

# M1 J39 to J42 Managed Motorway—Soil Nailing

## Project Profile

**Client:** Bam Morgan JV

**Designer:** Halcrow Hyder JV

**Value:** £650k



Soil nailing slope stabilisation to support critical embankments that were constructed to new steeper angles on the M1 Managed Motorway contract J39—J42 near Wakefield for Highways England.

Three sections of embankment were stabilised using R32-280 Dywidag Galvanised Hollow Bar soil nails and structural slope support mesh;

- Section RW1 Northbound Carriageway, 720 nr x 10m long nails installed in 6 rows with embankment slope angle of 26 – 31 degrees using specialist air driven crawler rigs.
- Section RW3 Southbound Carriageway, 406 nr x 5m long nails installed in 3 rows with 45 degree embankment slope using Klemm KR904 drilling rigs.
- Section RW7 Southbound Carriageway, 697 nr x 5.5 – 9.5m long nails installed in 4 rows with embankment slope of 26 – 45 degrees using a combination of Klemm KR904 drilling rigs and a specialist soil nailing mast attached to a 24 tonne excavator.

The soil nails were installed as self-drilled grouted nails with a 100mm diameter sacrificial drill bit and grout flush. Due to the varying slope angles a combination of conventional and specialist drilling rigs were utilised. This included air powered Ingersoll Rand ECM 351 'Crawlair' drilling rigs which were anchored to 10 tonne winches established on the hard shoulder to both support the rigs in position while drilling and also to assist the rigs to climb up the steep embankment slopes, together with grout plant, compressors and other attendant plant.

In order to meet the demands of the programme and the associated sequencing, three drilling set ups were resourced to site to undertake the works. The grout flush was specified as OPC cement grout and this was produced using a Colcrete DD4 colloidal grout mixer.

A safe system of work was established which required the drilling operatives working on the embankments to be harnessed and attached by lanyard to secure anchor points during the works.

The work was carried out within the traffic management arrangements established for the motorway widening works which in itself brought many logistical challenges in terms of access to working areas. This required precision planning and phasing and to support this frequent co-ordination meetings were held to ensure that all activities could progress safely and without impacting the main works programme.



# M1 J39 to J42 Managed Motorway—Soil Nailing (Cont'd)

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Extensive liaison and planning with was undertaken with BAM Morgan and Highways England to establish programmes, working areas, traffic management, plant and delivery vehicle routing arrangements, locating support equipment, arrangements for fuelling and establishment of emergency procedures.

Bespoke traffic management arrangements were established to accommodate the positioning of the winching and support equipment for the drilling rigs on the existing hard shoulder which also provided access for the main works.

The soil nailing work was completed in two separate visits in line with the main programme with RW1 and RW3 undertaken simultaneously.

In addition to the slope stabilisation works additional site investigation drilling was commissioned separately and involved completing a number of rotary open holes and core holes together with SPT's to establish the thickness and condition of shallow coal seams at the proposed locations of overhead gantry signs. Again, bespoke traffic management arrangements were required to ensure the safe and efficient completion of these site investigation works.

