

GRP REHABILITATION BRINGS CULVERT BACK TO LIFE



Insituform
Technologies® Ltd.

Insituform Technologies Ltd (ITL) recently utilised its GRP (glass reinforced plastic) lining expertise to renovate 950 m of deteriorated main drainage culvert, as well as thirteen (13 No) manholes, at the Crossness Sewage Treatment Works (STW) in Abbey Wood, London, UK, at a project value of £1.6 million.

Known as the 844G MDC (Main Drainage Culvert) Rehabilitation Project, the ultimate client for the work was Thames Water, which has responsibility for the efficient functioning of the STW. Design consultant for the project was Hyder plc and the main contractor for the work was Laing O'Rourke. ITL was subcontracted to complete the GRP lining installation along with some chemically resistant coating applications in both the lining and the manholes.

THE PROBLEM

The MDC in need of renovation was a reinforced concrete structure running beneath the STW. There would be no impact from the project on the general public or local traffic as all works were within the confines of the treatment plant.

Over the years the concrete fabric of the culvert had suffered attack from hydrogen sulphide and sulphuric acid, causing structural deterioration. The purpose of the lining project was to rehabilitate the culvert with a structural GRP liner, along with the 13 manholes providing access to it. The combination of GRP and chemical resistant coatings would prevent further degradation and restore the culvert's life expectancy to in excess of 50 years.

SOLUTION

After careful consideration of the options available for the renovation of the culvert, it was decided that GRP lining offered the most effective solution, mainly due to the fact that the cross section of the culvert changed considerably over the 950 m length which was in need of repair. Following the renovation, part of the length now comprises a circular 1,400 mm diameter profile, part comprises a 945 mm x 1,400 mm D-shaped profile and the remainder comprises a 2,000 mm x 1,400 mm ovoid profile. As GRP sections are effectively 'made-to-order' this offered the client an excellent solution to the culvert renovation problem on each of the different profile sections.

With GRP liners providing a structural solution with a high degree of chemical resistance, this was also seen as the long-term solution to the chemical attack problems which caused the deterioration in the first place.

The profile sizes and shapes also enabled ITL to use man-entry techniques for the installation of the liners with access mainly via the existing manholes serving the culvert. However, one segmental shaft had to be sunk at one point to maintain effective and safe access on one of the longer manhole-to-manhole lengths.

As usual with GRP installations, the liner segments, manufactured by Stanton Bonna Concrete Ltd in 1.2 m long sections, were transported from the access manhole to the lining position on trolleys. They were then carefully positioned by hand using the location socket joints built into the liner ends and supported around the perimeter against the inner wall of the host culvert, thereby requiring no specialist equipment to achieve the installation. Once correctly positioned, the annulus between the host culvert and the liner was filled using a

cementitious grout. The joints between the liner sections were sealed prior to grouting with an epoxy based mortar which, once set, was further coated with a chemically resistant coating.

INSTALLATION

The lining project commenced on 15 October 2007 and was completed in August 2008.

Commenting on the project for ITL, Dave Rees, Project Engineer, said: “The use of GRP liners to overcome the chemical deterioration of the culvert was an ideal solution. ITL has the experience and expertise to complete this sort of project to a very high standard, ensuring a significant long-term increase in life expectancy for the culvert in question. Once this work is finished, the STW at Crossness will be able to rely on the effective operation of this culvert for many decades to come.”

For Thames Water, Ian Laber, Construction Team Manager, said: “Given the variety of sizes and shapes involved along the length of the culvert, we had to select a rehabilitation technique that would not only enable us to solve and eliminate as far as possible the culvert deterioration problem now, but also one that would prevent further attack in the future, whilst at the same time providing a structurally sound pipe over the long term at minimum loss of capacity. The GRP solution gave us this in an acceptable time frame and budget.”

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Picture captions:

ITL Crossness 1.jpg – Confined space precautions were utilised throughout the Crossness lining operation.



ITL Crossness 2.jpg – Access for the supply of lining equipment and materials to the drainage culvert was tight to say the least.



ITL Crossness 3.jpg – Positioning GRP liner segments inside the culvert prior to grouting.



ITL Crossness 4.jpg – Small bores in the liner provided proof that the grout filing was achieved to highest standard.



ITL Crossness 5.jpg – The completed liner with lateral connections reinstated.



ITL Crossness 6.jpg – The main drainage culvert condition prior to the GRP lining operation.



(Editors note: The Pictures shown here are supplied as low resolution versions within the Word document – for Hi-Resolution copies please contact NoDig Media Services, contact details shown below.)



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