

Vylon Pipe

Sinkholes, Sinkholes Everywhere

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On the south side of Orlando, Florida, not too far from Universal Studios amusement park, existed a not-so-amusing problem. In the midst of one of Orlando's busiest industrial parks was a major sewer line that did not want to be buried and forgotten. Initial investigation of the Presidents Drive 36" sewer line began in 1988. At that time, sink holes were beginning to show up in the grassy median overlying the sewer line and cracks appeared in the asphalt parking lots of this industrial park due to soil infiltration. Unstable ground conditions were causing the reinforced concrete pipe to settle off of line and grade; thus, causing offset (or dropped) joints and over articulated joints. The resultant openings at the joints allowed massive amounts of groundwater inflow and infiltration which eventually led to severe soil infiltration.

The settlement off of line and grade created a "roller coaster" effect of severe peaks and valleys in the sewer line. In some areas, 8" to 12" drops in invert elevation were measured along a twelve foot joint of pipe. The condition was not only detrimental to the hydraulic characteristics of concrete pipe, but also allowed for the settlement and gathering of solids in the invert. Although a concrete pipe normally provides a Manning's "n" smoothness coefficient of 0.015 in sanitary sewers, existing flows in this line were "back-calculated" to

represent a Manning's "n" of 0.019. For years, Orange County's public utilities department studied the problem, trying to determine the most prudent and cost effective method to halt the progressive leaking and corrosion of the concrete pipe while temporarily sealing and stabilizing the open joints of pipe.

Meanwhile, two miles away, 235 ft of 42" polyethylene lined ductile iron force main outfall was in severe distress due to the effects of hydrogen sulfide. Since its installation eleven years ago, the lining had peeled away from the interior of the ductile iron, thereby, exposing the corrosion susceptible pipe. Because the pipe was laid backwards (spigots facing upstream) to facilitate construction, the normally turbulent conditions were magnified. This allowed the flow to work its way past the gasket and undermine the bedding in crucial areas. Again, soil infiltration gradually affected the surface topography in the form of sink holes in the median, road bed deterioration, and cracking of the asphalt pavement in Florida State Highway 482

(Sand Lake Road).

Correction of the force main outfall was of primary importance. Sliplining



Backhoe bucket maintains control of new joint prior to assembly. Contractor poured concrete mats for work area floor safety and to keep dirt out of the line.

both of these sewers was the solution settled upon by Orange County and its consultant, Blount Sikes & Associates, because it offered the structural integrity and longevity necessary for these sewers to perform properly. Westra Construction

of Palmetto, Florida was the low bidder on this Orange County project. After reviewing the condition of the existing sewer lines, Ken Beukema and Bill Haan decided to put their most experienced sliplining crew on the job. Westra Construction has been sliplining sewers in Florida for well over ten years and knew that this project would probably prevent some of the most difficult challenges ever encountered.

Upon award of the contract, Westra ordered pipe for the Sand Lake Road portion of the project. Work space was limited, allowing for only five feet between the traffic lanes and the edge of the insertion pit. Unfortunately, the only area available

to place an insertion pit was located over a dropped joint. A six degree slope caused flow rates to reach 18 to 20 feet per second. The combination of flow rates and the dropped joint created a three foot shower of sewage in the work area. This did not deter the experienced sliplining team.

After stabilizing the existing pipe to be used as a slipliner assembly cradle, the crew was off and running. Dealing with the high flow rates initially slowed the project down, but once an installation system was established, work progressed smoothly. About halfway through the 235 foot run, the slope of the line changed from 6° to -0.5°. Due to a build up of solids in the invert at this location, the Vylon Slipliner was unable to fit. At this point, Westra's crew reversed direction and removed all of the slipliner pipe. Dragging a steel "bucket" through the line was of no help in removing the debris.

Project superintendent, Jeff Mulvihill, decided to enter the line and remove the build-up manually. Armed with a pry bar, the solids were chiseled out and removed, thereby allowing clearance for the slipliner. Sliplining commenced again and was complete in a matter of two hours. Due to the bridging effect produced by the slipliner pipe, the severe peaks and valleys were smoothed out. Future problems of solids build-up in the low spots were eliminated and hydraulic characteristics improved.

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The next challenge facing the crew was a radius curve in the sewer line that traced the curvature of Presidents Drive. This would be the first, and most difficult, 30" slipliner push of the 4015 lf of 36" RCP being sliplined. Upon initial consideration, Westra personnel decided to try sliplining with Vylon Slipliner's standard 15 foot lengths and that 7.5 foot lengths would be necessary. Four days later, the shorter lengths were on the jobsite and installed. Due to Vylon Slipliner's allowable joint articulation in excess of two degrees, the shorter lengths were pushed with plenty of clearance.

The remaining portion of the project consisted primarily of offset and over articulated joints. This scenario demanded that many of these areas be dug up and realigned. Due to the many sinkholes occurring over the existing sewer line, Westra's crew did not have difficulty locating the problem areas. Once the RCP was realigned, the Vylon Slipliner was installed at a rate of 300 lf per hour. The annulus between the two pipes was filled with a

neat cement grout consisting primarily of Portland cement and pozzolanic fly ash. The monolithic grout not only stabilized the slipliner in the host pipe, but also prevented the possibility of further localized subsidence. In some areas throughout the project, excessive amounts of grout were pumped, thus, filling the voids created around the RCP due to soil infiltration.

Once completed, the flow level within the Vylon Slipliner was actually lower than prior to sliplining, thereby allowing for additional capacity. Westra Construction and Orange County are pleased that the project was completed ahead of schedule and with minimal disturbance to the surrounding area. Throughout the project, Orange County Chief Inspector Charlyn Watts kept a watchful eye on this project realizing its crucial nature, and upon completion, breathed a sigh of relief knowing that this perennial headache was eliminated. Since this project, Westra Construction has installed additional Vylon Slipliner in other projects around Florida ♦