STRENGTHENING THE HAYMARKET TUNNELS

Angus MacGregor and David Gibson of BAM Ritchies give details of a project to strengthen two Network Rail tunnels in Edinburgh.

The Haymarket, a £200m joint venture development in Edinburgh between Interserve and Tiger Development, is approaching the milestone of pre-construction enabling works phase 1.

Taking two years of painstaking work, the strengthening of two Network Rail tunnels underneath the site will have taken over 100,000 man-hours to complete before above-ground work can begin.

The reinforcement of the north and south tunnels, which carry all east-west traffic from Edinburgh Waverley, has been further compounded by the necessity that work is undertaken at night to avoid any disruption to train services. About 830 trains travel through the tunnels each day, reaching much of Scotland, including Glasgow and Fife, suburban lines to the east as well as the East Coast Main Line through to London King's Cross.

The complexity of the underground phase has been unprecedented, thanks to the requirement to strengthen the tunnels that date back to 1846.

By the time the work is completed towards the end of the year, BAM Ritchies’ specialist geotechnical division of BAM Nuttall Ltd – will have installed 4,000 stainless steel masonry stitch bars placed with pinpoint precision, along with masonry repairs, including spray correspondent and brick replacement works. In addition, some 600,000 litres of cement grout is being injected into the tunnel linings through nearly 3,000 holes drilled into the Victorian brick linings.

The stitch bars are 10mm diameter, up to 30m long and secured in place by high-strength resin grout in 10mm diameter holes. The void/crack filling grout is 11 N/mm² cement grout carefully injected so as to ensure no excess pressure on the linings.

All work is undertaken during short night-time possessions in the north tunnel from midnight till 5am five nights per week and in the south tunnel from 1am to 9.30am for one night a week. Using drilling mast mounted onto road/rail plant, BAM Ritchies mobilises to working areas in the minimum possible time, so as to maximise the productive working time.

Services supporting the tunnel works are provided through access shafts bored directly from the proposed development site down into each tunnel. The shafts also convey grout and concrete, enabling large quantities of material to be placed during the short possession windows. A sophisticated and intricate tunnel monitoring system has been installed by BAM Ritchies to provide real-time data on the effects of the proposed works on the tunnel, both during the enabling and construction works.

We at BAM Ritchies are very well experienced in complex rail projects, but every situation is unique, so we've had to develop a very specific approach for this work based on the skills and knowledge of our team. There are many constraints to working on this site, but we have made good progress so far thanks to the working relationship that we have with our client and Network Rail.

Current project manager, Gibson Gibson, added: “We are now into the final few months of the project and it is satisfying to see how much has been successfully achieved when one considers the very short shifts that we have been working.”

Gary Walker from Network Rail Asset Protection said: “Clearly our priority is to ensure that the works are carried out safely and with no disruption to rail passengers on this extremely busy section of the network. We have worked closely with Interserve and BAM throughout the design process lasting about 12 months and it is pleasing to see work being carried out as planned.”

According to Tim Shepherd, senior project manager with Interserve, it has been an ambition phase in the Haymarket development that tested the technical nous of the project team. He explained: “The engineering and logistical challenges were immense, working on the Victorian tunnels in the dead of night where access was severely limited. Working on a live site that connects the capital with the rest of the UK has been extremely demanding, but we have worked closely with Network Rail to ensure no disruption to rail services.”

The overall scheme was designed by award winning Richard Murphy Architects and GDA Architects. With extensive piling work above ground well underway, and finishing of underground enabling works, the development is on track for a completion timeframe of 2017 for its Phase 1 HS office building, Premier Inn and StayCity apart-hotel. Work on HS2 and HS3 will begin in the second quarter of 2016 as scheduled.