

Keldgate Service Reservoir

Drainage and Waterproofing of a Critical Service Reservoir near Hull

by
Tony Jones, BSc, CEng, MICE

Keldgate Critical Service Reservoir (CSR) is a large service reservoir near Hull. It stores approximately 48 MI of treated water for distribution to East Yorkshire and was built in the early 1900's. The reservoir was built in mass concrete with a barrel vaulted concrete roof, covered by an average depth of 850mm of earth. Over the years the earth covering to the roof had become waterlogged and previously applied waterproofing membranes were thought to have failed, resulting in a risk of contamination through water ingress. Yorkshire Water's Eastern region contract partner, Costain Mouchel, was tasked with the challenge of re-waterproofing and providing drainage to the roof and its perimeter.



Keldgate CRE: Earth covered barrel vaulted roof

Courtesy of CostainMouchel

The traditional solution would have been to strip the earth covering and any loose existing membranes and place gravel surrounded perforated drainage pipes in each of the valleys to drain to the perimeter collector drains. For such a large structure this would have required the procurement and placement of almost 2,000 linear metres land drainage pipes, the importation and placement of over 2,000 cubic metres of gravel drainage media, and the disposal of a similar quantity of excavated material.

The project team challenged this traditional approach and proposed a solution that would be both technically better and result in cost and environmental benefits.

It was proposed to place a geo-composite drainage layer over the whole roof on top of a new Premseal waterproofing membrane. The drainage sheet would be hydraulically better than a piped system and be able to withstand the backfill and any superimposed loads. The



Installing geocomposite drainage layer over new waterproof membrane

Courtesy of CostainMouchel

chosen drainage sheet comprised a 25mm thick box-section composite with a polyethylene base core with a bonded permeable geotextile top sheet. ABG Geosynthetics supplied the material in 4.4m wide rolls, which made the installation quick and straightforward. The "dimples" on the bottom layer were overlapped to form a secure joint at sheet intersections.

Construction challenges included the choice of plant to work on the roof, which had loading restrictions, the lack of space for storage of stripped earth, and inclement weather conditions.

Benefits

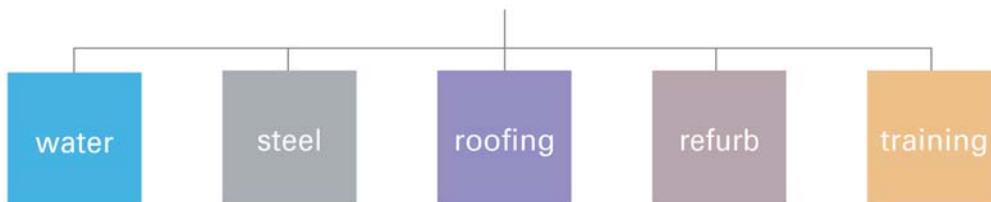
The geocomposite drainage sheet was light and easily transported in rolls on flatbed lorries. Compared to the delivery of drainage pipes and gravel surround, the solution reduced the construction impact by saving over 150 heavy vehicle deliveries in a predominantly residential area. Further environmental benefits came from the fact that the drainage sheet was made from re-cycled plastics and no unsustainable gravel import was required.

Yorkshire Water's Eastern region contract partner, Costain Mouchel, was the project delivery team, with Stonbury Ltd and Simpson's employed as specialist sub-contractors. The speed of laying resulted in the project being completed ahead of programme despite periods of very cold weather, and significant cost savings in the order of £140,000 could be demonstrated.

Note: The Editor & Publishers thank Tony Jones, a Principal Civil Engineer with Mouchel for providing the above article. ■



THE SOLUTION



STONBURY ARE MARKET LEADERS IN THE REFURBISHMENT OF WATER RETAINING STRUCTURES AND ASSOCIATED ASSETS

Reservoir repair & Refurbishment - Steel Tank Repairs & Coatings - Water Tower Refurbishment - Sewage Tank Refurbishment - Cleaning & Chlorination - Corrosion Protection - Security Works including Access Covers - Design & Installation of Ladders, Handrails & Walkways

Tel 01234 750924 www.stonbury.com