

# ROCKFALL MITIGATION WORKS- RAILWAY LINE-NEAR CH 14 - ANPARA, UP ANPARA, UTTAR PRADESH, INDIA

## Dynamic Barriers

### 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:14km, where rockfall events are reported from the hill along the stretch from CH: 14+718 km to CH: 14+913 km with a risk of rockfalls onto the railway track. The rainfall infiltrations during monsoon, and the rise of pore pressure within the rock discontinuities accompanied by traffic-induced vibrations, erosion factors and steepness, trigger the rock detachment. Hence, it is pertinent to address the impending rockfall from slope face problem to minimize the risk of rockfalls disrupting train operations.

### Solution

Based on engineering investigations, various site observations and previous history of rockfall events, the critical stretches have been identified. Rockfall barriers (presented here) along with slope protection measures are implemented along stretch from CH: 14+718 km to CH: 14+913 km.

RocScience's Rocfall software is used for the simulation of probable trajectories and the analysis of rockfall barriers. Two lines (100 RM each) of dynamic rockfall barriers of nominal capacity 1500kj and 5m height at the height of 10 to 15m above the railway top level, have been proposed, considering simulation, site conditions and ease of carrying out maintenance activities. The barriers are meant to prevent the loose boulders falling on track and thereby mitigating the risk of rock detachments from upslope locations from affecting the infrastructures below.

The dynamic rockfall barriers installed are ETA/EAD certified and comprise of primary interception mesh of MacRing (Ring Net) and secondary interception mesh of DT Mesh. These rockfall barriers have a compression braking system, which maintains performance throughout the entire design life of the structure and is easy to visually inspect by maintenance engineers as it progressively deforms once the barrier is impacted.

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 14km



Figure-2 Activities related to installation of barrier posts



Figure-3 Connecting upslope or lateral anchors with help of bracing cables



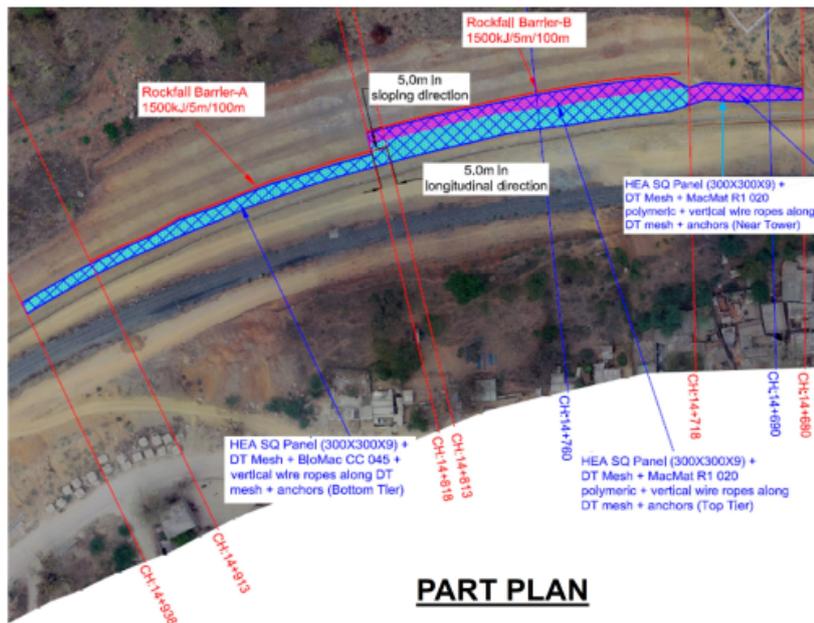
Figure-4 Installation of Primary Interception mesh (MacRing)



Figure-5 Installation of primary and secondary mesh (MacRing + DT mesh)



Figure-6 Overall site after the installations of Rockfall barriers



## Plan showing scheme

MACCAFERRI ENVIRONMENTAL SOLUTIONS PVT. LTD  
D40, MIDC Ranjangaon, Tal-Shirur, Dist. Pune - 412 220  
Tel: +91 2138 393000 , Email: info.in@maccaferri.com