

PROJECT SPECIFICATION

FOR

**BORE AND JACK
Rev. 1/31/2013**

Description

Bore and jack steel casing of the respective sizes as shown on the plans. The CONTRACTOR shall furnish all materials and operations necessary to construct the water main complete inside a casing pipe beneath and across the roadways and/or railroads as shown on the plans.

Bore and Jack

The casing pipe shall be jacked into place to satisfactory grade and alignment using the Bore and Jack method. All work shall be done in a workmanlike manner using sheeting or shoring as required to protect the workmen and the existing structures and utilities. All work shall be done to the satisfaction of the respective railroad or highway authority, as well as the ENGINEER. The ends of the casing pipe shall be sealed with pull on end seals. After completion of work, the CONTRACTOR shall leave the site in a better or equal condition than prior to start of construction.

Proper warning signals will be provided during construction as required by the respective highway or railroad authority.

The carrier pipes shall be pressure class 350 Ductile Iron Pipe Water Main or equal of the size shown on the plans and specified for under the Water Main items. The carrier pipes shall be subject to the same tests as required for water main. The carrier pipe shall be supported and electrically insulated from the casing pipe by casing spacers.

Casing spacers shall be bolt on style with a shell made of at least two segments. The band material shall be manufactured of a minimum 14 gauge T-304 stainless steel. The spacers shall be designed with risers (when needed) made of 10 gauge T-304 stainless steel. The runners shall be at least 7 inches long, and manufactured of high abrasion resistant and low co-efficient of friction, glass reinforced polymer with a minimum compression strength of 25,000 psi. The spacer shall have a flexible PVC or EPDM liner having a minimum thickness of 0.090 inches, with a hardness of durometer "A" 85-90. The liner shall have a rating of no less than 60,000 VPM and water absorption of 1% maximum. All welds are to be chemically passivated and all hardware to be stainless steel. Position the spacers one every 8 feet.

The length of casing pipe shall be as shown on the plans and shall be watertight throughout its length except at the ends. The casing pipe shall be of smooth wall steel with yield strength of 35,000 psi and shall be of the diameter and wall thickness as shown on the plans. The casing pipe joints shall be welded as they are installed. The I.D. of the casing pipe shall be a minimum of 6 inches larger in diameter than the outside of the maximum O.D. of the carrier pipe and fittings. The table below indicates the minimum acceptable wall thickness for different diameters of casing pipe.

JACKED IN PLACE STEEL PIPE CASING MINIMUM THICKNESS IN INCHES		
Nominal Pipe Size	Nominal Outside Diameter	Minimum Wall Thickness
2	2.350	0.154
4	4.500	0.188
6	6.625	0.188
8	8.625	0.188
10	10.750	0.188
12	12.750	0.188
14	14.000	0.250
16	16.000	0.250
18	18.000	0.250
20	20.000	0.250
24	24.000	0.250
30	30.000	0.312
36	36.000	0.312
42	42.000	0.438
48	48.000	0.500
54	54.000	0.563

The casing shall have a minimum cover of 5' 6" below the roadway or lowest base of rail and be a minimum of three feet below bottom of ditches, if any. When installation is to be made by the boring and jacking process, the auger must be kept a minimum of 6" behind the leading edge of the casing pipe or as otherwise specified by the ENGINEER or attending railroad inspector. The front of the casing pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The over-cut by the cutting head shall not exceed the outside of the pipe by more than one inch. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than approximately one inch, grouting or other methods approved by the ENGINEER or railroad authority shall be employed to fill such voids. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material. The use of water or other liquids to facilitate casing emplacement and spoil removal is prohibited.

The boring operation shall be progressed on a 24-hour basis without stoppage (except for adding length of pipe) until the leading edge of the pipe has reached the receiving pit. If during installation, an obstruction is encountered which prevents installation of the pipe in accordance with the railroad or highway authority specifications, notify the railroad or highway authority immediately, abandon the pipe in-place, and immediately fill with grout. A new installation procedure and revised plans must be submitted to, and approved by the railroad or highway authority before work can resume.

The casing shall be installed by a reliable and qualified CONTRACTOR with proper equipment and well versed in the process.

Abandoned water mains beneath the railroad or roadway shall be completely filled with cement grout and plugged on both sides of the railroad tracks or roadway. Each abandonment and cement grouting shall be included as part of each respective bore and jack operation.

A uniform mixture of 1:6 (cement : sand) cement grout shall be placed under pressure through the grout holes when voids between the pipe and undisturbed earth are required to be filled. Grouting shall start at the lowest hole in each grout panel and proceed simultaneously on both sides of the pipe. A threaded plug shall be installed in each grout hole as the grouting is completed at that hole.

Launching and Receiving Pits

The face of the jacking pits closest to the railroad track or roadway shall be loaded according to the requirements of the railroad or highway authority. For railroad crossings, the pits shall be located so that the intersection of the face of the pit nearest the railroad track with the bottom of the pit will be outside a theoretical slope line of 1 ½ horizontal to 1 vertical down from a point, on existing grade, 10' from the centerline of the railroad tracks. In no event shall the horizontal distance from the top of the pit to the end of the track ties be less than 25' measured at right angles to the centerline of railroad tracks. For roadway crossings, the pits shall be located so that the intersection of the face of the pit nearest the roadway crossing with the bottom of the pit will be outside a theoretical slope line of 1 horizontal to 1 vertical down from a point, on existing grade, from the outer edge of the roadway shoulder. Design plans and computations for the pits, sealed by a Licensed Professional Engineer, must be submitted to the railroad or highway authority and to the ENGINEER by the CONTRACTOR prior to the start of construction.

PROJECT SPECIFICATION

FOR

**CONNECTIONS TO EXISTING MAIN
Rev. 1/31/2013**

Description

The CONTRACTOR shall furnish all materials and do all work necessary to connect the proposed main to the existing main as shown on the plans and as specified herein.

Work Included

Connections to existing main shall include all work required to connect the proposed main to the existing main as shown on the plans. Included shall be cutting the existing main or removing the existing plug or fittings, furnishing and installing any required cutting-in-sleeves, furnishing and installing any pipe required for the connection, and the plugging of any main noted to be plugged on the plans or required to switch over to the new main.

The existing and required fittings shown on the plans are based upon available information. The CONTRACTOR shall expose the existing main and fittings at the proposed connection and shall determine the actual fittings required. The CONTRACTOR shall be responsible with the aid of the OWNER for locating all valves necessary to shut down the existing main for the connection. The CONTRACTOR shall have all required fittings ready for installation prior to shutting off the existing main to minimize the shut down period. The connections must be made during low usage periods of the water system and may be required to be performed at night. The CONTRACTOR shall coordinate with the local municipality Department of Public Works and the City of Saint Joseph Water Department to determine the timing for the connections.

The CONTRACTOR shall use the “dry tap method”, unless noted otherwise on the project plans. The CONTRACTOR shall request approval from both the City of Saint Joseph Water Department and the ENGINEER prior to deviating from the proposed plan.

When noted as a proposed connection utilizing the “wet tap method”, the CONTRACTOR shall install required tapping sleeves, tapping valves and valve boxes necessary to connect to an existing main under pressure. The “wet tap method” shall include all tapping sleeves, tapping valves, valve boxes, bolts, nuts, retaining glands, gaskets, and all other work and materials necessary to make the connection.

For this item, the CONTRACTOR shall cut and install solid plugs where required or noted on the plans for water main to be abandoned. Mechanical joint ductile iron plugs shall be installed on cut ends to remain in service. Concrete plugs shall be installed on main which has been abandoned to prevent entry of backfill material. Where the diameter of abandon main exceeds 8 inches the pipe shall either be filled with flowable fill or removed. All valves located on existing water main to be abandoned shall be abandoned and be rotated to a closed position as part of each water main connection. All valve boxes on abandoned water main shall be removed and filled with concrete. Valve boxes removed within the roadway shall be replaced with pavement of the same material and depth as existing pavement.

PROJECT SPECIFICATION

FOR

**HYDRANTS
Rev. 1/31/2013**

Description

The CONTRACTOR shall furnish and install all equipment and materials as shown on the plans and as specified for fire hydrants.

6" Hydrant, Valve and Box

Hydrants and their appurtenant gate valves shall be provided with standard mechanical joint connections. Hydrants shall have breakable flange parts and comply with the information in the table below. The CONTRACTOR shall verify the information in the table below with the local municipality and submit shop drawings to the ENGINEER for approval prior to ordering hydrants.

Color Factory Applied	Red for Authority Areas; Yellow for City Areas
Manufacturer	EJ Model #5CD 250 or Waterous Pacer WB67
Valve Opening	5"
Standard Hose Nozzles	2 - 2 1/2"
Outer Diameter Steamer Nozzles	1 - 5" (4 threads per inch)
Trench	5'
Extension on Riser	12"
Mechanical Joint Inlet Diameter	6"
Operating Nut and Nozzle Thread	1 1/2" Pentagon
Operating Direction	Counter Clockwise to Open and Clockwise to Close

All hydrants shall have 6" auxiliary gate valves meeting the specifications for valves and boxes included as part of this item and shall be set at locations designated on the contract drawings. They shall be placed with one cubic yard of crushed stone around the base to provide drainage for the hydrant drip when specified. Drain holes shall be plugged when below the water table. Retainer glands shall be used on the tee, valve and hydrant to provide a completely restrained installation. The 6" connecting water main from the auxiliary 6" gate valve to the main shall be Class 52 Ductile Iron Pipe. Hydrant chains shall be removed.

All hydrants shall have a bag placed over the top of them until they are placed in service.

Removal of Existing Hydrants

Where noted on the plans, the CONTRACTOR shall remove an existing hydrant and shall deliver the hydrant and appurtenances to the location within the local municipality as designated by the OWNER. As part of this item, the CONTRACTOR shall remove the hydrant and auxiliary gate valve and shall plug the end of the hydrant lead with an appropriately sized cast iron solid plug.

Plugging with concrete shall be allowed on water main to be abandoned. Restrained joints shall be provided as required on lines which are to return to service.

PROJECT SPECIFICATION

FOR

VALVES, BOXES AND MANHOLES

Rev 1/31/2013

Description

The CONTRACTOR shall furnish all equipment and materials and do all work necessary to install and construct the valves, valve boxes or valve manholes as shown on the plans and as specified.

Work Included

The work under this item includes all equipment, materials, work, and operations necessary to install the valves in valve boxes or valve manholes. Valves 4 inches or less shall be placed in a valve box while valves greater than 4 inch shall be placed in an appropriately sized concrete valve manhole with 5 ft minimum diameter or vault as shown on the plans.

Gate Valves

The gate valves to be furnished and installed shall comply with all applicable provisions of the latest revision of AWWA Standard C515-99 for reduced wall Resilient Seated Gate Valves. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas. Wedge rubber shall be molded in place and bonded to the ductile iron portion and shall not be mechanically attached with screws, rivets, or similar fasteners. Wedge shall seat against surfaces arranged symmetrically about the centerline of the operating stem so that seating is equally effective regardless of direction of pressure imbalance across the wedge. All seating surfaces in body shall be inclined to the vertical at a minimum of 32° (when stem is in a vertical position) to eliminate abrasive wear of rubber sealing surfaces. Stem shall be sealed by at least two O-rings; all stem seals shall be replaceable with valve open and subjected to full rated pressure. Waterway shall be smooth and shall have no depressions or cavities in seal area where foreign materials can lodge and prevent closure or sealing. Valve body and bonnet shall be epoxy coated, inside and out. Unless otherwise specified below or otherwise shown on the plans, gate valves shall have non-rising stem, 2" operating nut for counter-clockwise opening, with mechanical joint ends for ductile iron pipe. Wedge action retainer glands shall be used on all valves.

Butterfly Valves

When approved for use by ENGINEER and OWNER, butterfly valves shall be of the rubber-seated, tight-closing type. Butterfly valves and all accessories, including operators, shall meet the requirements of AWWA C504, except as otherwise specified. Valve bodies shall be either short-body flanged type, faced and drilled to the 125-lb ANSI Standard or wafer body. Butterfly valves, shall be as manufactured by Henry Pratt Co., Aurora, IL, Keystone Valve USA, Houston, TX, or equal. Wafer style valves shall be Pratt Model BF-04, Keystone Figure AR1, or equal. Short-body flanged valves shall be Pratt Model 2FII, Keystone Figure 504, or equal. Butterfly valve pressure classes shall be not less than Class 150B.

Valves shall be constructed of materials resistant to corrosion for the required service. Valve materials shall be as specified below or as required for the service.

1. Valve bodies:

Cast Iron	ASTM A126, Class B ASTM A48, Class 40
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2. Valve shafts:

	ASTM A276, Type 304, Stainless Steel
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3. Valve discs:

Wafer Body	Aluminum Bronze
Flanged Body	Ductile Iron w/316 Stainless Steel edge

4. Seats:

Wafer Body	Buna-N
Flanged Body	Synthetic Rubber

If stub shafts are furnished, the shafts shall extend a minimum of 1-1/2 diameters into the discs and the clearance between the shaft and discs shall not exceed the following:

Shaft Diameters (Inches)	Maximum Radial Clearance (Inches)
1/2 to 1 1/2	0.002
2 to 4	0.0025
5	0.003
6	0.004

The valve seat may be on the disc or on the body. Seats shall be mounted securely for complete immobility under all operating conditions. Seats shall be field replaceable. The operator shall be considered an integral part of the valve. Manual operators shall be of the enclosed, hand wheel worm-gear type, as required. Worm-gear type operators shall include a worm gear and matching drive worm. Bearings shall be provided for each rotating member. The operator shall be designed to operate the valve with a maximum hand wheel pull of 40 pounds. Stop-limiting devices shall be provided to prevent over travel of the disc in either direction. The operator shall be designed to hold the disc in any position without flutter or wear on the valve or operator. The operator shall be housed in a watertight enclosure and shall be packed with grease or oil-filled. Valve disc shall rotate 90 degrees from full open to tight shut position.

Each valve shall be equipped with a pointer and scale plate which will indicate the position of the valve disc at all times. The shaft seal shall be a packing gland with a one-piece cast-iron gland follower; studs and nuts shall be bronze. Packing shall be self-adjusting split v-type. Seals shall be self-compensating and self-adjusting under pressure.

Valve Boxes

Valve boxes shall be "Tyler" boxes designed for use with nut operated valves installed underground. Boxes shall be cast iron, screw type, consisting of a top section, boom section and cover. The assembly shall be of length as required by grades. Furnish cast iron extensions, if required. Boxes shall fit all sizes of valves so fitted.

Valve Vaults

The valve vaults shall be constructed where called for and in accordance with the details on the project drawings. 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 grade, unless otherwise noted on the plans.

Valve Manholes

Manholes shall be provided as required on all valves greater than 4 inch, except fire hydrant auxiliary valves, unless a valve vault is specifically called for on the plans. The manhole should be adequate in size to serve its purpose and suitably designed for traffic loads that may come upon it. No manhole shall be less than 5' inside diameter and shall be constructed from pre-cast reinforced concrete.

Valves shall be supported independently from the manhole bottom as approved by the inspector. Expansion joint material shall be provided for bearing at the point where the pipe passes through the manhole walls.

Manhole frames and covers shall be the specific type for each municipality as listed below and included as part of the manhole. Each cover shall have suitable holes for convenient removal of the cover.

City of Saint Joseph - Manhole frames with customized City of Saint Joseph Logo Covers (EJ product #00103648) or approved equal with "City of St. Joseph" and "Water" in 2 inch recessed flush lettering around the City of St. Joseph logo in the center, cast into the cover. Reference Construction Detail CD-15.

Royalton Township, Lincoln Charter Township and St. Joseph Charter Township – Manhole frames shall be East Jordan Iron Works No. 1040A covers, or approved equal, the manhole covers shall be marked "Water" with letters cast into the cover.

Manhole bottoms shall be pre-cast or poured concrete with 6" minimum thickness. The joint between the bottom and walls shall be properly sealed.

PROJECT SPECIFICATION

FOR

**WATER MAIN AND FITTINGS
Rev. 1/24/2013**

Description

The CONTRACTOR shall furnish all materials and do all work necessary to construct complete water main that is ready for service and test the water main as shown on the plans and as specified.

Pipe Materials – Ductile Iron Pipe (DIP)

The pipe material shall be Pressure Class 350 Ductile Iron in accordance with AWWA C150 and AWWA C151 standards for piping material with push-on joints for 8" and larger main. 6" and smaller main shall be Class 52 Ductile Iron with push-on joints. The pipe shall be cement lined in accordance with AWWA Standard C104. Cement lining shall be standard thickness and have a bituminous seal coat. All DIP water main must be stamped ANSI/NSF Standard 61. DIP water main shall be manufactured by United States Pipe and Foundry Company, American Cast Iron Pipe Company, Griffin Pipe Products Company, or approved equal. Depth of bury shall be 5'-0" to 6'-0" for DIP water main and each joint shall have two bronze wedges for conductivity.

Where areas of possible contamination are shown on the plans and soils indicate saturated conditions/seasonal high water tables at or above the water main laying depth, Nitrile (NBR – Acrylonitrile Butadiene) chemical resistant gaskets shall be provided in place of the standard push on joint gasket material (SBR – Styrene Butadiene).

Pipe Materials – High Density Polyethylene (HDPE)

For directional drilling when open cut is not practical or cost effective, the pipe material shall be HDPE water main in accordance with AWWA C906 standards for piping material. All HDPE water main must be stamped NSF-61. The internal diameter of the HDPE pipe shall match as closely as possible the internal diameter of DIP. Equivalent SDR 11 HDPE pipe sizes are 6" DIP – 6"DIPS HDPE; 8" DIP – 8" DIPS HDPE; 12" DIP – 14" DIPS HDPE; larger diameters must be approved by owner. All open ends shall be anchored to hold the pipe as it shrinks and expands with temperature changes. Minimum bury shall be 6'-0" for HDPE water main. A #12 tracer wire shall be installed along the HDPE water main and terminated at all hydrants, valves and adjacent cast or ductile main. The tracer wire shall be a #12 tracer copper clad steel wire installed above the main to facilitate future location of the main. The tracer wire shall have a HDPE insulation material.

Fittings

Fittings shall be mechanical joint, pressure class 350, compact fittings with body thickness and radii of curvature conforming to AWWA C153/A21.53 and AWWA C111/A21.11. Wedge action retainer glands shall be used on the following fittings: bends, branch leg off tees, and fittings and valves with less than 50 feet of water main extending beyond fitting or valve. All fittings shall be cement mortar lined of standard thickness and bituminous seal coat.

Pipe Laying

The water main shall be laid and maintained to the required lines and grades with fittings, valves and hydrants at the required locations and all valves and hydrant stems plumb in accordance with AWWA C600 standards for installation of DIP water main.

The trench shall be of sufficient bottom width to provide free working space and to permit compaction of the backfill around the pipe. The minimum width at the bottom of the excavation shall be the pipe outside diameter plus 16 inches. The maximum width at the bottom of the excavation shall be the pipe outside diameter plus 24 inches. The width of the top of the trench shall not exceed 8 feet in paved areas. Where the depth of the trench or the soil conditions require, the sides of the trench shall be sheeted, shored, and braced adequately to prevent sliding or caving and to protect curb, walk, trees and other utility lines. The bottom of the trench shall be shaped so that the entire bottom quarter of the barrel of the pipe will be uniformly supported and recesses shall be excavated to receive the bells. Any excavation below the required grade shall be replaced with porous backfill material, approved by the ENGINEER, and thoroughly tamped. Where rock or hardpan is encountered, the trench shall be excavated at least eight inches below the elevation established for the bottom of the pipe and this excess depth shall be backfilled with porous backfill or sand-gravel material and thoroughly compacted by hand-tamping or by mechanical methods approved by the ENGINEER.

The pipe shall be carefully laid in the prepared trench, with the spigot end fully entered into the adjacent bell and each section having a firm bearing throughout its length. Any pipe which is not true to alignment or which shows any settlement shall be taken up and relayed. Backfill material shall be placed on sections of water main only after such sections have been approved by the ENGINEER for backfilling.

Approved granular material, free from large stones and lumps, shall be carefully placed 4 inches below and around the pipe until the pipe is completely covered to a depth of at least one foot. This portion of the backfill shall be placed in layers not more than six inches in thickness, with each layer mechanically compacted without displacing the pipe. The balance of the backfill shall be placed in layers not exceeding one foot in thickness. Each layer of backfill material shall be mechanically compacted to 95% density (Modified Proctor). Water flooding of the backfill shall only be used under controlled conditions when approved by the ENGINEER.

All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones or other materials which, in the opinion of the ENGINEER, are unsuitable. When the type of backfill is not indicated on the plans or specified, the CONTRACTOR may backfill the trench with excavated material, provided that such material consists of loam clay, sand, gravel or other materials which, in the opinion of the ENGINEER, are suitable for backfilling. Backfill material beneath areas to be paved must meet MDOT Class II granular material specifications.

Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions, to plumb stems, or for other reasons, the degree of deflection shall not exceed the maximum deflections shown in the tables located in AWWA C600.

No pipe shall be laid in water or when the trench conditions or the weather are unsuitable for such work.

The location of existing water main, as shown on the plans, is only approximate. In order to determine the details of connections between existing and new lines, it will be necessary to locate the existing main both vertically and horizontally. The CONTRACTOR shall make the necessary investigations promptly to allow ample time for the details to be worked out and to obtain the necessary fittings for making the connections.

Buried utilities and structures shall be located by the CONTRACTOR prior to the start of water main construction. Where the water main is to be constructed parallel to and close to existing water lines, sewers, drains, gas lines, petroleum lines, electric, telephone, and signal cables, and other underground structures, the exact location of which is unknown or not shown on the plans, then a field adjustment of alignment or change in location of the new water main shall be made so as to least interfere with the existing utilities or structures. Where obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plan is required, the ENGINEER shall have the authority to change the location from the shown line and grade.

Prior to starting work, the CONTRACTOR shall go over the routes and/or locations of all water mains with the ENGINEER for the purpose of determining the exact field location of the main. The main may be shifted within reasonable distance, upon approval of the ENGINEER, in order to expedite the construction and create the least interference to the public and disturbance of street and road pavements, culverts, gutters, curbs, roadside ditches, underground utilities, etc. All utility companies must be notified by the CONTRACTOR prior to starting construction.

Water main shall be installed to cross all existing utilities at a right angle or as close to 90° as possible. Where a water main is constructed parallel to a storm or sanitary sewer line, the minimum horizontal distance between the two lines shall be 10'-0".

Where the water main crosses a storm or sanitary sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Where the water main crosses a storm or sanitary sewer line, with less than 18" of vertical clearance, the water main shall be encased in 6 inch thickness of concrete for a distance of 10' either side of the sewer crossing. This requirement will be waived if there are no pipe joints in the water main within 10' of the outside edge of the sewer.

Where the water main crosses a culvert or creek, the CONTRACTOR must follow all guidelines as designated by the Michigan Department of Environmental Quality.

Joint Restraints

The CONTRACTOR shall use restrained pipe joints in conjunction with the wedge action retainer glands required on the mechanical joint fittings. The CONTRACTOR shall install restrained joints for a minimum of four pipe joints in each direction from the fitting requiring the restraint, or all joints within a distance of not less than 50 feet of same, whichever is greater. The joints shall be restrained with boltless flexible restraining gaskets, listed by Underwriters Laboratories for 250 psi (pounds per square inch) operating pressure and approved by Factory Mutual Corporation. The restrained joints shall be Tyton push-on joints with gator gaskets, or approved equal. The actual type of restrained joint system proposed by the CONTRACTOR shall be approved by the ENGINEER prior to installation.

Styrofoam Insulation

Where called for on the plans or as directed by the ENGINEER in the field, the CONTRACTOR shall place 4" thick x 4' - 0" wide high density Styrofoam insulation directly above the water main. The water main shall be backfilled with compacted granular material level to the top of the pipe, then the insulation shall be placed directly on the pipe, centered with 2'-0" on either side. The trench shall then be backfilled per the specifications for backfill beneath areas to be paved.

Water Main Installation by Directional Drilling

Where shown on the plans or as directed by the ENGINEER, the CONTRACTOR shall install the water main by the directional drilling method. The CONTRACTOR shall submit to the ENGINEER, for review and approval, details of equipment and a written procedure with working drawings describing the proposed method for the directional drilling water main installation operations. Water main pipe material for the directional drilling installation method shall be High Density Polyethylene (HDPE), SDR 11, of the appropriate diameter. The water main installed by directional drilling method shall be installed to the same tolerances as open cut installation and shall be tested and meet all test requirements for water main listed in this specification.

Where the water main crosses a culvert or creek, the CONTRACTOR must follow all rules as designated by the Michigan Department of Environmental Quality.

Testing

When a stretch of pipe, appurtenances and other contract items necessary to complete the water main installation have been completed, the CONTRACTOR shall furnish proper appliances and facilities for testing and draining the new water main without injury to the work or surrounding area. The CONTRACTOR shall test by filling the pipe with clean water under a minimum hydrostatic pressure equal to 150 psi or 1.5 times the operating pressure whichever is greater. The pressure shall be maintained for a minimum period of two hours. In no case shall there be any visible leakage, nor shall the leakage in any stretch of pipe exceed 11.65 gallons per 24 hour day per inch diameter per mile, as measured over a period of two hours. Water for testing purposes shall be provided by the OWNER.

Any defects, cracks or leakage that may develop or that may be discovered either in the joints or in the body of the castings shall be promptly remedied by the CONTRACTOR at his own expense and to the satisfaction of the inspector.

Chlorination

After the water main, appurtenances and other contract items necessary to complete the water main ready for chlorination and service have been pressure-tested and flushed, they shall be disinfected in accordance with the requirements of the Michigan Department of Environmental Quality and AWWA Standard C651-99.

All piping shall be chlorinated with fifty parts per million or more of liquid chlorine. The chlorinated water allowed to stand in the mains for 24 hours shall show a free available chlorine residual of not less than 25 parts per million, otherwise the procedure will be repeated. The recommended chlorine bearing compound shall be high test calcium hypochlorinate (65-70 percent available chlorine). In the preparation of this solution, the calcium hypochlorinate powder is gradually thinned with water to approximately 1% chlorine solution (10,000 parts per million). This will require about 7.5 gallons of

water to each pound of powder. Solution shall be prepared in a barrel and then applied to the mains through a rubber hose by gravity, siphonage, injection or by suitable pump feeder.

The point of chlorine application shall be at the beginning of the water main construction, through a corporation cock on the downstream side of the valve controlling the flow of water into the main. The rate of chlorine application shall be in such proportion to the rate of water flow entering the main that the chlorine dose applied shall produce fifty parts per million (420 pounds per million gallons) chlorine concentration in the water within the main. The chlorine concentration shall be checked at the corporation cock located at the opposite end or ends of the section being tested from the point of application.

The chlorinated water shall then be removed from the main and the main left full of water. When the water in the treated main shall have been proven comparable to that of the source, water samples shall be collected at each sampling tap, previously determined by the inspector, and submitted to the St. Joseph Water Plant laboratory for testing. Two consecutive safe bacteriological samples shall be taken 24 hours apart before placing the water main into service. Samples shall be collected for every 1,200 feet of new main, plus samples from each branch and the end of the line. The chlorination procedure shall be repeated if unsatisfactory results are obtained. All chlorination expenses such as sampling taps, and labor shall be the responsibility of the CONTRACTOR. The CONTRACTOR shall be responsible for disposing of the chlorinated water in areas which will not drain directly to any surface water course.

Excavation, Pavement Removal, Aggregate Base

Excavation shall be done in a workmanlike manner. Where necessary, the CONTRACTOR shall remove the existing pavement to a maximum allowable width of 8 feet. Where the depth of the trench or the soil conditions require, the sides of the trench shall be sheeted, shored, and braced adequately to prevent sliding or caving and to protect curb, walk, trees and other utility lines. Pavement shall be saw cut, prior to removal, in straight lines parallel to the trench. The existing aggregate base material which is satisfactorily removed and segregated may be reused. All trenches in traveled areas shall be surfaced with eight inches of aggregate base, part of which may be made up of the existing base. Additional aggregate base shall be placed as required and shall consist of material meeting the Michigan Department of Transportation requirements of 22A aggregate. The CONTRACTOR shall maintain the trenches for traffic throughout the period of construction. The pavement material which is removed shall be properly disposed of offsite by the CONTRACTOR.

Except for the reuse of existing base materials as herein specified, the CONTRACTOR shall furnish and place the specified thickness of compacted aggregate base material over the whole surface of the trench, or in part, beneath any rigid and non-rigid type street, road, alley, private drive and parking lot pavement. Aggregate base will not be required over the surface of trenches located beneath sidewalks, curbs and gutters where the backfill consists of sand or suitable granular soil.

In those instances where the water main is constructed parallel to and close to one side of the street pavement, and where the surface of the backfilled trench or any portion of it lies within five feet of the edge of the pavement, then the entire trench shall be constructed to the road authority specifications.

If the CONTRACTOR is unable to place pipe into the trench and in place without earth entering the pipe, the inspector may require that suitable covering be placed over each end of the pipe before lowering into the trench, and until connection is to be made to the adjacent pipe. At times when pipe laying is not in progress or at the end of the day the open ends of the pipe shall be closed by a water tight plug or other means approved by the inspector.

Limitation on Open Trench

The CONTRACTOR shall not open nor leave open anymore trench than is absolutely necessary and as approved by the ENGINEER to carry out the construction work in an efficient manner.

Utilities

The CONTRACTOR shall contact all utilities in the area of the proposed water main and have them locate their utility lines prior to start of construction. For protection of underground utilities and in conformance with Public Act 53, the CONTRACTOR shall dial The "Miss Dig" alert system at "811" a minimum of three full working days, excluding Saturdays, Sundays and holidays, prior to beginning each excavation in areas where public utilities have not been previously located. Members will thus be routinely notified. This does not relieve the CONTRACTOR of the responsibility of notifying utility owners who may not be a part of the "Miss Dig" alert system. CONTRACTOR shall make provisions for the protection of all such utilities during the course of construction.

Water Main Polyethylene Encasement

The CONTRACTOR shall furnish all materials and do all work necessary to wrap ductile iron pipe with a tube of polyethylene encasement unless providing test results based on the "10-Point Soil Evaluation Procedure" found in the appendix of ANSI/AWWA C105/A21.5, verifying non-corrosive soil conditions.

Encasement for underground water main piping shall be 0.008 inch minimum thickness polyethylene film tube in accordance with ASTM A674 and AWWA C105.

The polyethylene tube supplied shall be clearly marked, at a minimum of every 2 feet along its length, containing the following information:

- Manufacturer's name or registered trademark
- Year of manufacture
- ASTM A674
- Minimum film thickness and material type (LLDPE or HDLLPE)
- Applicable range of nominal pipe diameter size
- Warning – Corrosion Protection – Repair any Damage

Install the polyethylene tube according to ASTM A674 and ANSI/AWWA C105/A21.5. Overlaps and ends shall be secured by the use of adhesive tape. Direct service taps shall be made directly through the polyethylene, with any resulting damage areas being repaired. To make direct service taps, the polyethylene shall be wrapped with two or three wraps of adhesive tape completely around the polyethylene encased water main to cover the area where the tapping machine and chain will be mounted to minimize damage to the polyethylene during the direct tapping procedure. The corporation stop is installed directly through the tape and polyethylene.

PROJECT SPECIFICATION

FOR

WATER SERVICES

Rev. 1/31/2013

Description

The CONTRACTOR shall do all work and furnish all materials necessary to install new water service connections and new service lines from the proposed water main to the property line and reconnect existing water services, where directed by the ENGINEER.

New Water Service Connection

The New Water Service Connection shall include the service clamp, corporation cock, curb stop, all required fittings, and all materials and work necessary for installation of the new service connections from the proposed water main to the property line. The CONTRACTOR shall install the new services in locations as directed by the ENGINEER. The curb stop shall be located within the right-of-way offset 5 foot from property line or as directed in the field by the ENGINEER.

Reconnect Existing Water Services

The CONTRACTOR shall reconnect existing services where existing water main is being replaced, or in areas where the existing main with services is being abandoned, or in locations as directed by the ENGINEER. The curb stop shall be located within the right-of-way offset 5 foot from property line or as directed in the field by the ENGINEER.

Water Service Pipe

All water service piping and associated appurtenances shall be in accordance with the current Operating Rules and Regulations of the Greater St. Joseph Water System.

The Water Service Pipe shall be Type K copper conforming to ASTM Specifications B88, approved for potable water. Corporation cocks shall be made of bronze and shall have a clear opening of the diameter of the service pipe specified. Corporation cocks shall be located at the saddle connection to the water main for all service connections. Clamps and saddles shall be made of bronze or stainless steel.

The curb stop shall be located within the right-of-way offset 5 foot from property line or as directed in the field by the ENGINEER, and shall be constructed of bronze with an iron valve box, extension rod and cover of the size recommended by the manufacturer.

All stop cocks, curbs stops, clamps and saddles must be approved by the ENGINEER prior to being ordered or incorporated into the project.

Water Meters and Meter Pits

Where indicated on the project drawings, new water meters and meter pits shall be installed in accordance with the current Operating Rules and Regulations of the Greater St. Joseph Water System.