

# SLOPE PROTECTION MEASURES- RAILWAY LINE- NEAR CH 13 - ANPARA, UP ANPARA, UTTAR PRADESH, INDIA

## Surface Strengthening and Support

### Problem

The new railway line along Karaila Road- Shakti Nagar, as part of the doubling project, passes through very complex terrain and several stretches have been identified to have rockfall and erosion problems. One such stretch is identified near ch:13km, where the side slopes of the cuttings along the stretch from CH:13+285 km to CH: 13+880 km. The site has been facing soil erosion problems by erosive agents such as wind, water and gravity. The resultant loss of soil due to erosion will become a matter of serious concern if left unprotected. Unchecked erosion had resulted in cuts, rills or gullies and slide problems. The site has been witnessing various slope instability, rockfall and erosion problems and there was a requirement for railway widening as well.

### Solution

Based on engineering investigations, various site observations and previous history of rockfall events, the critical stretches have been identified. Various slope protection measures (presented here) along with rockfall barriers are implemented along stretch from CH:13+285 km to CH: 13+880 km.

Maccaferri has offered different solutions based on the slope geometry which is to be protected against surficial instability and erosion. Installation of HEA SQ Panel over DT mesh along with wire ropes installed in a vertical fashion is done along with erosion control mats such as BioMac CC and MacMat R1 polymeric for erosion protection. Bioengineering measures are proposed for vegetation.

The MacMat R1 polymeric reinforced and/or BioMac CC are used for providing immediate, high-performance erosion control and root reinforcement for re-establishing vegetation on vulnerable/exposed slopes. Self-Drilling Anchors (SDA) were installed on the slope with nail lengths of approx. 4m for surface and top nails. The meshes used in the slope protection system are conforming to existing Indian and international codal guidelines.

Separate measures such as erosion control, slope protection and rockfall barrier work etc., are adopted suitably for other identified chainages nearby.

**Client:** EAST CENTRAL RAILWAYS-DHANBAD DIVISION  
**Designer / Consultant:** Maccaferri Environmental Solutions Pvt. Ltd.

**Contractor:** MACCAFERRI ENVIRONMENTAL SOLUTIONS PVT. LTD

**Products used (Qty.)**

**Date of construction:** 06/2022 - 01/2023



Figure-1 Satellite image -identified scope near CH 13km



Figure-2 Installation of Surface nails



Figure-3 Providing DT mesh over the erosion control mats



Figure-4 Installation of wire rope vertically on the edges of DT mesh



Figure-5 Mesh installation over nailed slope face

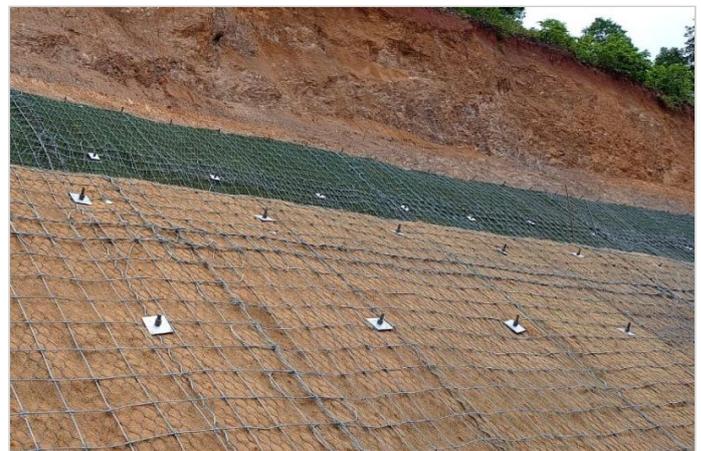
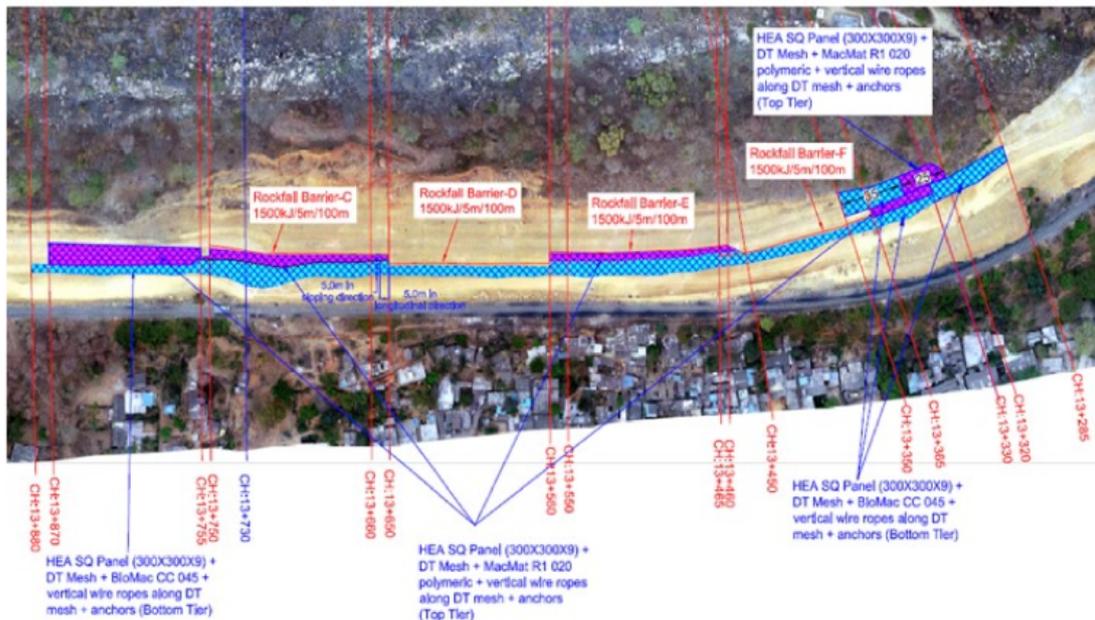


Figure-6 Overall site after the installation of slope protection system



## PART PLAN

Plan showing scheme

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