Trenchless Technology Center Newsletter
December 2009

Research Project Highlight:

Field Installation of a New Segmental, Flash Joint PVC Liner Using the TIP Method

In October 2008, the TTC performed a full-scale field test of a new, segmental (36-in. long), flash-joint, 8-in. IPSOD PVC pipe, which was developed to be compatible with the Tight-in-Pipe (TIP) method, a close-fit sliplining process developed by TT Technologies. This was the first utilization of the TIP equipment in North America. The PVC pipe segments were manufactured especially for this field test by IPEX Inc. In this particular test, the TIP equipment was utilized in combination with a modified bursting head.

The field test was conducted at a test site of the TTC, located on Louisiana Tech University's South Campus. The test bed consisted of 105 ft of 8-in. internal diameter vitrified clay pipe (VCP) placed in a trench at a depth of 5 ft (ground surface to the crown of the pipe). Two 8-in. VCP vertical risers were placed approximately at one-third and two-thirds points along the pipe alignment to allow for viewing of the burst head and the replacement pipe as they moved through the host pipe. The soil was classified as clayey sand using the USCS soil classification chart. The test bed included comprehensive instrumentation of the new pipe and measurement of surface heave. An access pit 5 ft x 10 ft and an exit pit 5 ft x 5 ft were constructed at each end of the pipe alignment. The floor of the access shafts were 4 in. below the invert of the pipe. The TIP machine has a capacity of 40 metric tons (89,000 lbs) and utilized interlocking push rods 700 mm (28 in.) in length (see Figure 1).

TIP unit in the launching pit during rod pushing operation.

Stresses in the in-situ soil around the host pipe were monitored using four earth pressure cells (EPCs) placed around one of the VCP segments. The earth pressure cells enabled the monitoring of changes in the in-situ soil prior to, during and following the installation of the PVC pipe. A static 11-in. diameter burst-head was designed and fabricated for the field test by TT Technologies. The field installation began by setting up the TIP unit in the exit pit and then the rod stem was pushed from the launching pit through the VCP host pipe to the exit pit. The rod pushing activity required 30 minutes to reach the exit pit. The burst head and the first pipe segment were then slid over the rods, followed by a pneumatic clamping device that simultaneously gripped slots cut in the rods as well as locked into a groove machined in the inner wall of the PVC liner (Figure 2). After each 3-ft section was pulled in, the clamping machine was removed to allow the addition of the needed number of guide rods as well as a new section of PVC pipe. Pulling in each 3-ft segment took approximately 30 seconds. A total of 36 sections (~107 ft) of PVC pipe were pulled into the host pipe in 2 hours and 11 minutes, or 3.5 minutes per each 3-ft pipe segment. The additional three minutes were used for assembling the rod column, placing the pipe segment and aligning it with host pipe.

PVC segment and burst head thrust against host pipe by pneumatic clamping device

The initial full load values were around 35,000 lbs, increasing to a maximum of 43,000 lbs roughly half way through the installation. As the burst head approached the earth pressure cells, their readings increased from baseline values of 1 to 3 psi to 7 to 9.5 psi. These readings were maintained each time a section was pulled for the next 4 sections, including a temporary spike to nearly 11 psi, before dropping to around 7

psi for the final two segments.

Following the installation, the pipe was pressure-tested by bringing the system up to an internal pressure of 4 psi (27 kPa) for two minutes, closing the air pump and measuring the time in took the system to drop to 2.5 psi (17 kPa). The system held at 4 psi for 15 minutes, greatly surpassing the minimum requirement of 3 minutes 47 seconds. Finally, the City of Ruston conducted a CCTV inspection of the newly installed 96.2-ft long pipe three months after the installation showing that the liner was in good condition.

October 2009 TTC IAB meeting in Ruston

The TTC typically holds three Industry Advisory Board meetings each year. Two short update meetings are held: at the UCT conference in January and at the NASTT No-Dig conference later in the spring. However, the main event is the fall meeting held at Louisiana Tech where industry members, faculty and students get together for two days of presentations and discussions wrapped around several very enjoyable social events. The 2009 meeting was held Oct. 21-23.

A social highlight of the Ruston meeting was a barbeque, hosted by Rob and Linda McKim, which was held on the evening before the board meeting commenced. The meeting itself has 23 different presentations on TTC research projects and the graduate students normally present their own research activities to the board. Demonstrations utilizing some of the TTC novel testing facilities further enhanced the event, displaying engineering phenomena tested on full-scale specimens under highly controlled conditions.

Since it is difficult for large numbers of faculty and students to travel to the major national conferences, the meeting in Ruston serves the very important purpose of allowing the direct interaction between the Board and the researchers. Feedback from the Board about the value of the meeting is very positive in terms of learning about the latest research underway, being in a position to contribute the board members' experience to the research efforts, and being able to network with other industry colleagues, owners and consultants.

Enquiries about participation in TTC activities as an Industry Advisory Board member or Sponsor are welcomed. The IAB is a key part of the TTC success providing critical financial and intellectual support.

The TTC Industry Advisory Board met in October in Ruston.

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The TTC Newsletter is published as a department within *Trenchless Technology*. All newsletter materials are prepared by TTC. Communications should be directed to the center.