

Rehabilitating Large Diameter Pipe with Grouted Liners

George McAlpine

Abstract

What is a Grouted Liner?

One type of grouted liner system of pipe consist of ribbed plastic strips which are locked together on the edges to form a continuous liner. The strips are light and easily handled and can be passed through a narrow opening or manhole, therefore there is no need for excavation. The strips are manufactured from rigid unplasticized PVC 12 inches wide and are delivered to the job site in coils approximately 4 feet in diameter, each coil provides about 200 linear feet of PVC strip. The PVC strips may be installed circumferentially one strip at a time (in this case the strips are custom cut to a length equal to the portion of the circumference of the inside of the pipe to be lined and are referred to as "panels") or spirally wound manually from a coil. Spiral winding can be used in either circular pipe or oviform (egg shaped) lines and in any host pipe material. The space between the panels and the host structure is then grouted with high strength cementitious grout in several lifts to avoid deforming the PVC lining with excessive grout pressure. This installation practice is described in ASTM F 1698.

Structural Properties

In large diameter circular and non-circular pipes/conduits the PVC serves principally as a barrier to the chemicals that attack the cementitious materials and formwork for the grout. In large diameter pipes/conduits the grout provides the structural repair with its significant compressive strength, its effectiveness in integrating the host pipe/grout/PVC into a composite structure, and its repair of the host pipe's holes, cracks open joints and possibly filling voids outside the host structure. This structural benefit of grout in brick pipe has been documented by WRc in England [4, 6] and in concrete pipe by Watkins [5] and WRc [8]. These references also document the bonding of the grout to the host pipe. The WRc's field experiments [6] found that composite action was being achieved with normal grouting procedures and minimal grout thickness, e.g., 0.2 inch. The structural benefit of the partial lining system in RCP was demonstrated in D-Load test in 1994 supervised by the County Sanitation Districts of Los Angeles County. The data from the unpublished test reports of Watkins [4] and the D-Load test data are reported in a 1994 ASCE conference paper [1]. The method of structural rehabilitation of rigid pipes using the Danby system is described in a 1997 ASCE conference paper [2].

Examples of Prior Projects

Man-entry pipe (diameters greater than 36") rehabilitation accounts for about 95% of Danby projects and a large percentage of these are in pipes 60" and larger. Several of these projects will be discussed with photos illustrating the installation process and final products. Among the projects to be discussed are a 108" concrete storm drain in Houston,

105' cast-in-place reinforced concrete sewer in Oakland, a 102" RCP sewer in San Diego, 78" projects in Houston and Los Angeles, and 66"/72" job in San Jose California.

In many very large pipes and conduits it may be cost effective and structurally suitable to line and grout only a portion of the total circumference of the host structure. In many instances the need for rehabilitation is hydrogen sulfide corrosion of the upper portions of the structure above the flow line; while the lower portions are structurally sound and unaffected by the acid attack. The 105" sewer in Oakland and the 102" RCP in San Diego were rehabilitated using this method [3].

Reference

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If you have any questions, please contact [Dr. C.Vipulanandan](#)

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