CITY OF JACKSON
Founded 1829

Finance Department
Purchasing Division
161 W. Michigan Ave. • Jackson, MI 49201
Phone: (517) 788-4020 • Facsimile: (866) 971-2119

June 21, 2018

ADDENDUM NO. 1

Edgewood Street Water Main Replacement and Street Repaving

Notice is hereby given that the following additional information and changes shall become part of the specifications of the above referenced contract. You are to acknowledge the addenda on the Proposal Sheet.

1. Confirmation of Bid Opening Date and Time: Friday, June 29, 2018, 10:30 AM.

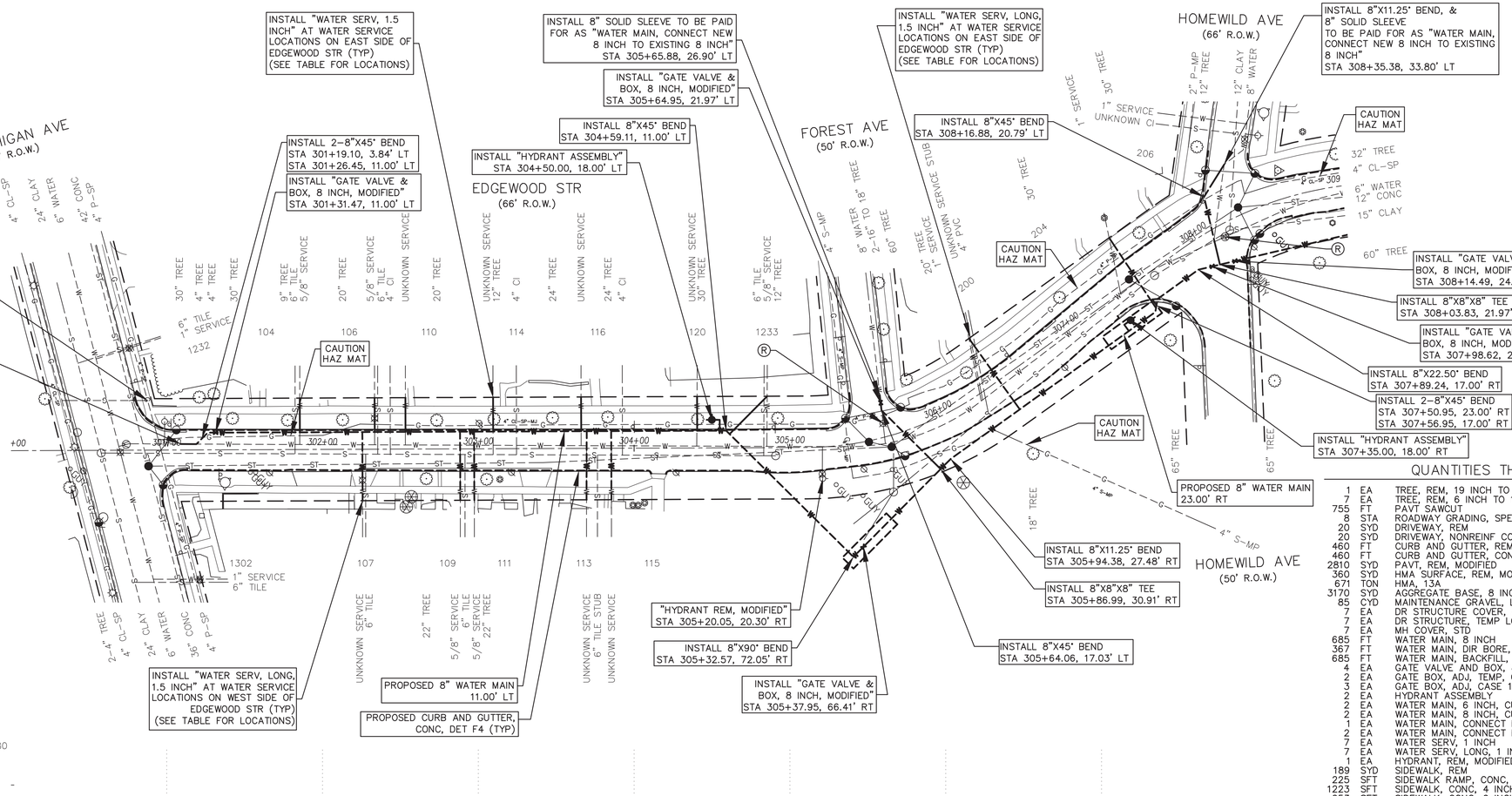
2. Page IB 4 of 4, item E.:
   E. Contract documents require that all work on this project be completed by June 14, 2019.

3. The Specification for Water Main Construction dated 05-03-18 on page SP 60 of 129 in the proposal is removed and replaced with the attached Specification for Water Main Construction dated 06-14-18.

4. Sheets 8 and 9 are removed from the plan set and replaced with the attached revised plan sheets 8 and 9 with revision dates of 06/20/18. These sheets were revised to show the locations of bore pits for the installation of pipe by the horizontal directional drill method.

5. The attached Special Provision for Sanitary Sewer Video Inspection dated 06-13-18 is added to the proposal.

END OF ADDENDUM

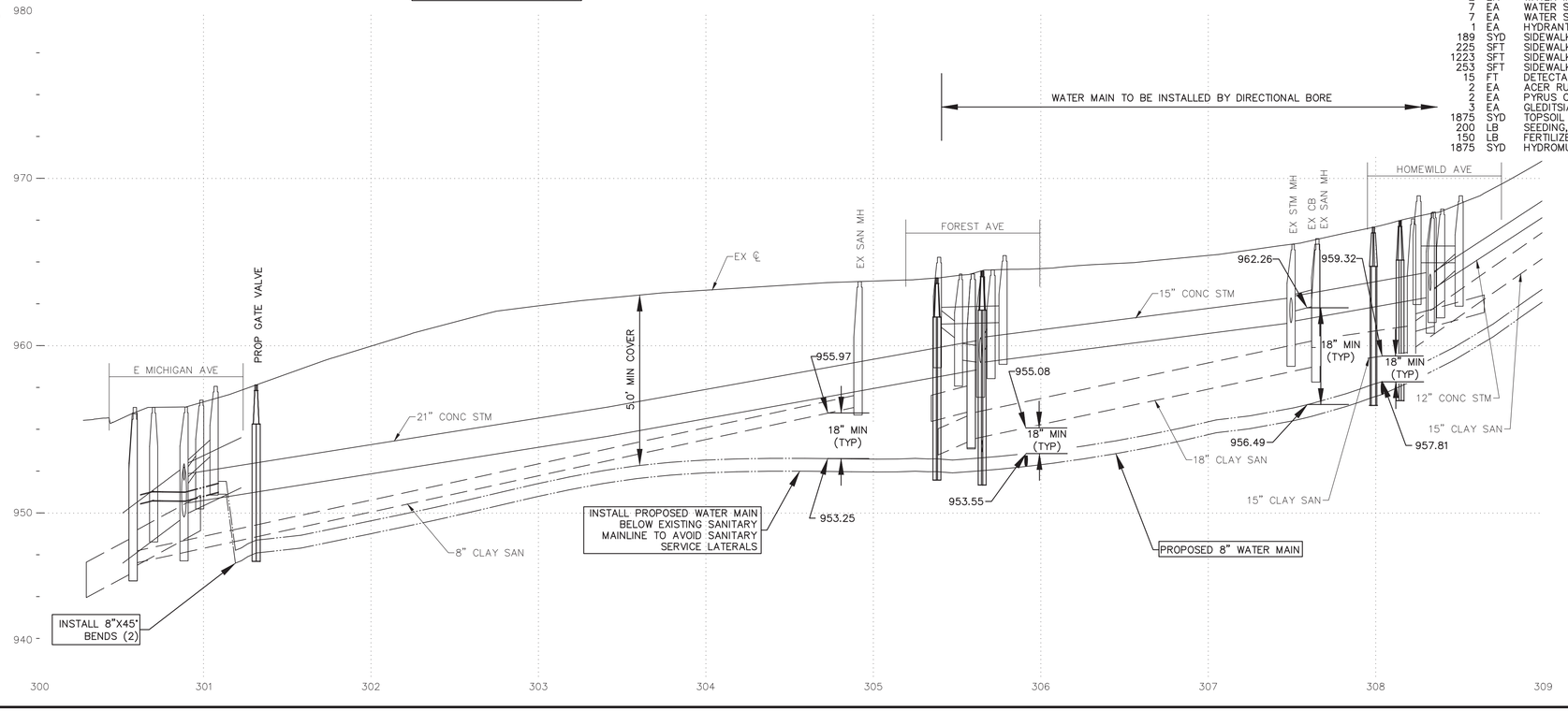


WATER SERVICE LOCATIONS		
ADDRESS	STA	OFFSET
104 EDGEWOOD	301+85.53	UNKNOWN LT
106 EDGEWOOD	302+33.54	19.89' LT
110 EDGEWOOD	302+53.35	UNKNOWN LT
114 EDGEWOOD	303+09.59	UNKNOWN LT
116 EDGEWOOD	303+66.10	UNKNOWN LT
120 EDGEWOOD	304+40.52	UNKNOWN LT**
1233 FOREST	304+85.43	UNKNOWN LT**
200 EDGEWOOD	306+43.82	UNKNOWN LT
200 EDGEWOOD	306+44.92	UNKNOWN LT*
204 EDGEWOOD	307+54.58	UNKNOWN LT
107 EDGEWOOD	302+25.66	19.92' RT
109 EDGEWOOD	302+88.33	UNKNOWN RT
111 EDGEWOOD	302+97.33	UNKNOWN RT
113 EDGEWOOD	303+69.33	UNKNOWN RT
115 EDGEWOOD	303+85.33	UNKNOWN RT

*DO NOT REPLACE WATER SERVICE (STUBBED AT ROW)
**DO NOT REPLACE WATER SERVICE (VACANT LOT)

QUANTITIES THIS SHEET

1	EA	TREE, REM, 19 INCH TO 36 INCH
7	EA	TREE, REM, 6 INCH TO 18 INCH
755	FT	PAVT SAWCUT
8	STA	ROADWAY GRADING, SPECIAL
20	SYD	DRIVEWAY, REM
20	SYD	DRIVEWAY, NONREINF CONC, 6 INCH
460	FT	CURB AND GUTTER, REM
460	FT	CURB AND GUTTER, CONC, DET F4
2810	SYD	PAVT, REM, MODIFIED
360	SYD	HMA SURFACE, REM, MODIFIED
671	TON	HMA, 13A
3170	SYD	AGGREGATE BASE, 8 INCH
85	CYD	MAINTENANCE GRAVEL, LM
7	EA	DR STRUCTURE COVER, ADJ, CASE 1
2	EA	DR STRUCTURE, TEMP LOWERING, MODIFIED
7	EA	MH COVER, STD
685	FT	WATER MAIN, 8 INCH
367	FT	WATER MAIN, DIR BORE, 8 INCH
685	FT	WATER MAIN, BACKFILL, CLASS II
4	EA	GATE VALVE AND BOX, 8 INCH, MODIFIED
2	EA	GATE BOX, ADJ, TEMP, CASE 1
3	EA	GATE BOX, ADJ, CASE 1
2	EA	HYDRANT ASSEMBLY
2	EA	WATER MAIN, 6 INCH, CUT AND PLUG, MODIFIED
2	EA	WATER MAIN, 8 INCH, CUT AND PLUG, MODIFIED
1	EA	WATER MAIN, CONNECT NEW 8 INCH TO EXISTING 6 INCH
2	EA	WATER MAIN, CONNECT NEW 8 INCH TO EXISTING 8 INCH
7	EA	WATER SERV, 1 INCH
7	EA	WATER SERV, LONG, 1 INCH
1	EA	HYDRANT, REM, MODIFIED
189	SYD	SIDEWALK, REM
225	SFT	SIDEWALK RAMP, CONC, 4 INCH
1223	SFT	SIDEWALK, CONC, 4 INCH
253	SFT	SIDEWALK, CONC, 6 INCH
15	FT	DETECTABLE WARNING SURFACE
2	EA	ACER RUBRUM 'RED SUNSET', 2 1/2 INCH
2	EA	PYRUS CALLERYANA 'CLEVELAND SELECT', 2 1/2 INCH
3	EA	GLEDITSIA TRIACANTHOS INERMIS 'SKYLINE', 2 1/2 INCH
1875	SYD	TOPSOIL SURFACE, 4 INCH
200	LB	SEEDING, MIXTURE THM, MODIFIED
150	LB	FERTILIZER, CHEMICAL NUTRIENT, CL A, MODIFIED
1875	SYD	HYDROMULCH



NO	DESCRIPTION (REVISIONS)	DATE	BY
1	REVISED TO SHOW BORE PIT LOC.	06/20	NCI

NORTH

CITY OF JACKSON
DEPARTMENT OF NEIGHBORHOOD AND ECONOMIC OPERATIONS
ENGINEERING

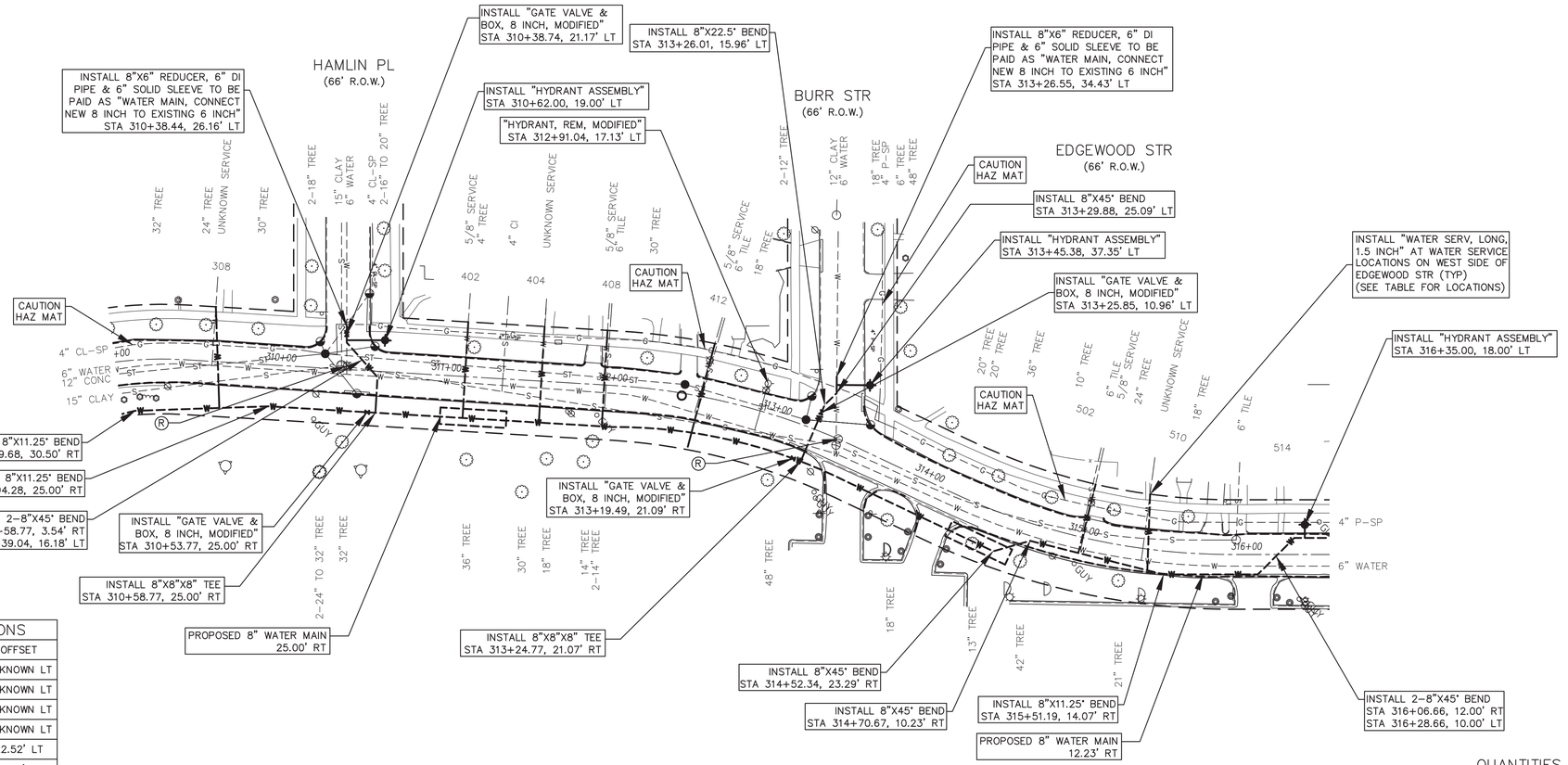
WATER MAIN REPLACEMENT
EDGEWOOD STR: MICHIGAN AVE TO NORTH STR

PLAN & PROFILE

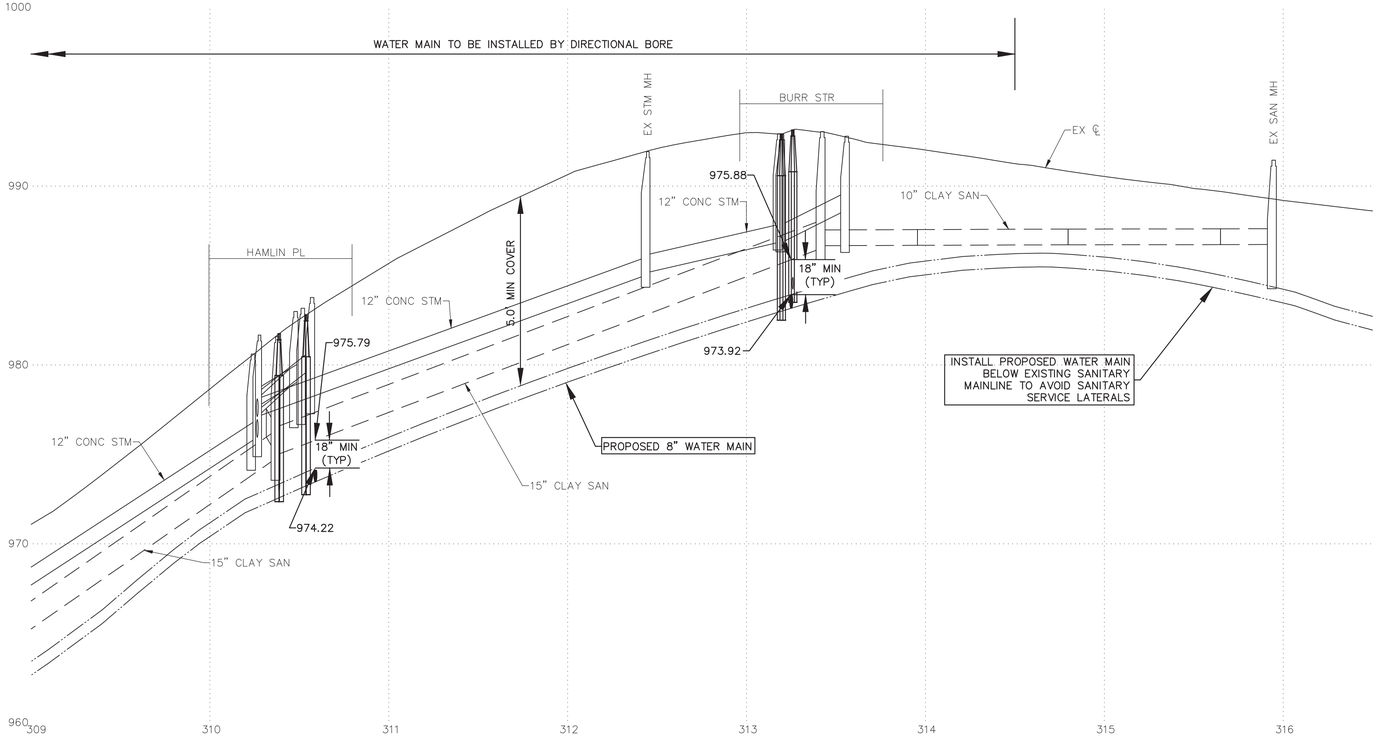
NCI
NORTHWEST CONSULTANTS, INC.

DATE:	6/7/2018
HOR SCALE:	1" = 40'
VERT SCALE:	1" = 4'
DRAWN BY:	EH/RM
DESIGN BY:	EH/RM
CHECKED BY:	AK/TL
APPROVED BY:	

SHEET 8 OF 17



WATER SERVICE LOCATIONS		
ADDRESS	STA	OFFSET
308 EDGEWOOD	309+58.96	UNKNOWN LT
402 EDGEWOOD	311+11.40	UNKNOWN LT
404 EDGEWOOD	311+57.50	UNKNOWN LT
408 EDGEWOOD	311+95.50	UNKNOWN LT
412 EDGEWOOD	312+55.37	22.52' LT
502 EDGEWOOD	315+00.75	21.54' LT
510 EDGEWOOD	315+37.10	UNKNOWN LT



QUANTITIES THIS SHEET

1	EA	TREE, REM, 6 INCH TO 18 INCH
197	FT	PAVT SAWCUT
7.5	STA	ROADWAY GRADING, SPECIAL
412	FT	CURB AND GUTTER, REM
412	FT	CURB AND GUTTER, CONC, DET F4
2597	SYD	PAVT, REM, MODIFIED
550	TON	HMA, 1.3A
2597	SYD	AGGREGATE BASE, 8 INCH
80	CYD	MAINTENANCE GRAVEL, LM
7	EA	DR STRUCTURE COVER, ADJ, CASE 1
7	EA	DR STRUCTURE, TEMP LOWERING, MODIFIED
7	EA	MH COVER, STD
550	FT	WATER MAIN, DIR BORE, 8 INCH
350	FT	WATER MAIN, 8 INCH
350	FT	WATER MAIN, BACKFILL, CLASS II
4	EA	GATE VALVE AND BOX, 8 INCH, MODIFIED
4	EA	GATE BOX, ADJ, TEMP, CASE 1
2	EA	GATE BOX, ADJ, CASE 1
3	EA	HYDRANT ASSEMBLY
2	EA	WATER MAIN, 6 INCH, CUT AND PLUG, MODIFIED
2	EA	WATER MAIN, CONNECT NEW 8 INCH TO EXISTING 6 INCH
7	EA	WATER SERV, LONG, 1 INCH
1	EA	HYDRANT, REM, MODIFIED
145	SYD	SIDEWALK, REM
453	SFT	SIDEWALK RAMP, CONC, 4 INCH
687	SFT	SIDEWALK, CONC, 4 INCH
165	SFT	SIDEWALK, CONC, 6 INCH
20	FT	DETECTABLE WARNING SURFACE
1	EA	GLEDITSIA TRIACANTHOS INERMIS 'SKYLINE', 2 1/2 INCH
1530	SYD	TOPSOIL SURFACE, 4 INCH
200	LB	SEEDING, MIXTURE THM, MODIFIED
150	LB	FERTILIZER, CHEMICAL NUTRIENT, CL A, MODIFIED
1530	SYD	HYDROMULCH

NO	DESCRIPTION (REVISIONS)	DATE	BY
1	REVISED TO SHOW BORE PIT LOC.	06/20	NCI

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CITY OF JACKSON
DEPARTMENT OF NEIGHBORHOOD AND ECONOMIC OPERATIONS
ENGINEERING

WATER MAIN REPLACEMENT
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DRAWN BY:	EH/RM
DESIGN BY:	EH/RM
CHECKED BY:	AK/TL
APPROVED BY:	
SHEET	9 OF 17

CITY OF JACKSON

SPECIFICATION
FOR
WATER MAIN CONSTRUCTION

a. Description. Water main work includes all labor, equipment and materials necessary to complete the water main, water services, hydrants and other related construction.

b. Materials. All materials shall be of U.S. or Canadian manufacture. All standards shall be the latest edition. The Contractor shall direct all requests for any variances to the Engineer in writing. The manufacturer shall supply a sworn statement (certification) that all pipe, hydrant valves, fittings, gaskets and all appropriate appurtenances furnished comply with the standards referenced in these specifications. Catalog cuts for all materials to be installed shall be provided to the Engineer for review at the pre-construction meeting. No materials shall be installed prior to the approval of the catalog cuts by the Engineer.

1. Ductile Iron Pipe. Ductile iron pipe shall meet or exceed the requirements of ANSI/AWWA C151/A21.51 for Pressure Class 350 pipe and ANSI/NSF Standard 61. Ductile iron pipe shall be cement-mortar lined per ANSI/AWWA C104/A21.4. ALL hydrant leads shall be ductile iron pipe.

2. Polyethylene Encasement. Ductile iron water main, fittings and appurtenances and non-copper service connections shall be encased with polyethylene in accordance with ANSI/AWWA C105/A21.5. Encasement material shall be linear low-density polyethylene film with a minimum thickness of 8 mil.

3. Polyvinyl Chloride (PVC) Pipe. PVC pipe shall meet the requirements of ANSI/AWWA C900 for Pressure Class 305, DR14 pipe and ANSI/NSF Standards 14 and 61. All PVC pipe shall be stamped “NSF-pw” on the exterior pipe wall. PVC pipe is not allowed where it may be exposed to significant concentrations of pollutants comprised of low molecular weight petroleum products or organic solvents or their vapors.

4. Gaskets. Gaskets for ductile iron pipe shall be push-on type, shall meet ANSI/AWWA C111/A21.11 and shall be Nitrile NBR (Acrylonitrile Butadiene**)**. One gasket per length of pipe shall be furnished. Gaskets shall be compatible with the pipe joint furnished. Gasket lubrication meeting the requirements of ANSI/AWWA C111/A21.11 shall be furnished for each gasket.

Gaskets for PVC pipe shall meet the requirements of ASTM D3139 and ASTM F477. One gasket per length of pipe shall be furnished. Gaskets shall be compatible with the pipe joint furnished. Gasket lubrication shall be furnished for each gasket.

5. Fittings. All fittings shall be ANSI/AWWA C110/A21.10 or C153/A21.53, mechanical joint type and be cement-mortar lined per ANSI/AWWA C104/A21.4.

6. Joints (trench construction only). Joints used for trench construction shall be push-on type and shall meet the requirements of ASTM D3139 and ASTM F477.

7. Joints, Interconnections, and Pulling Bell Assemblies (directional boring only). Joints used for directional boring shall be boltless, flexible and restrained. Joints with bulky glands or flanges that may prevent the smooth flow of the drilling fluid/soil slurry over the joint are not acceptable. Pipe and joint seals, when properly assembled and installed, shall be capable of dependably handling the specified internal pressure, as well as vacuum and external pressures that can occur in pipeline operation. Joints shall exhibit such performance attributes in straight alignment or at maximum rated joint deflection. Pipe pulling bell assemblies shall be designed and furnished by the pipe manufacturer. The pulling bell assemble shall have the same performance characteristics as the pipe to which it is connecting. For ductile iron pipe, joints shall be Clow Super-Lock, American Flex-Ring, U.S. Pipe TR FLEX, or Griffin Pipe SNAP-LOK. For PVC pipe, joints shall be Certainteed Certa-Lok or Engineer approved equal.

Proof-of-Design Tests. The manufacturer shall have representative proof-of-design tests of flexible restrained pipe joints as well as of the pipe pulling bell assemblies that establish the basis for the maximum allowable pulling loads.

8. Drilling Fluid (directional boring only). Drilling fluid consists of bentonite clay, potable water and appropriate additives. No hazardous additives may be used. Water and additives shall be mixed thoroughly and be absent of any clumps or clods. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of the borehole.

9. Mechanical Joint Bolts. Mechanical joint bolts (T-bolts) shall be high-strength, low-alloy steel meeting ANSI/AWWA C111/A21.11 requirements.

10. Mechanical Joint Restraints. Mechanical Joint Restraint shall be MJ FIELD LOK® Gasket or devices that consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11. The gripping wedges shall have individually actuated wedges with torque limiting twist off nuts. Gland body, wedges and wedge actuating components shall be ductile iron conforming to ASTM A536.

Ductile Iron pipe mechanical joint restraints shall have a working pressure rating of 350 psi and be EBAA Iron Megalug Series 1100, Uni-Flange Series UFR 1400 or Engineer approved equal.

PVC Pipe mechanical joint restraints shall meet the requirements of ASTM F1674 and have a working pressure rating of 200 psi. PVC joint restraints shall be EBBA Iron Series 2000PV, Uni-Flange Series UFR 1500-C or Engineer approved equal.

MJ FIELD LOK® Gasket. The restraint system shall be completely integral to the gasket, requiring only standard mechanical joint assembly techniques. The restraining system for ductile iron shall be pressure rated to 350 psi. The restraining system for PVC shall be rated at a 2:1 safety factor for the pipe on which it is installed. The restraining system shall be rated in accordance with the performance requirements of ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

Other methods of restraint shall be only as authorized by the Engineer and may include tie rod joint restraints using Duc-lugs or 3/4 –inch Corten Steel Anchor Eyebolts.

11. Pipe Bell Restraints. Ductile iron pipe bell restraint shall be locking gasket or devices that consist of a restraint ring on the spigot joined to a ring behind the bell. The restraint ring shall have individually actuated wedges with torque limiting twist off nuts. Bell restraint rings and wedging components shall be made of ductile iron conforming to ASTM A536. Connecting tie rods shall be made of low alloy steel that conforms to ANSI/AWWA C111/A21.11. The assembly shall have a rated pressure of 350 psi. Ductile iron bell restraint shall be the EBAA Iron Series 1700 Megalug restraint harness, Uni-Flange Series UFR 1450, or Engineer approved equal.

Locking Gasket. Locking gaskets for ductile iron pipe shall be a boltless, integral restraining system and shall be rated for 350 psi in accordance with the performance requirements of ANSI/AWWA C111/S21.1. Gaskets for TYTON® joints shall be Field Lok 350 manufactured by U.S. Pipe. Gaskets for American pipe shall be Fast-Grip® manufactured by American Cast Iron Pipe Co.

PVC pipe bell restraint devices shall meet the requirements of ASTM F1674 and consist of split serrated rings to grip behind the pipe bell and on the connecting pipe. The restraint shall be manufactured of ductile iron conforming to ASTM A536. Connecting tie rods shall be made of low alloy steel that conforms to ANSI/AWWA C111/A21.11. The assembly shall have a minimum working pressure rating of 200 psi. The restraint shall be the EBAA Iron Series 1500, Uni-Flange Series UFR 1390-C or Engineer approved equal.

12. Hydrants. Hydrants shall conform to ANSI/AWWA C502. Hydrants shall be American Darling B-62-B traffic model hydrants, Mueller Super Centurion 250 traffic model hydrant, American Flow Control Waterous Pacer Model WB67-250, American AVK Series 27 or East Jordan Iron Works WaterMaster 5BR250 with the following:

5'-6" bury for smaller than 12" water main
6'-0" bury for 12" and larger water main
OPEN RIGHT
5-1/4" valve opening
Mechanical joint inlets with accessories
15/16" square operating nut (top nut)
Nozzle caps shall have 15/16" square nuts
One 4-1/2" pumper nozzle (facing curb or pavement)
Two 2-1/2" hose nozzles
Hose nozzles shall be national standard fire hose coupling thread
Drains shall be open before installation
O-ring seals
Hydrants shall be painted red above the ground line

Valve 20-inch or Larger. Valves 20-inch and larger shall be resilient seated gate valves, mechanical joint on both ends, 2-inches square operating nut, O-ring seals, **open right**,

horizontal with bevel gears. Valves shall conform to ANSI/AWWA C509 or C515, and be supplied with accessories. Valves shall be American Darling CRS-80 R/W, Kennedy Kenseal R/W, US Pipe Metroseal 250 R/W, East Jordan Iron Works Flowmaster or American Flow Control Series 2500.

13. Valves 4-inches through 16-inches. Valves 4-inches through 16-inches shall be resilient seated gate valves, mechanical joint on both ends, 2-inches square operating nut, O-ring seals, and **open right**. Valves shall conform to ANSI/AWWA C509 or C515 and be supplied with accessories. Valves shall be CLOW R/W, Kennedy Kenseal R/W, US Pipe Metroseal 250 R/W, East Jordan Iron Works Flowmaster or American Flow Control Series 2500. American AVK Series 25 may be used for hydrant leads.

14. Tapping Valves. Tapping valves shall be resilient seated gate valves with mechanical joint on one end and flange with alignment ring on the other end. Tapping valves shall accommodate a full-size shell cutter. Valves shall have 2-inch square operation nut, O-ring seals, and **open right**. Valves shall conform to ANSI/AWWA C509 or C515 and be supplied with accessories. Valves shall be CLOW R/W, Kennedy Kenseal R/W, US Pipe Metroseal 250 R/W, East Jordan Iron Works Flowmaster or American Flow Control Series 2500.

15. Tapping Sleeves. Tapping sleeves, nuts, bolts and lugs shall be 304 stainless steel. Lugs shall be of extra-heavy gauge construction, welds must be fully passivated to insure maximum corrosion protection, sleeves shall have full circle virgin SBR or neoprene gasket per ASTM D2000 with 360 degrees of sealing surface, and flanges shall be recessed for tapping valve alignment. Sleeves shall be Powerseal 3490, Ford FTSS, Romac SST III or JCM 432.

16. Valve Boxes. Valve boxes shall be buffalo-type complete, 5-1/4-inch shaft, screw-type with #6 base. Sleeves shall be Tyler 6860 series, Item D or Bibby 45 to 66 inches extension, or Bingham & Taylor (B&T) Figure No. 4906, size D. Lids shall be marked “WATER.”

17. Service Lines. Water service connections shall be ASTM-B88 Type-K soft temper copper.

18. Corporation Stops. Corporation stops for copper service pipes shall conform to ANSI/AWWA C800 with AWWA corporation stop inlet threads and outlet external threads for use with flared copper pipe (No compression types). Corporation stops shall be Mueller Company (H-15000), McDonald (4701) or Ford Meter Box (F-600).

19. Service Saddles: Service saddles for 2 inches and smaller service connections to PVC water pipe shall conform to ANSI/AWWA C800. Saddles shall be cast brass construction with internal threads compatible with AWWA corporation stop inlet threads. O-ring gasket shall be EPDM rubber conforming to ASTM D2000. The saddle shall provide full support around the circumference of the pipe. Service Saddles shall be Mueller Company (BR2B), McDonald (3805) or Ford Meter Box (S90).

20. Curb Stops (Service Stops). Curb stops for copper service pipe shall conform to ANSI/AWWA C800 with threading for use with flared copper pipe (No compression types). Curb stops shall be Mueller (B-25204), McDonald (6100) or Ford Meter Box (ball valve B22).

21. Service Boxes (Curb Stop Boxes). Curb boxes shall be buffalo-type complete, screw-type 2-1/2-inch shaft, extension 41 to 64 inches, Tyler 6500 series, Item 95E, or Bibby 95E or B&T Figure No. 4901, Size 94F with Figure No. 4901-A old-style top and cover. Lids shall be marked "WATER."

22. Cast Couplings. Cast coupling shall be Rockwell 441, Power Seal System 3503, Dresser Style 253 or Dresser Hymax.

c. Installation. Ductile Iron water main pipe shall be installed in accordance with ANSI/AWWA C600, "Installation of Ductile Iron Water Mains and Their Appurtenances." Polyvinyl Chloride (PVC) water main pipe shall be installed in accordance with ANSI/AWWA C605, "Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water". Additional requirements are as shown on the construction plans and standard details and as specified herein.

1. General:

A. Installing Pipe. Pipe shall be laid to line and grade and shall have bearing over its entire length except at joints where joint holes shall be of such size as to give adequate room for working. Depth of installation shall be such as to give between five (5) feet and six (6) feet of cover over the pipe. Where pipe is installed in future streets, the depth of cover shall be sufficient to provide a minimum of 5-1/2 feet of cover below established grades as indicated on the plans.

B. Protection from Contamination. The effectiveness of disinfection depends, in large measure, on maintaining clean pipes and avoiding major contamination during construction. Therefore, it is strongly recommended that sanitary practices be used for handling and installing pipe, valves, fittings and accessories.

The interiors of pipes, fittings and valves shall be protected from contamination. Pipe delivered for construction shall be strung to minimize the entrance of foreign material. 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 or meal periods. Rodent proof plugs may be used when watertight plugs are not practicable and when thorough cleaning will be performed by flushing or other means.

C. Isolation. The new water main shall be kept isolated from the active distribution system using a physical separation (see standard detail drawing) until satisfactory bacteriological testing has been completed and the disinfectant water flushed out. Water required to fill the new main for hydrostatic pressure testing, disinfection and flushing shall be supplied through a temporary connection between the distribution system and the new main. The temporary connection shall include an appropriate cross-connection control device consistent with the degree of hazard and shall be disconnected (physically separated) from the new main during the hydrostatic pressure test. It will be necessary to re-establish the temporary connection after the completion of the hydrostatic pressure test to flush out the disinfectant water before final connection of the new main to the distribution system.

D. Insulation. Where water and sewer are approximately the same elevation, the water shall pass over the sewer where possible. If in going over sewers, the minimum required cover cannot be maintained, 2-inch x 4-foot x 8-foot Styrofoam insulation shall be used. The inspector will provide needed instructions. Cost of insulation and installation shall be included in cost of water main installation.

E. Separation of water mains and storm and sanitary sewers shall meet Michigan Department of Public Health recommendations as outlined in the Recommended Standards for Water Works.

(1) Parallel Installation. Water main shall be laid at least ten (10) feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten-foot separation, the reviewing authority may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer.

(2) Crossings. Water mains crossing sewers shall be laid to provide a minimum vertical distance of eighteen (18) inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

(3) Exception. The reviewing authority must specifically approve any variance from the above requirements when it is impossible to obtain the specified separation distances. Where sewers are being installed and these requirements cannot be met, the sewer materials shall be water pipe or equivalent and shall be pressure tested to insure water tightness.

(4) Force Mains. There shall be at least a ten-foot horizontal separation between water mains and sanitary sewer force mains. There shall be an eighteen-inch vertical separation of crossings as required above.

(5) Sewer Manholes. No water pipe shall pass through or come in contact with any part of a sewer manhole.

F. Mechanical Restraints for 12 inch and smaller pipe. All tees, bends, dead ends, reducers, valves and hydrant watch valves and hydrants for water main 12 inches and smaller are to be restrained by mechanical joint retainer glands, bell restraint harnesses or locking gaskets. Restrained lengths shall be as specified on the Standard Water Plans. Other methods of restraint shall be only as authorized by the Engineer and may include the following:

(1) Thrust blocks (poured against undisturbed earth with concrete. No precast blocks).

(2) Tie rod joint restraints using Duc-lugs or 3/4-inch Corten Steel Anchor Eyebolts. Two restraints per joint are required for 4 inch through 8 inch pipe. Four restraints per joint are required for 10 and 12 inch pipe.

G. Fire Hydrants. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb, except that the hydrants having two-hose nozzles 90 degrees shall be set with each nozzle facing the curb at an angle of 45 degrees.

(1) Set to Grade. Hydrants shall be set to the established grade, with the center of the lowest nozzle at least eighteen (18) inches above the ground. The lowest nozzle shall be installed away from the curb line at a sufficient distance to avoid damage from or to vehicles. Traffic model hydrants shall be installed so that the breakaway flange is not less than two inches nor more than six inches above the established grade. Any fittings used to set the hydrant to grade shall be included in the unit price bid for hydrant installation.

(2) Hydrant Valve. Each hydrant shall be connected to the main with a six-inch diameter branch controlled by an independent valve, unless otherwise specified. The valve shall be restrained to allow shutoff when the hydrant is to be removed.

(3) Drainage. When a hydrant is set, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least six inches above the drain port opening in the hydrant and to a distance of one foot around the elbow. Where ground water rises above the drain port or when the hydrant is located in contaminated soils or when the hydrant is located within ten feet of a sanitary or storm sewer main, the drain port shall be plugged.

(4) Backfill. All backfill within the influence of the road shall be MDOT Class II, compacted to 95% maximum density.

H. Valve and Fitting Installation.

(1) Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure containing bolting and test plugs, cleanness of valve ports, and especially seating surfaces, handling damage and cracks. Defective valves shall be marked and held for disposition as required. All bolts and nuts, with the exception of seat adjusting bolts or screws in butterfly valves, shall be checked for proper tightness. Seat adjusting bolts in butterfly valves shall be adjusted only on the recommendation from the manufacturer.

(2) Placement. Valves, fittings, plugs and caps shall be set and joined at the pipe according to ANSI/AWWA C600 or ANSI/AWWA C605 as applicable. Valves connecting to PVC pipe and all valves twelve inches or larger shall be provided with

special support, such as crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.

(3) Drainage Branches and Blowoffs. Mains shall be drained through drainage branches or blowoffs. Drainage branches, blowoffs and appurtenances shall be provided with control valves and shall be located and installed as shown on the plans. Drainage branches or blowoffs shall not be directly connected to any storm or sanitary sewer, submerged in any stream or be installed in any manner that will permit a back siphonage into the distribution system.

(4) Vents. Air-release of vacuum vents shall be provided at high points in the line and in areas of potential negative pressure. The air release or vacuum vents shall not be connected to any storm or sanitary sewer and they shall be protected from freezing.

(5) Valve Box. A valve box shall be provided for every valve that has no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a gear case. The valve box shall not transmit shock or stress to the valve. The valve box shall be centered over the operating nut of the valve with the box cover flush with the surface of the finished area or another level as specified.

(6) Valve Vault. A vault designed to prevent settling on the pipe shall be provided for every valve that has exposed gearing or operating mechanisms. The operating nut shall be readily accessible for operation through the opening in the valve vault. The opening shall be set flush with the surface of the finished pavement or another level as specified. Vaults shall be constructed to permit minor valve repairs and to protect the valve and pipe from impact where they pass through the vault walls.

(7) Plugs and Caps. All dead ends on new mains shall be closed with plugs or caps that are suitably restrained to prevent blowing off under test pressure. If a blowoff valve precedes the plug or cap, it too shall be restrained against blowing off. All dead ends shall be equipped with suitable blowoff or venting devices.

I. Damaged Materials. Any pipe, manholes, valves boxes, stop boxes or structures which are damaged during construction shall be replaced by the Contractor at no expense to the owner.

J. Salvaged Materials. Old fire hydrants removed as part of the work that will not be re-used shall remain City property and be set aside for pickup by the City of Jackson Department of Public Works (DPW). The Contractor shall exercise caution during removal to avoid damage to the hydrant and remove the head, barrel and foot piece intact in one piece.

K. Notify the Engineer two (2) working days in advance of starting work. Installation shall not begin until the Engineer agrees that proper preparations have been made.

2. Trench Installation:

A. Installing Pipe. The bottom of the trench shall be excavated to the required grade so that the pipe shall have a full four (4) inches of bedding.

B. Temporary Plugs. Plugs with watertight seals shall be installed to keep water, sand, mud, animals, etc. out of newly installed water pipe. A plug shall be placed into the open end of each pipe section as it is installed into the trench and shall remain in place until immediately before the next section of pipe is connected to it. Non-pressure plugs with rubber gaskets shall be as manufactured by Plug-It Products, Taylor Made Plastics or other plug acceptable to the Engineer.

C. Joints. Push-on joints shall be used and installed in strict accordance with the manufacturer's specifications.

D. Thrust blocks for pipe larger than 12 inches. All tees, bends and dead ends for water main larger than 12 inches are to be restrained by thrust blocks. Thrust blocks shall be concrete (no precast) having a compressive strength of 3,000 psi at 28 days, placed between the pipe and undisturbed earth of the trench wall. Exposed bolts and/or flanges shall not be covered with concrete. Concrete shall extend from the bottom of the trench to the top of the pipe within the limits of laying length of the fitting. Thrust block dimensions shall be as specified on the Standard Water Plans.

E. Polyethylene Encasement of Ductile Iron Pipe. The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material, but is not intended to be a completely airtight or watertight enclosure. All lumps of clay, mud, cinders, etc., on the pipe surface shall be removed before installation of the polyethylene encasement. During installation, care shall be exercised to prevent soil or embedment material from becoming trapped between the pipe and the polyethylene. The polyethylene film shall be fitted to the contour of the pipe to affect a snug, but not tight, encasement with minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell-spigot interfaced, bolted joints or fittings, to prevent damage to the polyethylene due to backfilling operations. Overlaps and ends shall be secured with adhesive tape, string, or any other material capable of holding the polyethylene encasement in place until backfilling operations are complete.

For installations below the water table, both ends of the polyethylene tube shall be sealed as thoroughly as possible with adhesive tape at the joint overlap.

Installation of polyethylene encasement shall be in accordance with ANSI/AWWA C105, Method A, and as described below unless otherwise authorized by the Engineer.

(1) Cut polyethylene tube to a length approximately two feet longer than the pipe section. Slip the tube around the pipe, centering it to provide a one-foot overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends.

Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube.

After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe and secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at the quarter points.

Any cuts, tears, punctures or other damage to the polyethylene shall be repaired as described herein. Proceed with installation of the next section of pipe in the same manner.

(2) Pipe-shaped Appurtenances. Cover bends, reducers, offsets and other pipe-shaped appurtenances with polyethylene in the same manner as the pipe.

(3) Odd-shaped Appurtenances. When it is not practical to wrap valves, tees, crosses and other odd-shaped pieces in a tube, wrap with a flat sheet of split length of polyethylene tube by passing the sheet under the appurtenance and bringing it up around the body. Make seams by bringing the edges together, folding over twice and taping down. Handle width and overlaps at joints as described above. Tape polyethylene securely in place at valve stem and other penetrations.

(4) Repairs. Repair any cuts, tears, punctures or damage to the polyethylene with adhesive tape or with a short length of polyethylene sheet or a tube cut open, wrapped around the pipe to cover the damaged area and secured in place.

(5) Openings in Encasement. Provide openings for branches, service taps, blowoffs, air valves and similar appurtenances by making an x-shaped cut in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape. Service taps may also be made directly through the polyethylene with any resulting damaged areas being repaired as described above.

(6) Junctions between Wrapped and Unwrapped Pipe. Where polyethylene wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least three feet. Secure the end with circumferential turns of tape.

(7) Service lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a minimum clear distance of three feet away from the ductile iron pipe.

(8) Exercise care to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones or other material that could damage polyethylene.

F. Backfilling. After the water line has been properly positioned for grade and horizontal alignment, the trench shall be backfilled in accordance with the following described methods.

(1) Pipe Bedding and Initial Backfill. Pipe bedding and initial backfill shall be performed to properly set the pipe. Bedding shall conform to details shown on the plans and as specified herein. Pipe laid in sandy soils will be bedded with hauled-in Class IIIA granular material or approved on-site material. Pipe laid in a rocky, dry trench will be bedded with Class III A granular material. Use coarse aggregate 6A as directed by the Engineer for bedding pipe in unstable soil conditions. The Engineer reserves the right to use alternate pipe bedding.

Initial backfill to twelve inches above the pipe shall be with Class IIIA granular material or approved on-site material. The Contractor shall take all necessary actions and precautions to insure that initial backfill is properly placed around the pipe, especially from the spring line of the pipe to the bottom of the trench. This shall be accomplished to the satisfaction of the Engineer. Initial backfill shall be compacted to a minimum of 90% of the maximum unit weight.

(2) Final Backfilling. After proper pipe bedding and initial backfill, the Contractor shall begin final backfill operations. Backfill shall be accomplished by placing layers, twelve inches maximum, of the appropriate backfill material in the excavation and compacting.

Trenches under road surfaces, pavement, curb, driveway, sidewalk and within their zone of influence shall be backfilled with Class II granular material. Compaction shall be by the controlled-density method or other effective means and shall be a minimum of 95% of the maximum unit weight. Other trenches may be backfilled with suitable on-site material and compacted to a minimum of 90% of its unit weight.

Wherever utilities cross the trench, the backfill material shall be thoroughly compacted for the full depth beneath such pipe and a stone-free sand cushion tamped under and around the pipe a minimum of twelve (12) inches measured in any direction.

Stones exceeding six inches in diameter, logs, stumps and other debris shall not be allowed in the backfill material in the roadway or within six inches of the pipe. Muck or other unstable organic soils which may be encountered in excavation shall be hauled and disposed of and the Contractor shall furnish sufficient approved material to complete the backfill as required.

(3) Granular Material. Granular material which is encountered in the excavated material may be used for the required MDOT Class II granular material if approved by

the Engineer. The use of such material shall not be allowed without prior approval of the Engineer.

3. Directional Boring Installation.

A. Preparation. The work site indicated on drawings, within the right of way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. The Contractor shall confine all activities to designated work areas.

(1) Drill Path Survey. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If the Contractor is using a magnetic guidance system, drill path will be surveyed for any geomagnetic variations or anomalies. Notify the Engineer and obtain instructions where there is a grade discrepancy or obstruction not shown on the drawings.

(2) Utility Location. Prior to the start of drilling, reaming, and pipe placement operations, the Contractor shall properly locate and identify all existing utilities in proximity to the pipeline alignment. The Contractor shall confirm the alignment of all critical utilities, by potholing/day-lighting using vacuum excavation or other suitable Engineer approved excavation method. When locating utilities in a paved area, the pavement shall be cored and restored to match existing. Excavations in paved areas shall be backfilled with non-structural flowable fill.

(3) Environmental Protection. The Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. The Contractor shall adhere to all applicable environmental regulations. Drilling fluids shall be contained within the drilling area and cleaned up within 48 hours following completion of pipe installation.

B. Polyethylene Encasement. Ductile iron pipe to be installed by horizontal directional boring shall be installed with a **double polyethylene encasement** (PE). With minor modifications included herein, “Method A” for Wet Trench Conditions as specified in AWWA C105 shall be utilized for applying the polyethylene encasement. After engaging the spigot into the bell, the following sequence shall be followed for specially securing and completing the PE encasement at the pipe joints.

(1) Two tube-type polyethylene sleeves shall be firmly attached to the barrel of each section of pipe. The innermost PE layer shall be secured to the barrel three feet from the spigot end of each pipe section (the end in the direction towards the drilling machine). This will allow the innermost PE layer to overlap the joint to the pipe that will follow in the pull by least 5 feet.

The tube end shall be secured with sufficient circumferential wraps of strong adhesive tape to resist movement of the polyethylene encasement along the pipe barrel. All excess material from the innermost PE layer shall be folded longitudinally and secured tightly to the pipe barrel by circumferential wraps of adhesive tape applied at intervals of approximately two feet.

(2) The same procedure is repeated for the outermost PE encasement layer except that it shall be secured to the barrel one foot from the spigot end of each pipe section. This is two feet from the point of attachment of the innermost PE layer in the direction toward the drilling machine. This will allow the outermost PE layer to overlap the joint to the pipe that will follow in the pull by least 3 feet.

(3) Each PE sleeve shall be attached only to the pipe barrel at the spigot end towards the drilling machine. The end of the sleeve away from the drilling machine is to be left unattached. No sleeve shall be attached to another sleeve. This will allow air to escape as the pipe run is pulled into the bore path. It will also minimize the impact on sleeves that follow in the pull should a sleeve become unattached.

The Contractor must have any other proposed methods of installing and fastening PE encasement approved by the Engineer. Any damage that occurs to the polyethylene wrap during pipe handling and throughout the construction process shall be repaired prior to pulling the pipe string into the bore path.

C. Pilot Hole and Reaming. The directional bore shall begin with a pilot hole being drilled along the proposed bore alignment. Navigation equipment on the surface shall monitor and provide directional information to the drilling operator. The pilot hole shall be drilled on the bore path within six (6) inches horizontally and vertically of the plan location. In no case shall the pilot hole or bore hole path radius of curvature be less than that recommended by the pipe manufacturer. In the event that the deviation exceeds the maximum allowed, the Contractor shall pull back and re-drill from the location along the bore path before the deviation.

Upon successful completion of the pilot hole, the Contractor will ream the borehole to a minimum of 25% greater than the outside diameter of the pipe being installed using the appropriate tools. The Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle. The borehole shall be pre-reamed to its final size before beginning pull back. Bentonite slurry shall be pumped through the drill steel and mixed by the reamer to stabilize and lubricate the wall lining of the boring hole and to protect the pipe. The Contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid flow and pressure.

D. Pipe Assembly. The use of versatile, restrained flexible joint pipe allows for alternative HDD installation techniques. Either the “cartridge” or the “assembled-line” methods may be used unless otherwise indicated on the plans.

(1) Cartridge Assembly (Option 1): Cartridge assembly option shall be defined by the assembling of individual sections of flexible restrained joint pipe in a secured entry

and assembly pit. The pipe sections are assembled individually and then progressively pulled into the bore path a distance equivalent to a single pipe section. This assembly-pull process is repeated for each pipe length until the entire line is pulled through the bore path to the exit point.

When applicable, pre-wrapped ductile iron pipe shall be appropriately cushioned to prevent damage to wrap and to keep bells, spigots, and wrap clean prior to assembly. Whenever polyethylene wrapped pipe is lifted, for example to lower wrapped pipes into place, such lifts shall be accomplished with wide-bearing nylon slings or other appropriately padded/bearing devices that will not damage the wrap.

(2) Assembled-Line (Option 2): Assembled-line option shall be defined by the pre-assembly of multiple pieces of flexible restrained joint pipe, with subsequent pulling installation into the bore path as a long pipe string. With this option, the Contractor shall provide an entry ramp to the entrance of the bore path. The ramp should be of sufficient length and grade such that any one pipe joint does not exceed the allowable joint deflection, at any point prior to the pipe string entering the also properly designed and prepared bore path.

When this method is employed, the Contractor shall be responsible for providing the necessary equipment or ground surface preparation to allow the pipe to be pulled back along the surface prior to the entry ramp and bore path, without damaging the pipe or, when applicable, the polyethylene encasement. Such precautions shall include suitably protective, multiple supporting pipe rollers (composed of non-marring polyurethane or coated rolls etc.), plastic slides placed between the wrapped pipe and the ground, or protective/sacrificial circumferential bearing pads or skids banded in the bell area on the outside the polyethylene encasement. For all circumferential bearing pads, the bearing pad shall extend at least slightly beyond the bell and be secured tightly with circumferential wraps of sufficiently strong tape, electrical ties or tensioning bands. The angle of ramp approaches shall be carefully considered/controlled to keep any joint articulation to within allowable deflection limits of the pipe joints.

(3) The Contractor shall be responsible for the proper assembly of all pipe and appurtenances in accordance with the Manufacturers written procedure and as supplemented by these guidelines. Prior to joint assembly, all joints and joint components shall be thoroughly cleaned and examined to assure proper assembly and performance. In the event that the Contractor is not experienced with the assembly of the type of flexible restrained joint being used, it shall be the responsibility of the Contractor to contact a factory-trained representative for recommendations on the proper and efficient installation of the joint.

(4) Unless indicated otherwise on the plans, the location of boring commencement points, pipe pull back commencement points and/or cartridge pits shall be determined by the Contractor subject to Engineer approval. The following restrictions shall apply:

(a) Disturbances to features such as pavement, curb, sidewalk, driveways, grassed areas, etc. shall be minimized. The Contractor shall bear all costs

associated with the restoration of disturbances and removals beyond what is shown on the plans.

(b) The requirements contained in the City of Jackson Special Provision for Earth Sawcut and Tree Preservation shall apply.

(c) The requirements contained in the City of Jackson Special Provision for Maintaining Traffic shall apply.

E. Pipe Pullback. After successfully reaming the borehole to the required diameter, the Contractor will pull the pipe through the borehole. The pipe shall be pulled from the spigot end to take advantage of the bell profile and minimize required pulling force. Once the pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into the borehole. During pullback operations, the Contractor shall not apply more than the maximum safe pipe pull pressure at any time.

If an obstruction is encountered during boring which prevents completion of the installation in accordance with the design location and specification, the pipe may be abandoned and left in place at the discretion of the Engineer. If the pipe is left in place, it shall be immediately filled with flowable fill and bulkheaded. Otherwise, removal of all materials and pipe installed in a failed bore path will be required. Abandonment or removal of failed pipe installations shall be at no additional cost. Prior to beginning another boring, a revised plan shall be submitted to and approved by the Engineer.

If, during construction, damage is observed, cease all work until resolution to minimize further damage and a plan of action for restoration is obtained and approved by the Engineer. The Contractor shall take full responsibility for restoration of any damage caused by heaving, settlement, escaping drilling fluid (frac-out) or the drilling setup and operation.

d. Hydrostatic Testing. Hydrostatic testing of all water mains installed by the Contractor is required. Costs associated with hydrostatic testing are included in the unit prices for water main items. Hydrostatic testing shall be performed IN accordance with ANSI/AWWA C600 for ductile iron pipe and ANSI/AWWA C605 for PVC pipe and as specified herein.

Note: The existing distribution system shall be protected against backflow caused by hydrostatic pressure test procedures.

1. Test Restrictions. Test pressure shall not be less than 150 psi at the highest point along the test section. Test pressure shall not exceed pipe or thrust-restraint design pressures. The hydrostatic test shall be of at least a two-hour duration. Test pressure shall not vary by more than ±5 psi for the duration of the test. Valves shall not be operated in either direction at a differential pressure exceeding the rated valve working pressure. The test setup should include a provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or the valve can be fully opened if desired. The test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

2. Filling New Water Main. Provisions shall be made to fill the main at the proper rate of approximately one foot per second. Air shall be bled off the water main prior to testing. Unless approved otherwise, this will require one-inch corporations and bypass main line valves. Tap and materials to install one-inch corporations shall be included in the cost of construction.

3. Pressurization. After the pipe has been laid, all newly-laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 150 psi at the point of testing. Each valve section of pipe shall be slowly filled with water, and the specified test pressure shall be applied using a pump connected to the pipe. Valves shall not be operated in either the opened or the closed direction at differential pressures above the rated pressure. The system should be allowed to stabilize at the test pressure before conducting the hydrostatic test.

4. Air Removal. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed at these points to expel air as the line is filled with water. After the air has been expelled, the corporation cocks shall be closed and test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and the pipe plugged or left in place as required.

5. Examination. Any exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants or joints that are discovered following the pressure test shall be repaired or replaced with reliable material, and the test shall be repeated until satisfactory results are obtained.

6. Testing Allowance Defined. Testing allowance shall be defined as the quantity of makeup water that must be supplied into the newly-laid pipe or any valved section thereof to maintain pressure within five psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Testing pressure shall not be measured by a drop in pressure in a test section over a period of time.

7. Testing Allowance. No pipe installation will be accepted if the amount of makeup water is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

Where:

L = testing allowance (makeup water), in gallons per hour
S = length of pipe section tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

8. Hydrants in Test Section. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

9. Acceptance. Acceptance shall be determined on the basis of testing allowance. If any test of laid pipe discloses a testing allowance greater than that specified, repairs or replacements shall be accomplished. After this work has been done, the tests shall be repeated. Final acceptance of the lines will not be made until satisfactory tests are obtained.

e. Disinfection and Sampling. All water mains installed by the Contractor shall be disinfected in accordance with ANSI/AWWA C651. Payment for disinfection included with that for associated water main items.

Note: The existing distribution system shall be protected against backflow caused by disinfection procedures.

The Contractor will be responsible for performing all water main disinfection and associated sampling. Samples will be taken after the mains have been satisfactorily chlorinated in accordance with these Specifications. The Contractor shall deliver the samples to the City of Jackson Water Treatment Plant for testing.

The Contractor shall provide all hoses and personnel needed to flush the mains in a manner that is safe and will not damage adjacent property.

Disinfect the water main and appurtenances using either the granular method or the continuous feed method in accordance with ANSI/AWWA C651.

Calcium hypochlorite (HTH) containing 65% available chlorine by weight shall be used as the disinfectant for the granular method. Liquid sodium hypochlorite containing approximately 10% available chlorine conforming to ANSI/AWWA B300 shall be used as the disinfectant for the continuous feed method.

The Engineer must observe the disinfecting process to record that proper procedures are followed. The Contractor shall notify the Engineer two (2) days prior to the start of the disinfection process.

1. Disinfection Procedure (Granular Method).

A. Place four ounces minimum (1/2 cup) of HTH granules in each length of pipe as it is installed (optional).

B. Fill the main and appurtenances, including hydrants, with water from the distribution system through corporations at a rate of approximately one foot per second as follows:

Nominal Pipe Size

Size (inches)	Rate (gallons per minute)
6	80
8	160
12	360
16	640

C. Allow a minimum of two hours contact time with the HTH in the new main (if Step A is used).

D. Flush the main at a minimum velocity of 3.0 feet per second.

E. Chlorine concentration will be measured at regular intervals using appropriate chlorine test kits or other approved method to ensure even distribution throughout the main.

(1) The chlorinated water shall be retained in the main for at least 24 hours during which time valves and hydrants shall be operated to ensure disinfection at the end of this 24-hour period.

(2) The treated water in all portions of the main after the 24-hour period shall have a residual of not less than 10 mg/L (10ppm) free chlorine.

2. Disinfection Procedure (Continuous feed method).

A. Chlorinate the main and appurtenances, including hydrants, using the "continuous feed method" as follows:

Water from the existing distribution system or other approved source shall be made to flow at a constant metered rate into the new main at a point not more than ten feet downstream from the beginning of the new main.

Water entering the main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 50 mg/L (50 ppm) free chlorine.

B. Chlorine concentration will be measured at regular intervals using appropriate chlorine test kits or other approved method to ensure even distribution throughout the main.

(1) The chlorinated water shall be retained in the main for at least 24 hours during which time valves and hydrants shall be operated to ensure disinfection at the end of this 24-hour period.

(2) The treated water in all portions of the main after the 24-hour period shall have a residual of not less than 10 mg/L (10ppm) free chlorine.

3. Bacteriological Samples.

A. After the satisfactory chlorination of the mains has been completed as described above, the disinfectant shall be flushed out and the mains filled with potable water.

B. The Contractor shall then take for analysis two consecutive bacteriological samples of the water in the mains. The first bacteriological sample will be taken a minimum of 24 hours after the chlorinated water has been flushed out of the mains. The second sample will be taken a minimum of 24 hours after the first sampling.

The Engineer will observe the sampling process to record that proper procedures were followed. The Contractor shall notify the Engineer two (2) working days in advance of sampling.

C. The Contractor shall deliver the bacteriological samples to the City of Jackson's Water Treatment Plant for testing. The use of other laboratories or testing locations shall not be allowed under any circumstance.

D. If the analysis of the samples shows the water to be non-potable as a result of unsatisfactory disinfection of the mains, the mains shall be re-chlorinated at the Contractor's expense until satisfactory samples are obtained.

f. Connections. Water mains and appurtenances must be completely installed, flushed, disinfected and have satisfactory bacteriological sample results received before permanent connections are made to the active distribution system. Sanitary construction practices shall be followed during installation of the final connection so that there is no contamination of the new or existing water main with foreign material or groundwater.

1. Connecting to Existing Water Lines. The Contractor shall make connections to existing water lines as shown on construction drawings. All new water system mains shall be constructed, backfilled, pressure tested, chlorinated and approved by the Engineer. The Contractor shall perform all sampling and deliver the samples to the City of Jackson Water Treatment Plant for approval for potable use prior to connecting the new system mains to existing water distribution mains. Temporary connections for filling, chlorinating and testing new mains shall be as specified herein and shown on the plans.

2. Notification Prior to Shutting Off Water. The Contractor may not operate City of Jackson water main valves. Valves shall be operated by City of Jackson DPW personnel.

Where water main construction under this contract requires shutting off water supply in existing mains supplying residents, the Contractor shall provide advance notice to the Owner and to all residents who will be affected. Residents and businesses shall be notified at least 24 hours prior to shutting off the water supply. Facilities with critical water needs may require more advance notice. Water supply shall not be shut off until approved by the Engineer. If faulty valves or other unforeseen conditions require expanding the area of shut off, the shut off shall be delayed until proper notification is provided. Delays will not be cause for extra compensation to the Contractor. Water supply shut off shall be limited to a period of not longer than four (4) hours between 8:00 am and 6:00 pm and this period shall be selected for the time of day which will least affect the residents and businesses. Other restrictions may be specified elsewhere in the contract documents. The Contractor shall be required to maintain an adequate water supply at all times (except as described above for brief periods) to all residents adjacent to the project, and change over to new mains or services shall be coordinated to eliminate any long periods for residents without water.

3. Disinfection of Fittings and Pipe Used for Connection. The new pipe, fittings and valves required for the connections may be spray-disinfected or swabbed with a minimum of 1% to 5% solution of chlorine just prior to being installed if the total length of the connection from the end of a

new main to the existing main is equal to or less than eighteen feet. If the length is greater than eighteen feet, the pipe required for the connection must be set up above ground, disinfected and bacteriological samples taken as described in the disinfection section above. After satisfactory bacteriological sample results have been received for the "pre-disinfected" pipe, the pipe can be used in connecting the new main to the active distribution system. Between the time the satisfactory bacteriological sample results are received and the time that the connection piping is installed, the ends of the piping must be sealed with plastic wrap, watertight plugs or caps.

4. Flushing. To assure complete removal of foreign materials that might have entered the main during the course of the installation, the new water main shall be thoroughly flushed following connection to the existing system or any other procedure that exposes new components to external sources of contamination. This is in addition to flushing required under "Disinfection and Sampling. Flushing shall be done following connection to the existing water system, but before any service connections are made. The new water main shall be flushed again after all final tie-ins are completed. If no fire hydrants or other convenient outlets for flushing are available, the Contractor shall install temporary hydrants for flushing at no additional cost.

Whenever practical, initial connection to the existing system shall be to a larger main so that desired flushing velocity can be achieved. All valves and hydrants shall be fully opened and closed under water pressure to ensure proper operations during flushing and to dislodge foreign material.

Flush new mains, hydrant leads and service connections to fire system risers thoroughly before connection is made to system piping. Flushing shall be of sufficient magnitude and duration to flush all foreign material out of the lines, valves and hydrants. The flushing velocity shall be a minimum of 2.5 feet per second (5 feet per second preferred) for non-fire protection lines. Where the main supplies a fire protection system, the velocity shall meet the NFPA 24 requirement of 10 feet per second. The flow required to produce a velocity of 10 feet per second in various pipe sizes is as follows:

Nominal Pipe Size Inches (in)	Gallons per Minute (gpm)
6	880
8	1560
10	2240
12	3520

Direct flushing water away from traffic, pedestrians and private property. Prevent erosion damage to streets, lawns and yards by the use of tarpaulins and lead-off discharge devices.

g. Disinfection When Cutting into or Repairing Existing Mains. The following procedures apply primarily when existing mains are wholly or partially dewatered. After the appropriate procedures have been completed, the existing main may be returned to service prior to the completion of bacteriological testing in order to minimize the time customers are without water. Leaks or breaks that are repaired with clamping devices while the mains remain full of pressurized water may present little danger of contamination and, therefore, may not require disinfection.

1. Trench Treatment. When an existing main is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from this pollution. Tablets have the advantage in this situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.

2. Swabbing with Hypochlorite Solution. The interior of all pipes and fittings (particularly couplings and sleeves) used in making the repair shall be swabbed or sprayed with a 1% hypochlorite solution before they are installed.

3. Flushing. Thorough flushing is the most practical means of removing contamination introduced during repairs. If the valve and hydrant locations permit, flushing toward the work location from both directions is recommended until discolored water is eliminated.

4. Slug Chlorination. Where practical, in addition to the procedures previously described, the section of the main in which the break is located shall be isolated, all service connections shut off and the section flushed and chlorinated by the slug method. The dose may be increased to as much as 300 mg/L (300 ppm) and the contact time reduced to as little as fifteen minutes. After chlorination, flushing shall be resumed and continued until discolored water is eliminated and the chlorine concentration in the water exiting the main is no higher than the prevailing water in the distribution system or that which is acceptable for domestic use.

5. Bacteriological Samples. Bacteriological samples shall be taken after repairs are completed to provide a record for determining the effectiveness of the procedure. If the direction of flow is unknown, then samples shall be taken on each side of the main break. The Contractor shall perform all disinfection and testing of water main. Samples will be taken after the mains have been satisfactorily chlorinated in accordance with these Specifications. The Contractor shall deliver the samples to the City of Jackson Water Treatment Plant for testing. If positive bacteriological samples are recorded, the situation shall be evaluated by the Department of Public Works to determine corrective action. Daily sampling shall be continued until two consecutive negative samples are recorded.

h. Service Connections. Minimum size shall be one inch. Water service connections shall be constructed with a minimum of five feet cover, at right angles to water main between main and curb stop, and as close as possible to the existing service that is being replaced. Where obstructions (e.g., trees) make open cut installation impractical or when directed by the Engineer, the service shall be installed by boring.

1. Service Taps. All dry taps and live taps will be conducted by the Contractor. Service taps should be located at ten o'clock or two o'clock on the circumference of the pipe.

Service taps on ductile iron pipe may be screwed directly into the tapped and threaded main without any additional appurtenances.

2. All service taps on PVC pipe shall utilize a tapping saddle (NO DIRECT TAPS). The equipment and procedures specified in ANSI/AWWA C605 for saddle tapping shall be followed.

3. Service Taps in Polyethylene Encasement. Service taps may be accomplished by making an x-shaped cut in the polyethylene encasement and temporarily folding back the film. After the tap has been completed, cuts in the polyethylene and any other areas of damage to the film shall be repaired with tape as described in ANSI/AWWA C105/A21.5. Direct service taps may also be made through the polyethylene, with any resulting damaged areas being repaired as described previously. The preferred method of making direct service taps consists of applying two or three wraps of polyethylene adhesive tape completely around the pipe to cover the area where the tapping machine and chain will be mounted. After the direct tap is completed, the entire circumferential area should be closely inspected for damage and repaired if needed.

4. Disinfecting Service. Prior to connecting customer's service line to curb stop, the service in the street right-of-way shall be flushed and filled with a 200 mg/L (200 ppm) minimum chlorine solution. Solution shall stand for a minimum of one hour after which time the service shall be flushed free of chlorine solution. A sample will then be taken by the Water Department after which the curb stop shall be installed, if not already in place, and the customer's service shall be reinstated.

5. Backfill. The service shall be bedded with Class IIIA granular material and backfilled with Class II granular material or approved on-site material. Backfill under road surfaces, curb, driveways or sidewalk or within their zone of influence shall be compacted to 95 percent of the maximum unit weight. Other trenches shall be backfilled with suitable on-site material and compacted to a minimum of 90 percent of its maximum unit weight.

i. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price for the following pay items:

Pay Item	Pay Unit
Hydrant Extension	Foot
Water Main Backfill, Class II	Foot
Water Main, ____ inch	Foot
Water Main, Dir Bore, ____ inch	Foot
Air Vent Manhole, ____ inch	Each
Gate Valve and Box, ____ inch, Modified	Each
Hydrant Assembly	Each
Hydrant Assembly, 6-foot Bury	Each
Hydrant, Rem, Modified	Each
Tapping Sleeve, ____ inch x ____ inch	Each
Tapping Valve and Box, ____ inch	Each
Water Main, Connect New ____ inch to Existing ____ inch	Each
Water Main, Cut and Plug, ____ inch	Each
Water Serv, ____ inch	Each

Water Serv, Long, ____ inch ……..Each
Water Serv, Reconnect ____ inch ……Each
Water Serv, Retire …… Each
Water Main Fittings, DI ……..Pound

Hydrant Extension will be for the actual length of extension installed in feet and includes providing and installing the hydrant extension necessary to raise hydrant to height specified, including all materials necessary for proper installation.

Water Main Backfill, Class II will be measured by length in feet along the water main. Payment for Water Main Backfill includes disposal of unsuitable material and furnishing Class II granular material for backfill from one foot above the pipe to the pavement base or finished grade. Where on-site backfill material is used in backfilling the water main, the payment will be reduced in proportion to the amount of on-site backfill material actually used.

Water Main of the size, class and trench detail specified, will be measured in place by length in feet, from center to center of crosses, tees and bends, including fittings. Payment includes providing and installing the specified pipe, bedding and initial backfill material to one foot above the pipe. Payment also includes polyethylene encasement (for Ductile Iron), gaskets, fittings, restraints and other materials required for proper installation. When required, payment includes providing and installing Styrofoam insulation. Payment also includes excavation, trenching, coffer dams, de-watering, placing and removing temporary sheeting and bracing, support and protection for existing utilities, backfilling with approved on-site granular material, compaction, disposal of surplus earth removal, tree root protection, abandoning old water main, removal of gate wells as required on the plans, temporary road or trench surface as directed by the Engineer, removal of temporary surfaces, all work and materials required for the necessary disinfection and testing, and all other work required for a complete job.

All additional work necessary for the completion of this work but not specifically listed as a pay item will be deemed included in one or more of the contract items listed in the proposal.

Water Main, Dir Bore includes all labor, equipment, and materials necessary to provide and install the specified pipe by the directional bore method as specified herein and detailed on the plans. The Directional Bore item shall be paid for per foot as measured HORIZONTALLY from bore entrance to exit with no allowance for curvature of the pipe. This item includes all utility location, excavation, backfill, boring, connection to other pipe at the ends of the bore, sheeting and bracing, dewatering, testing, flushing and chlorinating, cleanup and all other miscellaneous items of work necessary to complete the bore and install the pipe.

Air Vent Manhole of the size specified includes providing and installing air vent manhole including the manhole, bedding stone, valves, vent pipe, excavation and backfill with Class II sand or approved on-site material and any other materials needed to properly install specified items.

Gate Valve and Box, Modified and **Tapping Valve and Box** of the size specified includes providing and installing the valve, retaining glands if needed, cast iron valve box with lid marked “WATER”, excavation and backfill with Class II sand or approved on-site material and any other

materials needed to properly install specified items. Where required by paving operations, payment shall include temporary lowering. (Note: Payment for Gate Box, Adjust, Case 1 will be made for gate boxes lowered for paving.)

Hydrant Assembly includes providing and installing fire hydrant, 6-inch ductile iron hydrant lead, polyethylene encasement, 6-inch valve, cast iron valve box, retainer glands, coarse gravel or crushed stone mixed with coarse sand for drainage, excavation and backfill with Class II sand or approved on-site material.

Hydrant Assembly, 6-foot bury includes providing and installing 6-foot bury fire hydrant, 6-inch ductile iron hydrant lead, polyethylene encasement, 6-inch valve, cast iron valve box, retainer glands, coarse gravel or crushed stone mixed with coarse sand for drainage, excavation and backfill with Class II sand or approved on-site material.

Hydrant, Rem, Modified includes removing the existing hydrant lead, valve and hydrant assembly as shown on plans and setting the hydrant aside (undamaged and in one piece) for retrieval by the City Water Department. The work includes bulkhead of the existing lead and backfill with specified material.

Tapping Sleeve of the size specified includes providing and installing stainless steel tapping sleeve, excavation and backfill with Class II sand or approved on-site material and any other materials needed to properly install specified items. The City of Jackson Department of Public Works will make the tap after the Contractor has installed the tapping sleeve and valve.

Water Main, Connect new ___ inch to existing ___ inch includes providing and installing bends, couplings, retainer glands and any other materials needed to properly make the connection. Payment includes the removal of any valves, valve boxes or valve manholes rendered unnecessary by the new connection, bulkheading abandoned pipes with concrete and excavation and backfill with Class II sand or approved on-site material. Water main will be paid separately as measured between the connection point to the existing main and the center of the new main. Water valves will also be paid separately.

Water Main, Cut and Plug, ____ inch includes providing and installing plug or cap, polyethylene encasement, retainer glands and any other materials needed to properly install specified items. Payment includes the removal of any valves, valve boxes or valve manholes rendered unnecessary, bulkheading abandoned pipe with concrete and excavation and backfill with Class II sand or approved on-site material.

Water Serv of the size specified includes providing and installing copper pipe, corporation stop and tap saddle, curb stop, stop box, excavation and backfill with Class II sand or approved on-site material and any other fittings required to connect new service to existing pipe in parkway. This pay item will include connecting the new service to main and to the existing service line to building and disconnecting old service from main. A Water Service shall be defined as any service thirty (30) feet or less in length. A Water Service, Long is any service greater than thirty (30) feet in length.

Water Serv, Reconnect of the size specified includes disconnecting existing service from old water main and connecting to new water main. Water Service, Reconnect includes corporation

stop and tap (and saddle when required), up to ten (10) feet of service pipe, excavation and backfill with Class II sand or approved on-site material and any other fittings required to make connection.

Water Serv, Retire includes exposing the service at main, closing the existing corporation stop and disconnecting the service from the main. It also includes removal of stop box and excavation and backfill with Class I sand or approved on-site materials. This applies **only** to services to vacant lots or services that are no longer in use on existing water mains that will not be retired.

Water Main Fittings, DI to accommodate changes in the plans will be paid per pound based upon catalog weight. Payment for additional fittings includes furnishing and installing the fittings, joint restraint and appurtenances required to complete the installation. The cost of fittings indicated on the plans shall be included in the unit price of the water main.

CITY OF JACKSON, MICHIGAN

SPECIAL PROVISION
FOR
SANITARY SEWER VIDEO INSPECTION

a. Description. This work includes all labor, materials, and equipment required to make a digital video disc (DVD) record of the physical and structural conditions of the existing sanitary sewers prior to the beginning of any construction activities, and the newly constructed sanitary sewers after all project work has been completed in the vicinity of the sewers.

The contractor is responsible for damage to the existing sanitary sewers caused by their operation. Costs to repair damage caused by the Contractor's operations, as identified by the Engineer in the post-construction video inspection, will be borne by the Contractor.

b. Video Inspection. Conduct video inspection to determine the physical and structural conditions of the sanitary sewers prior to construction and after construction activities are completed.

Prior to starting video inspection, clean the sanitary sewer as necessary to ensure a complete video inspection. The rate of video inspection shall not exceed 30 feet per minute. Use video equipment specifically designed for sewer inspection and recording. Ensure the video is professional quality, in color, and provides a clear and accurate visual record of the sanitary sewer conditions.

All video recordings shall display the date (month, day, and year) and the time (hours, minutes, and seconds) in the upper left hand corner of the frame. Ensure that total sewer length and locations of sewer defects are also displayed in the upper right hand corner of the frame.

c. Lateral Launch. Conduct video inspection at each lateral service connection and point of connection as part of the video to determine the physical condition of the sanitary sewer services prior to construction and after construction activities are completed.

Ensure that video equipment is capable of pan, tilt, and zoom to view up each lateral service connection or point of connection to provide a complete video inspection.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price for the following pay item:

Pay Item	**Pay Unit**
Sanitary Sewer Video Inspection, Pre-Construction	Foot
Sanitary Sewer Video Inspection, Post-Construction	Foot
Sanitary Sewer Video Inspection, Pre-Construction, Lateral Launch	Each
Sanitary Sewer Video Inspection, Post-Construction, Lateral Launch	Each

Sanitary Sewer Video Inspection, Pre-Construction includes all labor, materials, and equipment necessary to provide a digital video disc (DVD) record of the physical and structural

conditions of the existing sanitary sewers prior to the beginning of any construction activities.

Sanitary Sewer Video Inspection, Post-Construction includes all labor, materials, and equipment necessary to provide a digital video disc (DVD) record of the physical and structural conditions of the sanitary sewers after all project work has been completed in the vicinity of the sewers.

Sanitary Sewer Video Inspection, Pre-Construction, Lateral Launch includes all labor, materials, and equipment necessary to perform the inspection of all existing service laterals prior to the beginning of any construction activities.

Sanitary Sewer Video Inspection, Post-Construction, Lateral Launch includes all labor, materials, and equipment necessary to perform the inspection of all service laterals after all project work has been completed in the vicinity of the sewers.