

Tech Notes

NCPI/NYC RESEARCH PROJECT

An Evaluation of Four Bedding Systems

The City of New York places a high priority on achieving the longest life cycle possible for all sewer installations while reducing disruptions to inhabitants. The city was interested in evaluating the impact of various bedding systems on the success of installations and asked National Clay Pipe Institute to assist them with this analysis. The four systems evaluated include:

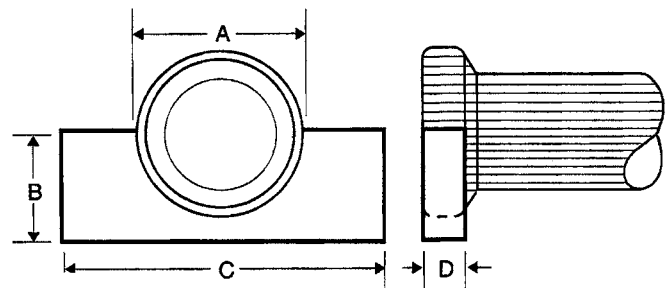
Crushed Stone Encasement – All contractors used 1/4" – 3/4" crushed stone bedding, and installed the pipe in accordance with ASTM C 12. This requires bell holes and shovel slicing of stone in the haunch areas.

Controlled Low Strength Material (CLSM) - For this evaluation, NCPI designed a new CLSM mix to prevent excessive strength gain and retain early setting and flowability. The new mix was tested for compressive strength and yielded the results below.

Days After Pour	Compressive Strength (psi)
28	76
90	317
180	417

Concrete Cradle With Concrete Block Support – This was New York City's standard bedding system, modified to use a smaller concrete block for pipe support. Four thousand psi compressive strength concrete was used for a concrete cradle system.

Concrete Cradle With Foam Block Support – NCPI developed a foam block support for use in this installation method. The block was designed to impart longitudinal flexibility by providing a construction joint to the installed pipeline. It also replaced the concrete block used to support the pipe (see drawing). It was shaped to fit the outside diameter of a 10" clay pipe bell. The block provided 6" of clearance under the barrel and 6" on each side of the pipe. The block was designed to support the entire weight of the clay pipe until the concrete cured enough to prevent pipe movement.

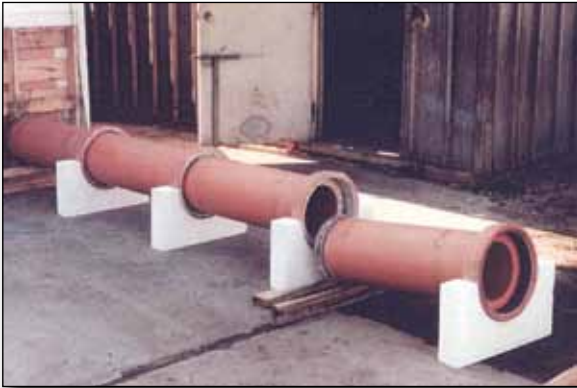


Placement of Foam Pipe Support Blocks



The Test

Three different contractors installed a minimum of 1,000 ft. of each bedding system. All twelve test sections are located in the same general area of Staten Island. Most of the lines were between 10 - 14 feet deep. Installation took place in all seasons with temperatures ranging from near zero° F in the winter to the low 90°'s in the summer. A dry and stable trench was the rule rather than the exception, but areas of wet and unstable soil were also encountered. Test results were based on CCTV inspections conducted within 30 days of installation and again at roughly six months and 12 months.



Foam block testing

The Results

Of the roughly 13,000 linear feet of pipe installed in this testing, there were concerns with less than 2% of the installed pipe. When the issues involving an assignable cause (i.e. contractor error, secondary construction or foundation problems) are removed, only 1% of the installations required detailed analysis. These issues were identified using CCTV inspection. A majority of the concerns involved bedding the pipe using a concrete block support in a concrete cradle.



CLSM in the trench

Proper consolidation of the concrete and the use of a construction joint were found to be the most practical solution to provide a robust, defect free installation method. Both CLSM and Crushed Stone Encasement showed exceptional performance but would require changes to current construction practices. Due to the significant improvements in quality of installed pipeline, the City of New York has included a requirement for construction joints in concrete cradle or concrete encasement construction. For a copy of the full report, contact NCPI at 262/248-9094 or visit our website at www.ncpi.org. After registering, search the website library for the term "New York".



Foam block in trench