

9.01 SCOPE OF WORK

The work covered by this section of the specifications consists of furnishing all plant, labor, materials, and equipment and in performing all operations for the installation of the watermains and appurtenances in strict accordance with these specifications and applicable contract drawings.

9.02 MATERIALS

A. Pipe Materials

1. PVC Pipe and Fittings: shall be designed in accordance with American Water Works Association (AWWA) Standards C900 (latest edition). The pipe shall be designed to withstand a minimum working pressure of 150 psi. Pipe shall be a minimum thickness of DR18. Joints shall be in accordance with ASTM D3139 (latest edition). PVC pipe must meet the requirements of NSF Standard 14 and NSF Standard 61 to be used for potable water systems.

Fittings for PVC pipe shall be the same as for Ductile Iron Pipe.

2. Ductile Iron Pipe and Fittings shall be designed in accordance with American Water Works Association (AWWA) Standards C150 (latest edition) and C151 (latest edition) also ANSI Standards A21.50 (latest edition) and A21.51 (latest edition). The pipe shall be designed to withstand a minimum working pressure of 200 psi and a minimum hydrostatic test pressure of 300 psi. The pipe shall also be designed for a laying depth of a minimum of six feet. All ductile iron pipe shall meet the requirements of NSF International (NSF) Standard 61.

All ductile iron pipe and fittings shall be coated on the outside with an asphaltic coating of asphalt base one mil thick at the point of manufacture in accordance with the specifications of the AWWA Standard C151 (latest edition) and ANSI Standard A21.51.02. Cement lining requirement shall conform to AWWA Standard C104 (latest edition) and ANSI Standard A21.4 (latest edition). The spigot ends of all pipe lengths which have been cut in the field shall be ground to a smooth surface, tapered back about 1/8 inch at an angle of 30° with the pipe centerline, and painted with two coats of asphaltum metal protective paint.

Ductile iron pipe shall conform to the dimensions set forth in the table below (Design Engineer shall verify expected pressure range with Township Engineer during design phase).

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Pipe Size Nominal Inside Diameter in Inches	Outside Diameter in Inches	Pipe Barrel Thickness in Inches	Thickness Class
6"	6.90	.31	52
8"	9.05	.33	52
10"	11.10	.35	52
12"	13.20	.37	52
16"	17.40	.40	52
20"	21.60	.42	52

3. High Density Polyethylene Pipe (HDPE) for river crossings or wetland crossings shall be DR 9, Class 3408 as supplied by Driscoplex PW 4000 by Performance Pipe or equal, and meet the following conditions.

Pipe Size Standard	Dimension Ratio (DR)	Working Pressure	Working Pressure + Surge Pressure
DIPS	9	200 psi	300 psi

All HDPE pipe shall be joined by heat fusion per manufacturer's requirements. HDPE pipe must meet the requirements of NSF Standard 14 and NSF Standard 61 and AWWA C906 (latest edition). The exterior wall print line of all HDPE pipe proposed for installation and potable use must bear the NSF-PW identification. River crossing section shall be pressure tested independently of other watermain. See Section 9.07 of these specifications. This method and locations must be approved by the Township Engineer. Refer to standard details for the connection of ductile iron pipe to HDPE. This connection, a mechanical joint (gate or butterfly valve, and corporations on the ductile iron) shall be enclosed in a pre-cast concrete manhole. The size of the manhole will be determined by the Engineer and a standard EJIW 1040 shall be utilized for this structure and shown in the standard detail.

Refer to MDOT specification BJ-2D, Special Provisions for Directionally Bored Pipe.

HDPE pipe shall be inspected prior to installation by a qualified person or by the Township Engineer. If damage is found to be unacceptable according to the manufacturer, then suitable efforts shall be made to repair the damaged pipe or the pipe shall be rejected from use.

The pipe should all be approved by the Township.

B. Joints for Watermain pipe shall conform to the following:

1. Flanged joints for ductile iron pipe shall be made with flanges, bolts, nuts, washers and gaskets conforming to AWWA Standard C110 (latest edition) and ANSI Standard A21.10 (latest edition).
2. Mechanical joints shall conform to AWWA Standards C110 (latest edition) and C111 (latest edition) along with ANSI Standards A21.10 (latest edition) and A21.11 (latest edition). Rubber gaskets shall conform to manufacturer's standards.
 - a. Retainer glands shall be utilized on all mechanical joint fittings.
 - b. Lead tip gaskets will not be allowed for providing metal to metal contact at joints.
3. Rubber gasket joints for ductile iron pipe shall be of a bell and spigot type which employs a single rubber gasket to effect the joint seal. These joints shall conform to AWWA Standard C111 (latest edition) and ANSI Standard A21.11 (latest edition). These joints shall be similar to "Tyton" as manufactured by U.S. Pipe and Foundry Co., "Bell-Tite" as manufactured by James B. Clow and Sons, Inc. or approved equal.
4. Bell joints shall be cast iron, mechanical, flexible joint tube designed to withstand a working pressure of 200 pounds and a hydrostatic test pressure of 300 pounds. Joints shall be similar to "Molox" as manufactured by the American Cast Iron Pipe Company, "Usiflex" as manufactured by U.S. Pipe and Foundry Co., "River Crossing Pipe" James B. Clow & Sons, Inc. or an approved equal.
5. Field-Loc gaskets/Fast-Grip or equal are accepted for the use of Tyton push on joints for fittings.

6. Ductile sleeves shall have “cookie” piece inserted between two pipes if there is any separation between the two pipes.

C. Gate Valves

Gate valves shall meet the requirements of AWWA Standard C500 (latest edition) or C515 (latest edition). Valves shall be designed for not less than 150 psi working pressure and shall be tested for leakage and distortion under a hydraulic pressure of not less than 300 psi. Under such pressure, the valves shall show no leakage or distortion.

All gate valves shall be cast iron body, fully bronze mounted, bronze stem, double disc gate valves or resilient wedge gate valves. The wedge casting shall be of a solid design and 100% encapsulated with nitrile rubber. Hollow wedges are not allowed and no epoxy coating is allowed in wedge. There shall be 3 stem seal o-rings; two in the seal plate which shall be replaceable with the valve in the full open position at rated working pressure, and one under the stem thrust collar. All gaskets shall be o-ring seals. O-rings set in a cartridge shall not be allowed. Each valve shall have a clear waterway equivalent in area, when open, to that of the connecting pipe. Valves shall be made to open left (counter-clockwise). All valves shall be connected to the pipeline by mechanical joints. All valves shall be operated by non-rising stems and shall have square wrench nuts.

All valves shall be furnished with a three piece adjustable valve box as specified herein unless the valve is housed in a manhole. Valves intended to be specifically used in fire line shall be designed and tested at minimum pressure of 200 psi.

The operating nut on all valves including hydrant valves will be located with five feet of the finished grade. If the valves operating nuts are greater than five feet below finished grade a fixed stationary rod shall be required in the valve box to allow the valve to be operated with a standard valve wrench.

D. Butterfly Valves

Butterfly valves, as called out on the plans, shall be so designed and fabricated that they will conform to AWWA Standard C504 (latest edition) for Class 150B valves. The rubber valve seat shall cover the entire interior surface of the valve body and the face of the body. The valve disc shall be streamlined, free of external ribs, keyed to the shaft, provided with suitable means for positioning and shall utilize wedge type closing against the rubber liner at a full close seating angle of 90° to the axis of the pipe.

Valves shall be as manufactured by Dresser Manufacturing Division, Keystone International, Inc. or an approved equal.

All Butterfly valves shall be installed in a manhole per the Standard Detail Sheet.

E. Valve Boxes

Valve boxes shall be cast iron, three-piece, adjustable type, with a 5-1/4 inch shaft. Covers shall be furnished with finger holes and marked "WATER". Valve boxes shall be similar to that as manufactured by the East Jordan Iron Works or an approved equal. Contractors shall be responsible for adjusting valve boxes to meet finish grades once finish grades are established.

F. Fire Hydrants

At the points indicated on the drawings, there shall be installed a hydrant assembly consisting of a hydrant, a six-inch gate valve, a cast iron valve box and all piping and fittings necessary for a complete job. Gate valves shall be as specified above. Valves shall be located three feet, plus or minus, from the hydrant as shown on typical hydrant setting on drawings.

1. Hydrant barrel inside dimension to be 8-inches I.D. from top to bottom.
2. Nozzles to be on a removable head so that they may be rotated by changing the position of the top flange without removing the barrel.
3. Hydrant to be fully bronze mounted including top of operating stem where it passes through the double "O" ring seal in the bronze packing gland. Operating stem in base and valve seat shall be made of bronze. No "V" type threads are allowed for the operating stem or nut.
4. The drain valve shall be plugged in all locations.
5. Hydrant nozzle shall be located 3'-0" to 3'-6" above breakaway flange.

Hydrants furnished for this work shall meet the requirements of AWWA Standard C502 (latest edition) and any revision thereof. They shall be East Jordan Iron Works Model 5BR250 Water Master, or approved equal. Hydrants shall be designed for installation with six feet of cover over the connection. The diameter

of the valve port in the hydrant shall be at least five inches. The hydrant shall be equipped with two four (4) inch pumper connections. Threads shall conform to national standard threads. Hydrant stems shall be built to open left (counter clockwise).

Hydrants shall be of the "break flange" type. The hydrant shall be so designed that all working parts, including valve and drip mechanism, may be removed from the hydrant through the barrel without the necessity of excavation. The hydrant shall be designed for a working pressure of 150 psi. Operating nuts shall be pentagon 1½" size, as measured point to opposite flat.

G. Water Service Connections

Water service connections are the water line connections which extend from the watermain to the property line or easement line of water system customers. A water service connection shall consist of a corporation stop in the watermain, a small diameter water line to the property line, a curb stop at the property line and curb box and cover. The Contractor shall place the water service connections where directed by the Design Engineer. The service line piping and fittings shall be either 1" or 2" size as called out on the plans.

1. Service Line Pipe and Fittings

Pipe material shall be Type K Copper, annealed and soft temper ASTM B.88. Joints shall be flared. No compression type is allowed. Must conform to AWWA Standard C800 (latest edition).

2. Corporation Stops

One-inch and two-inch corporation stops shall be Mueller series H-15000, Ford F600, McDonald 4701 or equal, for copper service pipe. Corporation stops shall be in the "open" position after the service connection is complete. Must conform to AWWA Standard C800 (latest edition).

3. Curb Stops

Curb stops shall be Mueller Oriseal curb valves series H-25204, Ford B22, McDonald 6100 or equal. Curb stops shall be of the quarter turn, positive shut-off type. Must conform to AWWA Standard C800 (latest edition).

4. Curb Boxes

Curb boxes shall be adjustable in height to allow for variable grade elevations. Curb boxes shall be all cast iron construction and coated inside and out with tar base enamel. A cast iron lid shall be furnished with finger holes, or plug in center (with rod) and shall have "WATER" permanently stamped.

Curb boxes for one-inch services shall be furnished with a stationary operating rod inside the box and arch pattern base equal to Mueller series H-10314, Ford EA1, or McDonald 5601.

Curb boxes for one and a half inch and two-inch services shall be the arched pattern base with rod, equal to Mueller series H-10386. Must conform to AWWA Standard C800 (latest edition).

5. Tapping Saddles

Tapping saddles shall be required for all PVC or HDPE watermains and service connections to ductile iron watermain larger than 1". Materials shall be ASTM B62 Brass, with optional stainless steel double straps. Saddles shall be in accordance with AWWA C800 (latest edition).

Saddles shall be manufactured by Mueller BR2S or A.Y. McDonald.

H. Tapping Sleeve and Valve

Where shown on the plans or where a tee and valve are to be installed on an existing main under pressure, a tapping sleeve and drilling machine shall be used. After installing the sleeve and prior to drilling, the sleeve shall be pressure tested at 150 psi for five minutes. The Township Resident Project Representative and the Township Water Department Operator shall be given 48 hours notice of all watermain live taps. Tapping sleeves for taps smaller than the main line, ex: 8"x10", 10"x12" utilize a stainless steel (vega type) wrap around sleeve. For taps which are size on size ex: 12"x12", 10"x10", use class 250 EJIW cast iron sleeves. Tapping sleeve and valve shall be mechanical joint, class 250, as manufactured by East Jordan Iron Works, or an approved equal.

I. Watermain Stubs

At the end of a stub, the last three (3) pipe joints shall have Field-Loc gaskets/Fast-Grip gaskets or equal. No galvanized pipe materials shall be

allowed. A corporation shall be placed for the use of flushing and sampling.

J. Tracer Wire Box

Tracer wire box shall have a cast iron cover conforming to ASTM-48 Class 25 or higher and a plastic standpipe made of acrylonitrile butadiene styrene (ABS) in accordance with ASTE D-1788. Acceptable manufacturer shall be VALVCO, Inc., Mini Test Station.

9.03 INSTALLATION OF PIPE AND FITTINGS FOR WATERMANS

All pipe and fittings shall be installed in strict accordance with the recommendations of the manufacturer and AWWA Standard C600, or AWWA C605 (latest edition). Piping and fittings for watermains shall be of the types and materials hereinbefore specified. The pipe and accessories shall be new and unused. 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 Owner.

All watermain shall be placed with a depth of bury, measured from the top of the pipe to final finished grade, with a minimum of six (6) feet of cover. Depth of cover greater than six (6) feet of cover may require additional easement width be granted to the Township and/or may require developer to assume some future restoration costs.

Watermain along private roads shall not be placed in the foreslope of ditches and shall be a minimum of 23 feet from the centerline of the road.

All watermain shall be laid with a 10 gage tracer wire. Tracer wire shall be laid six (6) inches above watermain. Tracer wire shall terminate in a tracer wire box. Tracer wire box shall be placed at each hydrant or approximately every four hundred (400) feet.

The interior of the pipe and fittings shall be thoroughly cleaned of foreign matter before being lowered into the trench with an approved method and shall be kept clean during laying operations by plugging the ends or other approved methods. The plug shall be fitted with a means for venting. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth, animals or other substance will enter the pipes. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe floatation, if the trench fills with water. No pipe or fittings shall be laid in water or when the trench or weather conditions are unsuitable for work except by permission of the Township Engineer. Valves shall be installed in the closed position.

Ductile iron pipe and fittings used on ductile iron (except flanged pipe) shall be provided with three brass wedges at each joint, Fastite conductive (American Pipe) or equal, "Electro-bond" strips of "Cadweld" connectors or other means of providing metal-to-metal contact at the joint to allow an electric current to flow through the joint.

Trench widths shall meet all standards, such as OSHA and AWWA Standard C600 or AWWA C605 (latest edition). The full length of each section of pipe shall rest solidly upon the pipe bed with recesses provided to accommodate the bells and joints. Refer to AWWA Standard C600 or C605 (latest edition) for maximum allowable joint deflection.

When pipe is cut in the field, the outside of the cut end shall be tapered back about $\frac{1}{8}$ inch at an angle of 30° with the centerline of the pipe to remove any sharp, rough edges. Exposed edges shall be coated with two coats of asphaltum metal protective paint.

Fittings at bends in the pipe line shall be firmly wedged against the undisturbed vertical face of the trench to prevent the fittings from being blown off the lines when under pressure. Concrete thrust blocks shall be provided as shown in the standard details or directed by the Township Engineer.

Where pipe ends are left for future connections, they shall be valved, plugged, or capped as called for on the drawings. Where connections are made between new work and existing mains, the connections shall be made by using special pipes and fittings as required to suit the actual conditions.

All temporary and permanent watermain stubs shall be restrained with Field-Loc gaskets/Fast-Grip or equal for at least three (3) pipe joints prior to the stub end, including mechanical fittings. This will allow for a connection to the main without removing or reducing the existing water pressure. It is recommended that a gate valve be installed at the end of the stub.

9.04 SETTING HYDRANTS

Under each hydrant the ground shall be excavated to a depth of at least one (1) foot below the hydrant base and over an area approximately three (3) feet square. This excavation shall be filled up to the elevation of the hydrant base with well compacted, clean, coarse gravel or crushed stone. Refer to the standard details.

Each hydrant shall be set truly plumb and held firmly braced in this position. The connection of the hydrant to the branch shall be made by mechanical joint as herein specified under jointing. After the joining has been made, a concrete thrust

block shall be poured on the side opposite the branch connection, from the hydrant to the solid undisturbed earth of the excavation wall.

When the concrete has become sufficiently hard, an additional one foot depth of gravel shall be spread and tamped around the hydrant. When this has been done, the remaining backfill shall be placed and compacted, taking care at all times to avoid jarring the hydrant.

Wherever it is necessary to adjust the length of the barrel to meet variations in elevation of the ground surface over the watermain and at the hydrant location, suitable extensions shall be provided for the hydrant barrel and operating stem. In all cases, the break flange shall be located at grade.

Contractor shall remove all water from fire hydrants. Water left remaining in each fire hydrant assembly will be removed by pumping prior to acceptance by the Township. Thawing and/or repair of frozen hydrants shall be performed by the Contractor at no additional expenses to the Owner.

In addition to pumping any new hydrant prior to Township acceptance the Contractor shall winterize any new hydrant installed or existing hydrant used during construction, if work done between October 1 and March 31.

9.05 CONNECTING TO EXISTING WATERMANS

Where connections are made between new work and existing watermans, the connections shall be made by using special pipes and fittings as required to suit the actual conditions. No connections to existing mains shall be made until the new main has been pressure tested and chlorinated and is ready to be placed into service. When making the connection, swab pipe and fittings with four percent chlorine solution. The Township Engineer shall witness all connections and shall be notified 48 hours prior to the connection of new pipe to existing pipe. Bacteriological samples shall be taken after connection to existing is completed to provide a record for determining the procedures effectiveness per AWWA Standard C651 (latest edition). Conform to AWWA Standards C600 (latest edition) and C651 (latest edition).

9.06 DIRECTIONALLY DRILLED WATERMAIN

A. Description

This work shall consist of constructing underground crossings of a wetland using the directional drilling method of placing pipe to serve as carrier pipe. Refer to Michigan Department of Environmental Quality Water Division Procedure and Policy DWRP-03-009.

B. Depth of Bore

The minimum depth of drill using this method shall be six feet (6') of cover below existing grade, and a minimum depth of three feet (3') under any existing stream.

C. Materials

Plastic Pipe: Section 9.02 A.2. High Density Polyethylene Pipe.

D. Construction Method

This method consists of auguring or jacking a steerable rod under the wetland; then pulling back a cone that expands the soil or a wing cutter, which cuts a hole big enough to obtain the desired diameter. The diameter of the reamer or wing cutter is not to exceed the diameter of the pipe being placed plus two inches (2").

A drilling fluid of water and bentonite may be used in all operations of a directional drill. The use of a polymer for lubrication in the drilling fluid is acceptable.

Connection to HDPE Pipe shall not be made immediately after the pipe has been installed. It is recommended to wait overnight so that the pipe can approach an equilibrium temperature with its surrounding environments. Linear dimensions will vary with temperature changes. A tracer wire adequate for future location of the pipe shall be installed with all HDPE projects.

9.07 ACCEPTANCE TESTING WATERMAIN

A. General

Prior to connecting the new watermain to an existing watermain, the new main shall be flushed, chlorinated, and pressure tested as outlined herein.

The Township Engineer shall be notified 48 hours prior to the start of a pressure test. All acceptance testing shall be witnessed by the Township Engineer or Township Resident Project Representative.

A physical gap of at least three (3) feet must be left between the existing and new watermain until all testing results are satisfactory. The testing sequence shall be: 1) flushing, 2) pressure test, and 3) chlorination. Water for testing may be taken from a nearby hydrant or tee connection by using fittings to accommodate a standard fire hose connection. A reduced

pressure principle backflow prevention assembly must be used on the 2-1/2 inch connection to the main being tested.

B. Flushing of Mains

The watermain shall be flushed clean of sand and debris. Flushing shall be done using the "poly-pig" method of flushing. The Contractor shall furnish the brand new, unused, foam "poly-pig" swabs to be used. Prior to pigging and flushing the watermain must be charged with water.

Contractor shall insert "poly-pig" swab in the end of the new main nearest the existing watermain (or where shown on the plans). The swab shall be passed through the new main using water pressure. The swab shall be recovered at the end of the main through the blow-off assembly.

C. Hydrostatic Testing

The watermain or sections thereof shall be tested by the Contractor in the presence of the Township Engineer and all leaks shall be made tight to meet the requirements below. The Contractor shall furnish all piping, bulkheads, pumps, gauges and other equipment required to carry out the test and shall obtain Township Engineer's approval of same prior to testing.

The section of main to be tested shall be slowly filled with water at least 24 hours prior to starting the test. Expel air through corporation stops installed at high points in line. The Contractor shall make arrangements with the operation/maintenance personnel for obtaining water for testing.

All water used shall be metered and quantities reported to the operation/maintenance personnel.

At the start of testing, the main shall be pumped up to a pressure of 150 psi and the test period shall start immediately thereafter. Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section. The line shall then be maintained under this test pressure for a continuous period of two hours by pumping water into the line at frequent intervals. The test pressure shall not vary by more than +5 psi for the duration of the test. The volume of water so added shall be measured and considered to represent the leakage from the line under test during the intervals. All water service leads shall be tested with the mainline pipe. Conform to AWWA standard C600 or C605 (latest edition).

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

In inch-pound units,

$$Q = \frac{LDP^{0.5}}{148,000}$$

Where:

Q=Testing allowance (makeup water), in gallons per hour

L=Length of pipe 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)

Hydrostatic testing allowance per 1,000 ft of pipeline-gph

Test Pressure 150 psi

Nominal Pipe diameter	Maximum Leakage Gallons Per Hour Per 1,000 Feet of Pipeline
6"	0.50
8"	0.66
10"	0.83
12"	0.99
14"	1.16
16"	1.32
18"	1.49
20"	1.66
24"	1.99

In the event that the leakage exceeds the specified amount, the joints in the line shall be carefully inspected for leaks and repaired where necessary. Any pipes or special casting found to be cracked shall be removed and replaced with new pieces by the Contractor. No repair clamps or bell clamps can be utilized for repairs on new construction. After this work has been done, the tests shall be repeated. Final acceptance of the lines will not be made until satisfactory tests have been passed.

Water service leads installed with mainline pipe will be included in the watermain pressure test. Installed water service leads shall have a riser (extension of water service) placed at the downstream side of the curb box. For flushing, testing, and sampling, once all tests are completed, this riser must be removed or buried 6' below grade.

Not more than 2,500 LF of watermain shall be tested at one time. If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.

Where there is a considerable elevation difference in the section of watermain being tested, the test pressure shall average 150 psi over the length of main, but shall be not less than 140 psi at the highest elevation.

All main line valves and hydrant lead valves within the test section shall remain open during the pressure test.

After completion of the two hour pressure test, each valve shall be checked against test pressure.

D. Disinfecting Watermains

After completion of pressure testing and flushing of the watermain, the disinfection of the watermain shall be carried out in accordance with AWWA Standard C651 (latest edition).

The method of chlorination chosen shall be one of the three methods specified under Section 4.4 of AWWA Standard C651 (latest edition). Sampling requirements stipulated by the City of Traverse City Water Treatment Department shall also be followed for new construction or extensive repair for all water systems that are operated and maintained by the Grand Traverse County Department of Public Works. This procedure is as follows:

- a) After disinfecting, flush the system until the chlorine residual equals the source water and then allow the water to remain static for 24 hours before drawing the first sample. Submit the first sample which will then be tested using the Colilert procedure.
- b) Twenty four or more hours after the first sample has been drawn and has passed the Colilert test, submit two samples from the same sample point, one of which will be tested using the Colilert procedure and the other using the Membrane Filter procedure. If both of the second samples are negative, authorization will be given to use the new construction or repair. If the second Colilert sample is negative but the Membrane Filter sample produces background growth, resampling for the Membrane Filter testing shall only be required until no growth occurs on the Membrane Filter sample.

Note: If the system is re-chlorinated or re-pigged the sampling procedure shall be started over as listed above in paragraphs a & b. When no growth occurs on the Membrane Filter, approval will be given to activate the system.

The Contractor shall discuss his proposed disinfection procedure with the Township Engineer and have it approved prior to beginning the process.

The Contractor shall supply the chlorine, all necessary equipment and labor necessary for its application. The Contractor shall make suitable arrangements with the Township Engineer for bacteriological analysis and shall be responsible for all cost incurred from bacteriological testing. Bacteriological analysis shall conform to the requirements of the Michigan Safe Drinking Water Act and be performed by a State approved drinking water testing laboratory.

9.08 TRANSFER OF WATER SERVICES

Where water services are to be transferred from an existing watermain to a new watermain, as shown on the plans, Contractor shall provide corporation stop and necessary pipe and fittings. Work shall be scheduled in such manners that transfer of service to any residence or water customer will result in the least possible interruption of water supply service. All services are 1 inch unless otherwise shown on the plans.

9.09 TRANSFER OF EXISTING HYDRANTS

Where indicated, existing hydrants are to be transferred from an existing main to a new main, as shown on the plans. Contractor shall excavate and reset the hydrant, as shown on Hydrant Assembly Detail, provide new 6-inch hydrant gate valve, 6-inch hydrant lead to new main and all fittings required for a complete installation.

9.10 HANDLING PIPE

All pipes and special castings shall be unloaded and distributed along the line of work in such a manner and with such care as will effectively avoid the cracking of any pipe or casting. Dropping directly from the truck will not be permitted. Care must also be exercised on the inside of the pipe. Wherever the outside coating may be found to have rubbed off, the part shall be thoroughly cleaned by brushing and shall then be recoated with an approved asphaltic paint or as may be required by the nature of the pipe coating. The Contractor shall keep on hand a supply of paint for such purposes.

9.11 MARKING PIPE

Each cast iron fitting shall have its weight and class designation conspicuously painted or cast on it. All other pipe materials shall have the class designation painted thereon. Where required, other designation marks shall be painted on the pipe or fittings to indicate correct location in the pipe section in conformity to a detailed layout plan.

All PVC pipe shall be marked as required by AWWA C900 (latest edition) and shall be stamped to indicate compliance with NSF Standard pw.

9.12 PIPE TAPS

Pipe lines shall be tapped for corporation cocks where shown or required for testing of completed watermains. For ductile iron or steel pipe, cocks shall be threaded directly into the pipe.

9.13 BLOWOFF

Blowoffs shall be placed on all dead-end mains and shall be as shown on the plans. Permanent blow-off assemblies shall be cut off below grade after testing is complete. Standing water within the blowoff shall be pumped out of the riser, capped, bolted, and buried.

9.14 THRUST BLOCKS

Concrete thrust blocks shall be poured on hand-excavated, undisturbed soil bearing surfaces of a minimum size as shown on the standard details or increased in size according to the actual bearing values of the soil in each location, in accordance with the instructions of the Design Engineer.

Thrust blocks shall be made of 3,000 psi concrete, wet mix. Concrete thrust blocks shall be placed at all 22-½ ° bends or greater, deadends, tees, reducers, hydrants and crosses, as required. Pre-cast thrust blocks may be utilized for certain applications, if approved by the Township Engineer. Retainer glands and/or mega lugs shall be utilized on all mechanical joint fittings.

9.15 PAINTING

All pipe, valves, bolts and any other portions of watermain exposed inside manholes and other structures shall be painted. If necessary, heat shall be provided to maintain good drying conditions. All items to be painted shall be dry and clean before application of the paint. Any rust or scale shall be removed by wire brushing or scraping.

9.16 FIRE HYDRANT SIGNS

The sign and its post shall be installed directly behind the hydrant. The sign shall be parallel to the street, and within the road right-of-way or easement. There shall be 2' (two feet) distance from the center of the top nut of the hydrant to the front face of the sign. The finish elevation of the sign shall not be less than 5' (five feet) to the top of the sign from grade at the base of the post and no more than 6' (six feet) to the top of the sign from grade at the base of the post. The post shall extend into the ground a minimum of 2' (two feet) below grade at the base of the post. Signs shall be constructed according to the Grand Traverse Fire Department Standards for Fire Hydrants. Signs and posts are available to be picked up at the Township Water Department for a nominal fee.

9.17 WATERMAIN VALVES

Contractor shall place a 4" wide fiberglass blue marking post at each main line valve. Marking posts shall be Rhino Fibercurve or approved equal. Valve marking post are available to be picked up at the Township Water Department for a nominal fee.

9.18 SHOP DRAWINGS

The Contractor shall furnish, as prescribed under Section "General Requirements" dimension and erection drawings and details of the watermain, valves, and other appurtenances furnished under this section. Complete details of all pipe deflections and ties to adjoining pipe shall be submitted to the Township Engineer for approval.

9.19 CERTIFICATION

The manufacturer of pipe and fittings shall furnish a certified statement that all pipe and fittings furnished by him have been inspected and tested in accordance with the applicable specifications. Pipe will be subject to inspection and approval upon delivery and no cracked, broken, damaged or defective pipe or fittings shall be laid in the work. Any piece that is found to be defective after it has been laid shall be removed by the Contractor and replaced by a sound and perfect piece.