

M8/M73/M74 Improvements - Structure 105 - Braehead Railway Bridge



The Scottish Government's five policy objectives of Environment; Economy; Safety; Integration and Accessibility underpins its' motivation for the M8/M73/M74 Motorways Improvements Project and its' importance to Scotland's infrastructure is immense. In particular, the projects role in reducing congestion on the M8 between Glasgow and Edinburgh is seen as critical for the future success of the Scottish economy. The Braehead Railway Bridge (S105), a new railway overbridge where it crosses the new M8 alignment near to the Baillieston Interchange, is the main structure on the project.

BAUER Technologies Limited was awarded a £3.5m sub-contract by Ferrovial Lagan JV (FLJV) to install the foundation piles for a number of structures along the new motorway including the 8no. 2.0m diameter foundation piles for the Braehead Railway Bridge.

Delivery of the works was not without its

challenges as it had to be planned in detail in close cooperation with FLJV and Network Rail to ensure minimum disruption to rail services. As a result the 2.0m piles had to be constructed within 4 x 54-hour railway possessions (closures) through April 2015. It was fundamentally important therefore that the works would proceed as expected in the relatively restricted working window made available by Network Rail and this demanded detailed in-depth planning and preparation.

Specifically, meticulous planning was put into:

- Mobilisation & establishment on-site
- Positioning and movements of plant in close vicinity to Network Rail assets, including overhead line equipment (OHLE)
- Procurement and mobilisation of spare drilling rigs and tools, parts and equipment in case of failure
- Resourcing of and training of BAUER

Technologies Limited specialist staff

- Personal Track Safety training was required for all employees engaged in delivering the works
- Suitability tests for Concrete
- Securing 'round-the-clock' materials supply (particularly concrete)
- Safe execution of the works, whilst minimising risk to Network Rail Infrastructure

A key element in assuring reliable delivery was to verify the design assumptions and the construction method. This was demonstrated by construction of a sacrificial test pile of the same diameter as the works piles, fitted with a 660mm diameter Osterberg Cell, which was subsequently tested to failure.

The design test load for the pile was 28.7 MN but it was finally tested to failure, achieving a maximum sustained gross bi-directional applied load of 39.5 MN. Directly after the successful test piling,

the 8no. 2m diameter rotary bored piles up to 18.7m deep were installed. The first 54hr possession was scheduled for the Easter weekend. At their closest the piles were within 2m of the nearest The design test load for the pile was 28.7 MN but it was finally tested to failure, achieving a maximum sustained gross bi-directional applied load of 39.5 MN. stanchion. The piles were drilled by BG40 drilling rigs resourced from the Bauer resources in UK and Europe. The piles were temporarily cased with Bauer segmental casing through the upper overburden and made ground strata, which consisted of silty / sandy firm to very stiff clay (glacial till). The segmental casing was then sealed into the underlying sandstone and siltstone rock. Using Bauer rock augers and drilling buckets, the pile bore was drilled through sandstone, siltstone and mudstone with rock strengths of up to 50Mpa.

Piles were heavily reinforced full length with a double layer of B50 reinforcement (a steel density of nearly 800kg/linear m). The line of piles constructed in closest proximity to the railway tracks had a permanent steel liner installed over the upper section, in



the zone above the concrete cut-off level, to allow safe access for follow on contractors to trim the piles. The permanent liner was attached to the reinforcement cage using a bespoke fabricated bracket-splice connection developed by the project engineering team.

Bauer Technologies added value to the project by using its' experience of previous work on similar technically demanding projects carried out in a rail environment. This experience,

which informed the meticulous detailed planning phase, was fundamental in Bauer Technologies installing the 8no. S105 piles in less than 50% of the allowed construction time: only 2 of the 4, 54-hour possessions were required to complete the work.

FLJV praised Bauer Technologies' for the standard of organisation, its commitment to safe working practices and to efficiency. As a result, other structures on the project have been awarded to Bauer.

Client:

Network Rail

Principal Contractor:

Ferrovial/Lagan (FLJV)

Piling Contractor:

BAUER Technologies Limited

Contract Period:

April 2015 - Ongoing

Project Value:

£3.5 million

Bauer's Scope of Works:

- 1no. sacrificial test pile - 2000Ø, 8.5m deep, fitted with O-cell
- 8no. rotary bored piles - 2000Ø, up to 18.7m deep fitted with permanent liners
- Integrity testing (all 8 piles)

Equipment Used:

- 3no. BAUER BG40 rotary drill rigs (2no in use, 1no standby capacity)
- 21 30mm diameter BAUER segmental casing
- 2000mm diameter BAUER drilling tools
- 2 x 100t crawler cranes
- Telehandler, MEWP, grout plant, general piling tools and accessories