

Boyer Perfects Tools for Houston Sliplining

by Paul J. Miller

Sliplining is an unglamorous, low-tech rehabilitation method. No sophisticated trucks with shiny gadgets. No multi-stage launching devices. Not even a reprieve from the flowing sewage.

Despite its low-tech image and earthy applications, sliplining continues to be a staple rehabilitation technique for effective, efficient renewal of sewers and mains. And some contractors have found the way to make it into a true niche of the construction industry.

Boyer, Inc. of Houston, Texas is one such contractor. In the last four years, Boyer has completed over 10,000 lineal feet of sliplined projects, mostly large diameter lines.

Presently, Boyer has undertaken two more projects totalling nearly 19,000 ft of sliplining, nearly tripling his prior record of such work. And Boyer has found the methods and developed the tools to give the company an edge in the sliplining market.

The Ben's Branch Sliplining Project in northern Harris County, near the Houston Intercontinental Airport, involves 13,423 ft of line renewal, most of it by sliplining, for the sanitary sewer serving the Kingwood Estates development. The main is 24 to 48-in. in diameter and has a flow rate of three to four million gallons per day. The project owner is the Harris County Utility District No. 5.

A second project which Boyer is involved with is a portion of the City of Houston Project No. 4420-1 (Old Spanish Trail) sewer slipliner project. Boyer has a contract for lining 5688 ft of a 60-in. monolithic combined storm sewer.

The Ben's Branch project involves original clay and reinforced concrete pipe. The new line is 18 to 42-in. elastic, gasketed, jointed Lamson Vylon PVC profile-wall pipe with flush slipline couplings.

A competitive bid requirement for the \$2.5 million project was that contractors were required to bid with two sliplining alternatives. The consulting engineer,

Ronnie Patrick of Civil Concepts, Inc., South Houston, recommended and the owner selected the Lamson Vylon product. In addition, all 57 manholes on the nearly three miles of main are to be replaced in Boyer's contract.

Mark Boyer, president of Boyer, Inc., pointed out that this project is unique in a number of respects. The project right of way borders on the rear of the established Kingwood subdivision, following fences and electric power lines on the fringe of a dense overgrowth of trees next to a drainage creek. This has required the transport of all materials and pre-cast manholes on undeveloped drives along the ROW with an all-terrain vehicle Boyer adapted from an old surplus military tank retriever.

The existing line also includes some sections in which a soft-lining rehabilitation product had been installed within the past three years but had failed to provide structural support for the deteriorated pipe. Boyer will remove these sections before the new line can be slipped into place.

Hydrogen sulfide corrosion has taken its toll on much of the original RCP line. According to Boyer, in certain conditions, hydrogen sulfide and sulfuric acid will deteriorate RCP in 20 years or less. When corrosion reaches the reinforcing steel, the pipe deteriorates rapidly. Joints fail, gaskets fall in and infiltration is soon rampant. On this line, 25 percent of the flow is judged to be from infiltration sources, said Boyer.

Boyer, Inc. has three crews working on the Ben's Branch project. One crew excavates, removes old manhole structures, and prepares pits for sliplining. A second crew rebuilds new manholes. The third crew carries out the sliplining process,



A track-mounted video inspection camera records the condition of the sewer line.

which includes cleaning the line, inspection, and installation of the pipe. Emmitt Malmay is the project superintendent.

Malmay described the process for a typical sliplining project. It usually requires one day to dig the insertion pit and set the 24-ft trench box and sheeting. Once the sewer line is exposed, the top half of the original pipe is cut away to permit inserting sections of new slipliner pipe. The second phase requires thorough cleaning, removal of obstructions or point repair, and inspection. Sliplining is the next step, usually taking only a few hours. Grouting the annular space is the final phase, and is done by a subcontractor.

Line inspection on this project was done by Coastal Contractors, Inc., Dickinson, Texas. Coastal used a track-mounted Peerless TV inspection unit to do the video inspection.

Once obstructions are identified in the

line, Boyer crews make a decision whether to spot-repair it or to remove the obstruction. Malmay pointed out that pit location can be planned where a particular obstruction exists which then can be manually removed. For example, a slipped joint was removed in an insertion pit at a substantial savings over the cost of spot-repair.

One of the procedures developed by Boyer, Inc. is a new cleaning method. Mark Boyer explained that, in his opinion, there are no readily available, effective systems for cleaning large diameter lines. He has developed a specialized 2-cubic yard bucket formed to fit the invert of the line which is pulled through to clean the line.

The new process permits cleaning a 500-ft line section in days, while the old conventional bucket line approach may take weeks to clean the same line.

Malmay confirmed the efficiency of the new bucket method. A 340-ft reach of 30-in. pipe, which was approximately half-filled with sand, was cleaned in only two days.

Before the pipe is sliplined, Boyer pulls a mandrel through the reach to ensure that the new pipe will move freely into position. This mandrel is simply a standard 15-ft joint of Vylon pipe which has been reenforced with metal straps and a pull chain.

Another Boyer-developed sliplining tool is a specialized hydraulic winch system to provide pulling force for the line. A downhole roller assembly on the winch keeps the cable centered for true pulling to avoid binding or abrading the new pipe being sliplined. Boyer

has patents pending for the several specialized tools he has developed.

Since all manholes were to be replaced, this was a major part of the Ben's Branch project. Groundwater at 8 ft be-

low surface called for dewatering each site before excavation could begin. The subcontractor Hunter Wellpoint of Crosby, Texas provided dewatering services for the digging of pits.

The pre-cast manholes which were specified with a T-lock PVC lining, were supplied by Moor-Tex Concrete, Sealy, Texas. Pipe entry points into the manholes were furnished with A-lock rubber gaskets to provide watertight seals.

As the manhole installations are completed, grouting vent pipes are installed into the existing line. The vents permit the evacuation of water from the annular space as the low-density, cellular foam grout is pumped into the lines. Grouting services were provided by Gulf Coast Grouting, a licensee of Pacific International Grouting.

Sliplining runs on this project varied from about 150 to 340 ft. A crucial step in the process, according to Malmay, is

making up the joint from one pipe section to another. A poorly joined pipe may cause a line deflection or allow inflow of grout through a partial joint.

After the lead section is in place, Boyer uses small air bags inserted into the carrier pipe to hold the liner in place. The new pipe section is pulled into place, requiring about 1000 lbs. of pressure to make up the joint. When complete, the air bags are released and the new sliplined pipe string is positioned.

An advantage of sliplining over other sewer relining methods is that the flow does not need to be stopped or bypassed in order to carry out the process. Malmay



Lamson Vylon pipe awaits insertion in the Ben's Branch project.

explained that they may need to temporarily restrict the flow in order to complete their work. However, at no time is the flow stopped.

By late July, Boyer was at the halfway point of the overall project schedule. Twenty-one of 57 manholes had been replaced. Project superintendent Malmay reported that the sliplining was ready to move to the 30-in. Vylon pipe. A 1574 lf portion of the overall project specified as open-cut also had been completed.

One of the claims favoring sliplining is the purported improved flow efficiency of the new pipe over the probable poor performance of the old host pipe. While the smaller diameter of the sliplined pipe reduces the cross-sectional area, the improved flow characteristics may compensate for the loss of capacity, and even improve the ultimate capacity.

Boyer, Inc. started in 1985 as an electrical construction firm. Mark and his mother Lyda founded and are partners in the business. A CPA, Lyda is the financial manager while Mark is the salesman and business development person of the firm. Boyer employs approximately 100 people and maintains five crews.

The company performs civil, electrical, and mechanical work, including all types of underground construction. Electrical construction now represents only 30 percent of Boyer's contract load. Their projects include electrical, gas and water distribution work, wastewater treatment plant construction, and even boring and jacking of large diameter storm sewer tunnels.

Mark Boyer reports that sliplining has made considerable headway throughout the Gulf Coast region. With the specialty tools Boyer has developed and the benefit of substantial project success, his company is positioned to lead in this pipe rehabilitation method long after the Ben's Branch project is completed.

The author is editor of Trenchless Technology.



Boyer workmen watch as a mandrel begins a test run through the cleaned sewer.