

Case Study: Foundation Grout Bag System

Engineer/ Contractor: Zublin Pihl Joint Venture Grout Bag Designer: Proserve 2012

To reduce congestion and increase the capacity on Stockholm's local and regional rail network, a 6 km long underground railway line has been constructed beneath the city. Where the railway crosses the Söderström River, three 100 meter long, 20,000 tonne immersed tunnel sections complete the underground link between the islands Riddarholmen and Södermalm.

Prior to immersion of the tunnel elements, Proserve grout bags were fixed to pre-constructed piled and raft foundations by divers, some 20 meters below water level on the river bed. After the tunnel elements were leveled using temporary jack supports, the grout bags were pump filled with a highly fluid micro concrete to complete the permanent foundation bearings for the tunnel.

Proserve Engineers, in agreement with the Main Contractor and Diver, designed the foundation grout bags system to overcome the challenges of sloping and undulating pile caps, close proximity to temporary jack supports during filling and restricted access to the grout bags once the tunnel elements had been positioned.

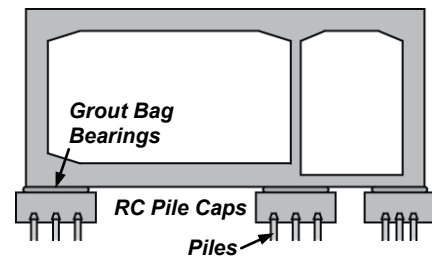


Grout Bag Test Filling

A Marine Quality Control System consisting of Risk Assessments, Quality Control Procedures and Checks was developed for the project to ensure successful completion of the foundation bearings. Rigorous testing of the micro concrete mix and filling test grout bags was carried out to ensure the completed foundation bearings met the desired design parameters and significant marine construction risks were overcome.



Location Plan



Tunnel Section

Proserve designed some 30 N^o grout bags specifically for the project with fabric 'positioning flaps' and 'break ties' to control how the grout bag developed during filling. Proserve provided detailed installation guidance, site visits and office based support to aid construction.



Tunnel Immersion

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