MICHIGAN

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**WATER MAIN, HIGH-DENSITY POLYETHYLENE, DIRECTIONAL BORE**

ISH:JSK 1 of 4 APPR:CJD:NJM:03-31-21

**a. Description.** This work consists of constructing an underground crossing using the horizontal directional bore method to install high-density polyethylene (HDPE) pipe for a proposed water main as shown on the plans. The work includes excavation, installation, backfilling, disinfection, testing, and cleanup as shown on the plans and specified herein to complete the water main system installation as part of the City of Marquette water system.

**b. Materials.** Provide the listed materials below in accordance with the standard specifications except as modified herein. Provide HDPE pipe manufactured in accordance with *AWWA C906* of the size shown on the plans. Ensure that the HDPE pipe is manufactured from PE 4710 material, Pressure Class 200 pounds per square inch (psi) or higher, ductile iron pipe size (DIPS), and has a Dimension Ratio (DR) of 11 or less. Furnish a manufacturer’s certification that all delivered HDPE pipe complies with the requirements of *AWWA C906* and *ASTM F714.* Ensure that all HDPE pipe meets the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Drinking Water & Environmental Health Division *Suggested Practice for Water Works Design, Construction, and Operation for Type I Public Water Supplies.*

Ensure that the HDPE pipe is clearly marked in accordance with *AWWA C906* with the following information:

• Nominal Size and Outside Diameter base

• Standard Material Code Designation (PE 4710)

• Standard Dimension Ratio

*• AWWA* Pressure Class

*• AWWA* Standard Designation Number (*AWWA C906*)

• Manufacturer's identification and production code

• Date of manufacture

*• National Sanitation Foundation* *(NSF)* International Standard 61 and 14 approvals

• “*NSF International*-potable water” designation

Provide SDR 11 flange adapters with lap joint flanges for end connections meeting the requirements of *AWWA C207* Class “D” flanges. Use stainless steel flange bolts and nuts.

Provide an annealed copper-clad steel tracer wire. Ensure tracer wire is 8 *American Wire Gauge (AWG)* copper conductor with 30-mil thick high-density polyethylene (HDPE) insulation, rated for 30 volts, has 21 percent conductivity, and rated Extra High Strength (EHS) breaking strength. Insulation color must meet the *American Public Works Association (APWA)* color code standard for identification of buried utilities.

Submit product data consisting of shop drawings and manufacturer’s literature in portable document format (PDF) for all materials and equipment associated with the HDPE water main construction to the Engineer and the City of Marquette for approval at least 10 working days prior to construction.

**c. Construction.** Ensure that all work is in accordance with the standard specifications and as specified herein. Install all HDPE pipe in accordance with *AWWA C906 and AWWA Manual M55*. Ensure all permits required for the horizontal directional boring operation are coordinated and obtained by the Contractor, except the EGLE Water Main Construction Permit will be obtained by the City of Marquette.

Submit a general work plan outlining the procedure and schedule to be used for installation of the water main.

Install HDPE pipe a minimum of 6 feet-6inches below finished grade or 3 feet-6 inches below culverts or structures, with no intermediate high points which could trap air. The Contractor may request changes to the proposed vertical and horizontal alignment of the installation and the location of the entry and exit points. Submit proposed changes in writing to the Engineer for approval a minimum of 10 working days prior to construction.

Make HDPE pipe joints using thermal butt-fusion in accordance with *AWWA Manual M55*, *ASTM D3261*, procedures, and equipment recommended by the manufacturer and as approved by the Engineer. Do not use extrusion welding for joining pipe sections.

Install an annealed copper-clad steel tracer wire with the HDPE pipe. Clearly label and terminate tracer wire within gate valve structures as shown on the plans. Ensure the locations of the terminations are noted on the as-built plans.

Submit project references and an experience record for all projects in which the Contractor installed HDPE pipe.

Ensure a representative from the drilling Contractor, who is experienced with the equipment and boring procedures, is on site at all times during the boring operation to address immediate concerns and emergency operations. Installation must not begin until the Engineer agrees that proper preparations have been made. Notify the Engineer at least 2 working days prior to starting the work.

Begin the directional bore with a pilot hole drilled along the proposed bore alignment. Monitor and provide directional information to the drilling operator using navigation equipment on the surface. A reverse drilling reamer is attached to expand the pilot hole to allow for the HDPE pipe installation. Bentonite slurry is pumped through the drill steel where it is mixed by the reamer to stabilize and lubricate the wall lining of the bore hole and protect the HDPE pipe.

Provide and maintain instrumentation that accurately locates the pilot hole and measures drilling fluid flow and pressure at all times.

After the HDPE pipe has been installed within the bore, ensure cleaning pigs of the appropriate size are used to remove residual water and debris. The Engineer must witness and approve the cleaning.

Connections between HDPE pipe and ductile iron (DI) pipe require the utilization of an HDPE/DI transition section with a stainless-steel ring stiffener and a raised ring to allow for a restrained mechanical joint connection. Connections cannot be made until at least 24 hours after the HDPE pipe has been pulled through the bore hole to allow for expansion/contraction. Anchor each end of the directional bored pipe in accordance with the flex restraint detail shown on the plans.

Contain drilling fluids within the drilling area and clean up within 48 hours following completion of HDPE pipe installation. Dispose of drilling fluid in accordance with local regulations.

Ensure deflections in HDPE pipe are made by bending the pipe in accordance with the manufacturer’s recommendations.

Restore any damage caused by heaving, settlement, escaping drilling fluid (frac-out), or the drilling setup and operation. Ensure a frac-out contingency plan is provided and approved by the Engineer prior to starting the work.

If an obstruction is encountered during boring that prevents completion of the installation in accordance with the design location and specification, the HDPE pipe may be abandoned and left in place with approval by the Engineer. If the HDPE pipe is approved to be left in place, ensure it is immediately filled with flowable fill and bulkheaded. Submit a revised plan prior to beginning another boring for approval by the Engineer. If, during construction, damage is observed, cease all work until a plan to minimize further damage and for restoration is obtained and approved by the Engineer.

If conditions warrant removal of any materials installed in a failed bore path, as determined by the Engineer, it will be at no additional cost to the contract.

Hydrostatic testing, disinfection, and water analyses of all water main installed by the Contractor are required. Ensure hydrostatic testing, disinfection, and water analyses is coordinated with other water main work and is performed in accordance with the standard specifications, except that the HDPE pressure test must include an initial expansion phase prior to testing in accordance with the *Plastic Pipe Institute’s* Handbook of Polyethylene Pipe and *AWWA Manual M55 and ASTM F2164*.

Provide the Engineer a complete set of as-built plans, showing all bores (successful and failed), within 30 calendar days of completing the work. Ensure as-built plans include the locating equipment used; horizontal and vertical alignment with degree of accuracy; entry and exit points; bore diameter; tracer wire termination locations; drilling fluid composition; and important subsurface features. Ensure the as-built plans are legibly drawn on project plan sheets or sheets developed by the boring Contractor. The Engineer will have 15 calendar days to review and approve the as-built plans.

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

**Pay Item** **Pay Unit**

Water Main, HDPE, 8 inch, Directional Bore Foot

**Water Main, HDPE, 8 inch, Directional Bore** will be measured horizontally from bore entrance to bore exit with no allowance for curvature of the pipe. This item includes all utility location, labor, tools, equipment, materials, excavation, backfill, boring, connections and flex restraints, tracer wire, monument boxes, grouting around the HDPE pipe, sheeting and bracing, dewatering, testing, disinfection and flushing, cleanup, disposal, as-built plans, and all other miscellaneous items of work necessary to complete the bore and install the HDPE pipe meeting the requirements of the EGLE permit.

No payment will be made for directional boring until as-built plans have been reviewed and approved by the Engineer.