

**ROCKFALL MITIGATION MEASURES AT SAPTSHRUNGI GAD,
NASHIK
NASHIK, MAHARASHTRA, INDIA**

Dynamic Barriers

Problem

The Saptashrungi Gad temple is a Hindu pilgrimage site situated at Vani, near Nashik. Large numbers of pilgrims move along the Parikrama path (pathway around the shrine) at the temple, which is situated in high hill terrace comprising of moderately weathered and fractured basaltic terrain where numerous rocks are hanging precariously at many locations. Due to the extreme weathering, the loose rock mass from the top of the hill occasionally fall, bounce, roll and slide down along the hill slope with some rocks landing on or passing the temple complex and the Parikrama path causing fatal injuries to the pilgrims. The work site involved a very large area and posed numerous challenges because of inaccessible terrain, low visibility, higher slope (about 200m from road level) and bigger threats of rockfall. Engineering investigations were carried out and studies were done by geologists and other experts to provide solutions to mitigate the rockfall problem.

Solution

The rockfall mitigation measures constituted of secured drapery system with Steelgrid MO and High Energy Absorption (HEA) panels and surface anchoring. Two lines of flexible rockfall barrier of 5000 kJ capacity and 7m height of total length 150m were strategically installed above the temple and Parikrama path to provide an additional safety layer in view of highly sensitive site requirements. Helicopter was employed for shifting various components. After installation completion in Dec-2015, a rockfall event was reported on slope above the temple in June-2017 and has been successfully contained by the dynamic barrier. The maintenance activities were done to remove the boulders and repair of the damaged components. This project was selected as one of the finalists of Ground Engineering Awards- 2017 under "International Project of the Year Award" Category" on account of its innovative design to overcome a significant geotechnical challenge, demonstration of delivery of value and quality for the client, involvement with project stakeholders and community to deliver a successful outcome and efficient and collaborative delivery through close relationships with the client and supply chain.

Client: PWD NASHIK

Designer / Consultant: IIT, Bombay

Contractor: MACCAFERRI ENVIRONEMNTAL SOLUTIONS PVT LTD

Products used (Qty.)

- HEA Panels 18450 Sq.m
- Steelgrid MO-18450 Sq.m
- Dynamic Barriers RMC 500/A 7m high-150m total length

Date of construction: 09/2013 - 12/2015



Figure 1- Steelgrid MO laid out on slope surface



Figure 2-HEA Panels laid over Steelgrid MO on slope surface



Figure 3- Helicopter used to transfer material during installation



Figure 4- Installation of dynamic rockfall barrier

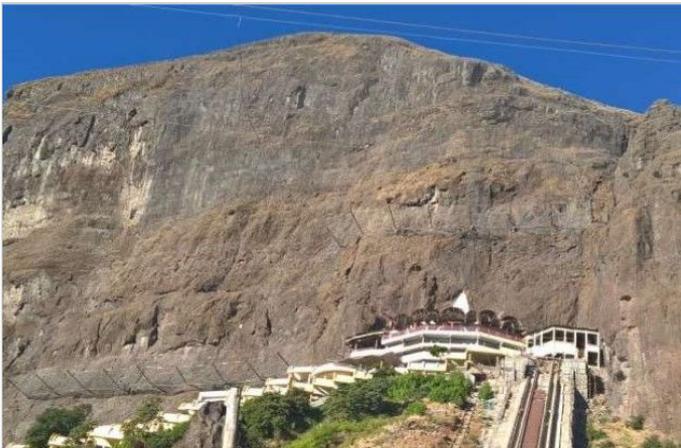


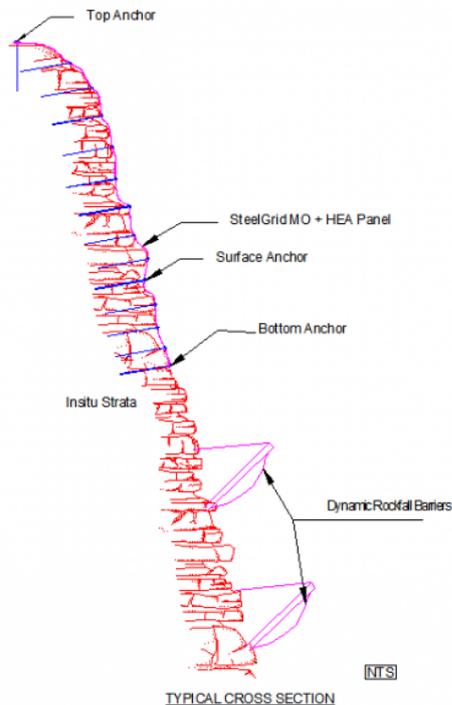
Figure 5-Completed scope of two lines of rockfall barriers and secured drapery s



Excerpt of Newspaper (June 2017) showing report of rockfall event happened near Saptashrungi Gad which has been successfully contained by the dynamic Rockfall barrier



Breakage of rock pieces happening with the help of silent explosives (as part of maintenance activities)



TYPICAL CROSS SECTION

Cross-section

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