Section 27 - Trenchless Crossing Installations

A. Introduction – In this section, information is presented on trenchless crossing techniques under railroads, roadways, waterway, and environmentally sensitive areas.

B. General Evaluation Criteria

1. The FIRM shall consider and evaluate appropriate trenchless technologies including conventional techniques in the preliminary engineering report (PER) stage.

2. Consider space required for setup and installation equipment.

3. Require final acceptance leakage testing and use of a mandrel or other approved method to verify deflection and minimum internal diameter requirements as appropriate.

C. New Trenchless Pipe Installations - FIRMs under the direction of HRSD's Engineering Department, Design and Construction Divisions, are required to work closely with contractors who are preparing to use approved trenchless crossing means and methods for installation of force mains or gravity sewer mains. HRSD developed a checklist that has been based upon our progressive learning by doing and preparing for jack and bore operations. This checklist is located in this standards manual in Section 28 – Checklist for Trenchless Crossing Installations and is to be used, completed and submitted to HRSD jointly by the Inspector and Contractor.

1. Horizontal Directional Drilling (HDD) – HRSD has used HDD primarily for river crossings and other long crossings of environmentally sensitive areas. It can be considered for new construction or pipe replacement.

   a. Measurement and payment for HDD projects shall be on a lump sum basis paid to the Contractor upon successful completion (as defined in the Bid Documents) of each crossing. Successful installation includes verification of hydrostatic and other specified testing requirements.

   b. The FIRM to consider the limitations of materials for use with HDD projects on a case by case basis, and make a recommendation to HRSD during the preliminary engineering phase.

   c. For Welded Steel Pipe (WSP), provide external coatings using fusion-bonded epoxy. Internal linings are also required and may vary depending on the pipe diameter. Perform a corrosion analysis study and specify a cathodic protection system as necessary.

   d. Removal of internal weld beads for 24-inch pipe diameter and larger is required for fused High density polyethylene (HDPE) due to the size of the bead and likely impact on velocity and debris accumulation.

e. Require a ground grid system or other equipment to ensure accuracy of the pipe at the exit point.

f. Require the Contractor to provide a pilot hole survey alignment, to be approved by the FIRM, prior to commencement of the reaming operation.

g. Locate soil borings so that they will not be over the centerline of the pipe. Borings are a potential blowout point for drilling mud.

h. Consider the environmental impacts of this construction method including location of entry and exit points, depth of cover, and disposal of drilling mud and spoils.

i. Consider the land and alignment requirements needed for both the drill rig and the pull-back pipe.

j. Delineate a water source for drilling mud make-up in the contract documents.

k. At the conclusion of a successful HDD project and prior to connection to other pipe sections, XYZ coordinates to be collected by the HDD installer and tied to project coordinates to create accurate recorded installation information to be incorporated into HRSD's record drawings and GIS. This requirement may be waived only with advance approval by HRSD's Project Manager.

2. Jack & Bore and Microtunneling - HRSD has used jack & bore and microtunneling methods in various locations where traditional open cut and HDD are not accessible and/or economically feasible. It should be considered where applicable for new construction or replacement.

   a. Measurement and payment for jack & bore, microtunneling, and similar trenchless methods for installation of casings and pipeline projects shall be on a lump sum basis paid to the Contractor upon successful completion (as defined in the Bid Documents) of each crossing.

   b. Steel pipe shall be used as the casing material and shall be in accordance with the latest edition of applicable ASTM standards unless otherwise approved in writing by HRSD's Project Manager and allowed by the permitting agency.

   c. Permalok pipe joining system may be considered on a case-by-case basis as an acceptable method to butt welds for adjoining steel casing pipe sections.

   d. Casing pipe design shall include casing spacers, bulkhead at each pipe end, and leak detection.

   e. HDPE, Ductile Iron (DI), and Polyvinyl Chloride (PVC) should be evaluated as pipe material for the carrier pipe. Removal of internal weld beads for 24-inch pipe diameter and larger is required for fused HDPE.

f. FIRM shall give special consideration to the extents of the casing pipe in the design to account for future road improvements and for maintenance or repair of the installed pipeline.

g. The bored hole shall be minimally larger than the outside diameter of the casing pipe as over-cutting by the cutting head could lead to excessive soil removal and possible ground settlement.

h. The FIRM shall evaluate if corrosion protection is required on the casing pipes.

i. Consider the environmental impacts of this construction method including location of entry and exit points, depth of cover and disposal of drilling mud and spoils.

j. For slurry microtunneling installations, locate soil borings so that they will not be over the centerline of the pipe. Borings are a potential blowout point for drilling mud. Consider requiring the Contractor to grout the bore holes with cement if practical to reduce a soil fracture.

k. Consider the area needed for both the jacking pit and receiving pit.

l. Jack & bore historically has been used for relatively short crossings or under secondary roadways. Evaluation of appropriateness of this method by the Engineer for each installation is needed.

m. Microtunneling historically has been used for long crossings or heavily traveled roadways. Evaluation of appropriateness of this method by the Engineer for each installation is needed.

3. Ground Penetrating Radar (GPR) shall be considered for use on all projects involving trenchless pipe installation. The GPR testing is recommended for the following:

a. Pre-construction to help identify near surface voids, unknown utilities and obstructions not identified by subsurface utility designation.

b. Following dewatering of the trenchless launching / receiving pits to the planned groundwater elevation and prior to advancing casing or pipe.

c. Post-construction to help identify any voids created as part of the trenchless pipe operation.

d. GPR testing requirements when utilized, including the limits of testing, shall be written into the contract documents by the FIRM. When used, GPR testing shall include a real time imaging, recordable output that can be viewed on a computer screen and printed without the use of proprietary software. The test area shall be laid out in a grid fashion over the existing plans and shall be referenced using swing ties,

State Plane Coordinates, latitude/longitude or other means to allow the contractor to reestablish the grid in order to conduct post-construction GPR testing. The FIRM shall evaluate the subsurface conditions and make recommendations as to the type of GPR required. At a minimum 2D scans and reports shall be required and discussion on the testing done and technology used in final submitted reports. One of the scans to be performed following lowering of the groundwater table to the elevation necessary for preparation for the trenchless installation. Note that GPR results are not reliable below ground water levels.

End of Section