Section 27 - Trenchless Crossing Installations

I. Introduction – In this section, information is presented on trenchless crossing techniques.

II. General Criteria

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

B. Consider space required for setup and installation equipment.

C. 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 grouting the boreholes with cement, if practical, to reduce soil fracturing.

D. FIRMs under the direction of HRSD's Engineering Division, Design and Construction Departments, are required to work closely with contractors who are preparing to use suitable trenchless crossing means and methods.

E. HRSD developed a checklist that has been based upon our progressive learning by doing and preparing for trenchless installation 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.

F. Require final acceptance leakage testing as applicable (e.g., ductile iron pipe) and use of a mandrel or other approved method to verify deflection and minimum internal diameter requirements as appropriate.

G. Measurement and payment for trenchless installations 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.

III. Trenchless Pipe Installations - The following technologies are commonly used by HRSD. This should not preclude the FIRM from considering and recommending alternate technologies that may provide advantages over those described below.

A. 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.

1. 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.

2. Methods to addressing internal and external corrosion are to be evaluated based on site conditions and material capabilities and limitations. Perform a corrosion analysis study and specify a cathodic protection system as necessary.

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

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

5. 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.

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

7. At the conclusion of a successful HDD project and prior to connection to other pipe sections, X,Y,Z 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.

B. 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.

1. Casing pipe materials should be evaluated considering their capabilities and limitations as well as the site conditions for which they will be installed. Materials to consider include, but are not limited to, steel and HDPE. Steel 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.

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

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

4. Carrier pipe materials should be evaluated considering capabilities and illimitations as well as the site conditions for which they will be installed. Materials to consider include, but are not limited to, HDPE, Ductile Iron (DI), and Polyvinyl Chloride (PVC).

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

6. 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.

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

8. 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.

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

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

IV. Subsurface Investigations - Implement subsurface investigations on all projects involving trenchless pipe installation. Methodologies shall include, but not be limited to, ground penetrating radar (GPR), Subsurface Utility Engineering (SUE) levels A and B, and exploratory excavating. The following criteria shall be considered when performing investigations at the various phases of the project:

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

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

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

4. 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 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 the 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 single-frequency GPR results are not reliable below groundwater levels.

End of Section