ROCKFALL BARRIERS

Product: RMC 050 ICAT/2 Class A and RB 100 Class A

Problem

Handsworth Cutting, on the Deepcar to Cleethorpes line, was originally constructed as a tunnel known locally as Darnall Tunnel, 3/4m east of Darnall station near Sheffield. When opened to passengers in February 1849, the railway consisted of only two lines. Due to an increase in coal traffic to Immingham Docks during the early 20th century the railway capacity was increased by adding two good lines.

At this time Darnall tunnel presented a bottle neck preventing the construction of the goods lines and requiring its own signal box to control train movements through the tunnel. In order to allow the construction of the goods lines, the tunnel was decommissioned and demolished in 1912, creating what is now known as the Handsworth Rail Cutting.

As coal exports decreased, along with the associated traffic, the outer goods lines were removed leaving a cess 5m - 6m wide. This 'wide cess' would prove pivotal to CMLs method of works during the installation of the rock fall protection scheme.

The rail cutting which comprises several distinct slope forms cut through with coal measures, bands of sandstone and siltstone/mudstone. The local geology, along with debris left by the explosives used in the decommissioning of Darnall tunnel, has led to unstable cutting faces. The maximum height of the cutting is approximately 25m, with slope angles of approximately 70° - 80° degrees within the rock slopes, and 35° - 50° within the soil slopes.

With a history of rock falls throughout the cutting and records of a derailment around 1996, this stretch of track posed a significant risk to an operational railway for Network Rail and its users.
Solution
CML commissioned design consultants AECOM and proposed a solution consisting of a variety of rock fall protection methods:

The steep sections of the cutting, would be secured by means of Maccaferri double twist rock fall netting and spot rock bolting.

Where cess width was sufficient, rockfall barriers were deemed to provide the most effective collective protection to the railway lines from the hazards throughout the cutting. The barriers were designed to absorb Serviceability Energy Level (SEL) rockfall impacts.

This design was optimised by specifying barriers with several different capacities throughout the site, depending on the potential rockfall hazards recorded at each location during the inspection. The design included consideration of barrier impact deflection to ensure that this would not encroach upon railway operation.

Maccaferri 500kJ RMC 050 ICAT/2 and 100kJ RB100 barriers were selected as suitable options and function by transferring rockfall impact energies to lateral cables and the barrier bases. Indeed, the ICAT/2 barrier does not require any uphill support cables, reducing installation time. The barriers were designed and constructed to suit the cutting cess ground conditions, which included ballast over variably loose or disturbed horizons of fill and weathered insitu materials, underlain by more competent rock.

The rockfall barriers designed by AECOM were:
- 3 No. RMC 050 ICAT/2, 50m long and 2m high with posts at 10m centres.
- 3 No. RB 100, 60m long and 2m high with posts at 10m centres

CML Rope Access Technicians began work in the cutting in mid-April 2017. Initially the worksite was secured by rock scaling of loose material and de-vegetation, allowing safe access for work on the cutting slopes and the installation of the rock fall netting.

The wide access areas, left after the removal of the previous goods lines, enabled work to begin on the rock fall barriers. The wide cess provided the opportunity for plant which would normally require possessions to work, to be operated under Network Rail ALO system, allowing work to take place during the day and eliminating the need for mid-week night time working. Works were completed August 2017 ahead of programme and budget.
CML installed the designed polymeric double twish mesh.

RMC 050 ICAT/2 and RB 100 were installed in different locations throughout the site.

Detail of the RMC 050 ICAT/2 foundation.

View of the RB 100 Class A installed.