

CASE HISTORY

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ROCKFALL PROTECTION AND OTHER ANCILLARY WORK IN CUTTING AREA BETWEEN STATION UMRA AND ZAWAR (CH 121+640 TO 144+000) IN CONNECTION WITH UDAIPUR - HIMMATNAGAR GC PROJECT, UDAIPUR
UDAIPUR, RAJASTHAN, INDIA



At the Heart of GeoHazard Mitigation Activity

Rockfall Protection

Client:	Products used :
NORTH WESTERN RAILWAY	• DOUBLE TWISTED WIRE MESH - 2.7mm Zn+PVC, 10x12 • TECHRHOMBUS HRC - 300x300/10 • TECHANCHOR - 32mm
Main contractor:	
GEO ONE SOLUTIONS	
Manufacturer & Supplier:	Year of construction & Total Area of protection :
TECHFAB (INDIA) INDUSTRIES LTD.	2023 & Total Area of Protection - 21,000 SQM

Project brief & Problem Description:

The Udaipur city of Rajasthan state and Himmatnagar city of Gujarat state were previously connected by a Meter Gauge Railway line. However, as part of the "Uni-gauge Policy of Indian Railways," most railway lines between these cities and others across the country have been converted to Broad Gauge, with the remaining Meter Gauge lines also undergoing conversion. The absence of a Broad Gauge line between Udaipur and Himmatnagar necessitated trans-shipment of passenger and goods traffic at Udaipur or Himmatnagar, causing inconvenience, delays, and additional expenses. Both cities are significant for business and tourism, with the line connecting several important locations in Rajasthan and Gujarat states. The existing Meter Gauge Railway line's speed is limited to 45 kmph, resulting in prolonged travel time between Udaipur and Himmatnagar.

Recognizing these challenges, the Ministry of Railways has approved the Gauge Conversion project from Meter Gauge to Broad Gauge between Udaipur and Himmatnagar. The proposed speed for trains on the Broad Gauge line will be 100 kmph. Upon completion of this project, the two cities will be connected by Broad Gauge, facilitating faster, more comfortable travel for passengers without the need for train changes at these stations.

This railway alignment passes through hilly terrain, particularly at the location where the diversion of forest land was proposed between Umra and Zawar stations. Rockfall protection and other ancillary works have been planned for the cutting area between these two stations. These protection measures, spanning from CH 121+640 to 144+000, aim to ensure the safety and stability of the cutting area along the route.



Photo 1 & 2 : Construction Progress: Primary and Secondary Mesh Integration

Solution Proposed:

TechFab India has proposed an effective solution to the challenges posed by the Gauge Conversion project between Udaipur and Himmatnagar. Our innovative approach integrates advanced materials and engineering techniques to ensure the safety and stability of the railway alignment.

The protective measures include the installation of ETA Approved Primary Mesh - TechRhombus HRC (High Resistance Clip). This High Strength Rhomboidal-shaped cable panel is crafted from High Tensile steel wire Ropes with a tensile strength exceeding 1960N/mm^2 , providing a superior alternative to conventional rockfall protection systems. TechFab India has recommended the TechRhombus HRC with a mesh opening size of $300 \times 300\text{ mm}$ and a rope diameter of 10 mm , specifically designed to handle large boulders. Additionally, TechFab Double Twisted Wire Mesh (Netting), a BIS marked Secondary Mesh with a mesh opening size of 10×12 and ZN + PVC coating, has been installed to retain smaller boulders. The combination of Primary and Secondary meshes, anchored with Self Drilling Anchors - TechAnchors, SDA R 32 at both top and bottom, ensures the stability of the slope.

This comprehensive approach not only addresses immediate slope stabilization needs but also integrates advanced materials and engineering techniques for a durable and effective solution.



Photo 3 : Ensuring Safety: Installation of Rockfall Protection Systems

Execution at the site:

The area was excavated and scaled to the required levels and slope. Self-Drilling Anchors (SDA) were drilled and installed with rotary percussive drilling and continuous grouting, maintaining drill holes at a 10-degree downward inclination to contain the grout. Grout was injected through hollow steel bars to stabilize the hole. DT Mesh rolls were transported and aligned to the slope top, extended over the anchors and trenches, and adjacent mesh was lapped by looping or using a ring system. TechRhombus Mesh with High Resistant Clip (HRC) was installed, and base plates were fixed and tightened over the anchors and mesh. Periodic maintenance was performed by clearing debris after rockfalls and checking all connections every six months.

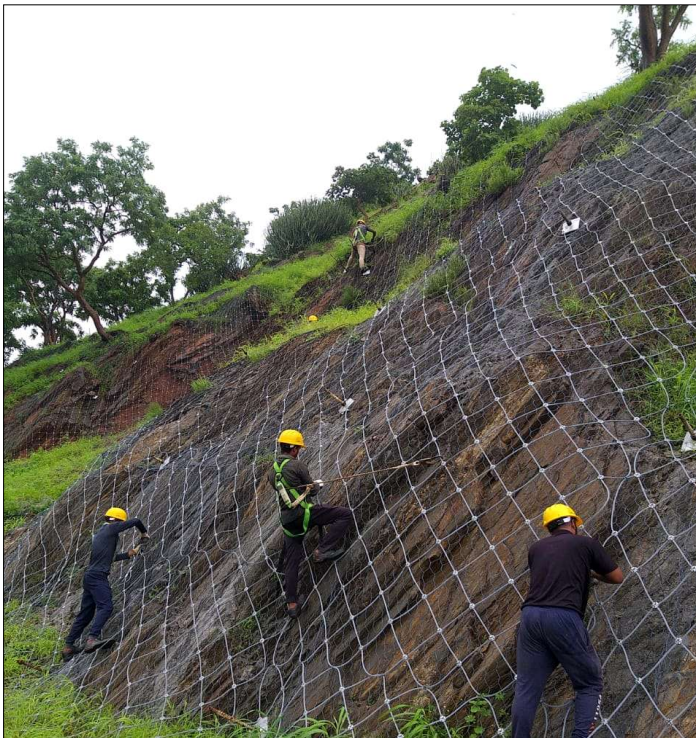


Photo 4, 5 & 6 : Proposed Solution on the Slope



Photo 7 : Ensuring Proper Installation



Photo 8 : Secured Slope : Post-Installation of Rockfall Protection Measures



Photo 9 : Open for Traffic: Completed Structure

Conclusion:

The project has been completed successfully. The implementation of advanced rockfall protection measures, including TechRhombus HRC, TechFab Double twisted Wire Mesh and TechAnchor has significantly enhanced slope stability along the railway alignment. With the completion of construction, the area is now open for traffic, ensuring safer and more efficient travel between Udaipur and Himmatnagar. Both the client and contractor expressed satisfaction with the product quality and service provided.

Disclaimer: The safety gear and the photographs do not represent actual working conditions.

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