shall be performed in a neat and workmanlike manner, without damage to the pipe or lining, and so as to leave a smooth end at right angles to the axis of the pipe.

For cast iron and ductile iron pipe, cutting shall be performed with a power saw, or a roller or shear type cutter for pipe sizes up to 20 inches in diameter. When machine cutting is not available for cutting pipe 20 inches in diameter or larger, the electric arc cutting method will be permitted, using a carbon or steel rod. Only qualified and experienced workmen shall perform this work.

For asbestos-cement or PVC pipe, cutting shall be performed by power saw, hand saw, abrasive disks or with a special asbestos-cement or PVC cutting tool. All piping cutting tools must be of the true cutting variety. Under no circumstances is the pipe to be cut with a roller or shear type cutting tool.

7 Connections to Existing Water Mains

Connections shall be made with line pressure on or off according to the Plans or Proposal. Existing pipelines shall be adequately supported during the cutting operations and prior to placement of backfill.

Prior to cutting existing pipelines, the surface of the existing pipe shall be thoroughly cleaned by wire brushing and scraping. When cut-in is made under pressure, the existing pipe surface shall be washed down with a 4 percent solution of chlorine prior to installing the cutting-in tee. All fittings, pipe, valves, etc. used in the connection that cannot be disinfected during normal water main chlorination shall be swabbed out with a 4 percent or stronger solution of chlorine, such as standard laundry bleach, during assembly. Care shall be exercised in order to prevent contamination of the existing water mains and failure to comply with this requirement will necessitate chlorination of the existing water mains at the Contractor's expense.

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After the connection is made, the Contractor shall flush sufficient water through the connection to effect removal of the chlorine solution.

All valves will be turned to the open position at the final inspection.

8 Valve Boxes

The valve box shall not transmit shock or stress to the valve when the box cover is flush with the surface of the pavement or other such level as may be directed. The base section of the valve box shall be set two inches above the flanged bonnet joint of the valve and accurately centered on the valve operating nut.

9 Hydrants

Hydrants shall stand plumb and have hose nozzle parallel with the roadway, with the pumper nozzle facing the roadway.

Hydrants shall be installed in conformance with AWWA C-600 and AWWA M-17. Hydrants shall be set to the established grade, with the breakaway no more than 8 inches above the finished topsoil grade or as directed by the Engineer. Nozzles should be placed at least 20 inches above the finished topsoil grade. Hydrants set with elbow or hydrant tee shall be rotated 90 degrees to conform to the above specifications.

At least 3 feet of horizontal clearance shall be provided around each hydrant from any above ground obstacles such as utility poles, trees, signs, fencing, walls, etc.

Hydrants must be connected to the main with a 6-inch branch and controlled by an independent gate valve. In the case of relocated four-inch hydrants, four-inch valves shall be used. This Valve on Branch shall be located no less than 18 inches or greater than 36 inches from the hydrant unless otherwise shown on the plans. Each Valve on the branch shall be left open prior to pressure testing and disinfecting and shall be left open prior to final acceptance.

A drainage pit shall be placed on both sides of the bottom inlet at the drainage waste opening. The pit shall be 2 feet radial from the waste opening, at least 90 degrees in width, and 3 feet deep. The pit shall be completely filled with specified aggregate to an elevation 6 inches above the waste opening.

10 Water Service

All water services shall originate at and include the tap into the water main in the street with a corporation stop and terminate with the connection to the existing service with a curb stop and service box located within 7 feet outside of the property line. All services shall be tapped at the 2 o'clock or 10 o'clock positions. Services shall be installed at a depth of 5 feet below the final grade. Short services shall be installed by boring. Borings may be made by the "Augur" or "Missile" methods. Services installed under existing concrete or bituminous surfaces shall be installed by boring. Services installed under gravel surface may be by open trench or boring.

Where soil conditions in open trenches are not suitable for copper pipe, the pipe shall be embedded in Granular Material Class III and backfilled as specified.

All services shall be observed for leaks and disinfected (chlorinated) before they are covered.

Curb stops will be placed in such a way that when turned off the key position is parallel to the centerline of the right of way that the water line services.

11 Seasonal Suspension

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In the event that hazardous or nuisance conditions arise during the winter from the previous construction season's water main work, and such conditions are not corrected by the Contractor, the City shall notify the Contractor through the Engineer, in writing, that a deficiency exists and the specific location thereof. The Contractor shall, immediately upon such notification, correct the defective condition to the satisfaction of the City. Should the Contractor not correct the defective condition promptly, the City may perform the required maintenance and deduct their incurred costs from the contract price.

If the Contractor so desires, and by prior written consent of the City, he may elect not to perform such inspections and/or maintenance, due to prohibitive travel distances or shortage of off season manpower. Should the Contractor desire to initiate this exception, the City may perform the winter inspections and maintenance itself and deduct his incurred costs from the contract price.

IV Hydrostatic Testing

1 General

The Contractor shall pretest and be satisfied that all lines are ready for testing before requesting test inspection. The Contractor shall provide all necessary equipment and perform all work required in connection with the tests.

2 Hydrostatic Testing

The test shall conform to AWWA C-600 for ductile iron pipe and or AWWA C-605 for PVC pipe and Section 823.03 T. of the 2012 Standard Specifications for Construction by MDOT for all newly laid pipe and fittings except that the test pressure shall not vary by more than 5 psi for the duration of the test.

V Disinfection of the System

1 General

Disinfection shall be by chlorination and/or other methods as approved by the Engineer after pressure testing and flushing. The disinfection shall conform to the current AWWA C-651 standards.

2 Chlorination

All new water lines shall be chlorinated. The Contractor shall furnish all labor, equipment, and materials necessary for effective chlorination of the water mains.

3 Materials

- a High Test Calcium Hypochlorite (HTH, "Perchlolen", "Maxochlor", "Pittchlor"). - Powder and water shall be mixed to form a 1 percent chlorine solution (10,000 ppm), pumping solution at a constant rate into the water main while bleeding off the water at the extreme end.
- b Liquid Chlorine. - Liquid chlorine conforming to AWWA B-301 may be applied to the water main much the same way as the hypochlorite solution listed above.
- c Chlorine Gas. - Chlorine gas shall not be used.

4 Method of Chlorination

The method of chlorination shall be in accordance with AWWA C651 and per Section 823.03(U) of the 2012 *Standard Specifications for Construction* by the Michigan Department of Transportation except that after completing disinfection the flushing shall take place at a velocity of 3 feet per second and two samples shall be taken 24 hours apart for every section of pipe or 1,200 linear feet of pipe.

VI Measurement and Payment

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The complete work as measured for Water Main will be paid for at the contract unit prices for the following items (pay items). Each item includes supplying all necessary material, equipment, and labor.

Pay Item	Pay Unit
Hydrant, Rem	Each
Water Main, Rem.....	Foot
Water Main, __ inch, Cut and Plug.....	Each
Gate Well, Rem.....	Each
Water Service, Rem	Each
Fire Hydrant.....	Each
Gate Valve and Box, __ inch.....	Each
Water Main, __ inch, Tr Det __	Foot
Water Serv	Each
Water Serv, Long	Each
Water Serv, 2 inch	Foot
Gate Box, Adj, Case __	Each
Water Main Tie in	Each
Live Tap, __ inch by __ inch	Each
Pressure Test and Disinfect	Each
Water Main Tee, __ inch by __ inch	Each
Water Main Reducer, __ inch by __ inch	Each
Water Main Cross, __ inch by __ inch	Each
Water Main Bend, __ Deg, __ inch	Each

1 General

The actual number of units of each unit price item of work actually performed may be more or less than the number stated in the Bidding Schedule of the Proposal, or included in the Contract, but no variation in the Contract unit price will be made on that account. Payment will be made only for the actual number of units incorporated in the work, or for the actual number of units of work performed, and at the Contract unit price for each such unit with measurement for payment made as defined in the following paragraphs. Measurement for payment of work done on a unit price basis will be as follows.

- A. **Hydrant, Rem.** Removing Hydrants will be paid for on an each basis. All existing hydrants will remain the property of the City and will be salvaged
- B. **Water Main, Rem.** Removing water main will be paid per foot of water main removed and will include all excavation needed and hauling from site.
- C. **Water Main, Cut and Plug.** The unit price for water main, cut and plug includes the cost of cutting the existing water main, providing and placing the required plug and thrust blocks.
- D. **Gate Well, Rem.** Removing gate wells will include complete removal of the water valve pit and all surrounding heavy, saturated material
- E. **Water Service, Rem.** Removal of water service shall be from the corporation at the main to the right-of-way and will be paid for on an each basis. Salvaging existing curb boxes for the city's use shall also be included in this item
- F. **Fire Hydrant.** Fire hydrants will be paid for on an each basis. The payment for fire hydrant assemblies includes the hydrant, main line by 6 inch tee, 6" resilient wedge valve and box, rodding, thrust restraint, aggregate, hydrant extension kits and other accessories necessary to complete the installation to proper grade and specifications
- G. **Gate Valve and Box, __ inch.** The unit prices Gate Valve and Box, of the types and sizes required, include the cost of providing and installing the valve and valve box, complete and ready for use.
- H. **Water Main**

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- a. **Water Main, __inch, Tr Det __.** Water main, of the diameter, class, and trench detail specified, will be measured in place, by length in linear feet, from center to center of cross mains with no deductions in length for intermediate structures. Payment shall include any dewatering or trench bracing/sheeting necessary along with any necessary restraints. Excavation and backfill will not be measured separately but shall be included as a part of the item of water main furnished and installed. Price shall include any necessary tracer wire.
- I. **Water Services**
 - b. **Water Serv.** Includes the tap, corporation, saddle, curb stop, service box, tracer wire and service pipe from within 5' of the ROW to the short side of the water main.
 - c. **Water Serv, Long.** Includes the tap, corporation, saddle, curb stop, service box, tracer wire and service pipe from within 5' of the ROW to the long side of the water main.
 - d. **Water Serv, 2 inch.** Shall be in addition with the **Water Serv** pay item for placing service pipe and includes the saddle and attachment to the main. Tap, corporation, curb stop, tracer wire and service box from within 5' of the ROW will be included with the **Water Serv** pay item.
- J. **Gate Box, Adj. Case __.** Case 1 refers to structures located in hard surfaced travel areas and unit price includes saw cutting, removing and replacing existing pavement, curb, or curb and gutter, and adjusting the water shutoff or gate box to final grade. Case 2 refers to structures located outside existing pavement, curb or curb and gutter and unit price includes restoring disturbed vegetated or sidewalk areas.
- K. **Water Main Tie in.** Connection of a new water main to an existing water main will be paid on an each basis for each connection made as noted on the plans. Payment includes all items necessary to complete the work including excavation and backfill, cutting and removing existing water main, all fittings, reducers, bends, and sleeves with restraint necessary to align new main with existing main.
- L. **Live Tap, __inch by __inch.** The unit price for Live Tap, of the size required, includes the cost of providing and installing the valve, tapping sleeve, all necessary restraints, and valve box, complete and ready for use. This work includes the complete live tapping procedure.
- M. **Pressure Test and Disinfect.** Pressure Test and Disinfect Water Main will be paid once per location approved by the engineer. If the main fails to pass the first pressure and disinfectant tests, further tests shall be made at the Contractor's expense. Payment for flushing and disposal of the disinfectant chlorinated water in accordance with environmental regulations is included in this item.
- N. **Appurtenances.** Water main tees, reducers, crosses, bends and other appurtenances shown on plans but not listed as bid items will be included with the water main items.