DEBRIS FLOW MITIGATION MEASURES NEAR KEDARNATH TEMPLE

KEDARNATH, UTTARAKHAND, INDIA

Debris Flow Barriers

Problem

The project is situated in a very challenging area at a very high altitude of 11,750 ft above MSL. The strata near Kedarnath temple consists of boulders along with soil. Due to heavy rainfall in this region, the debris flow occurs frequently which carries huge amount debris. The area also is prone to cloudbursts. This causes deadly destruction to the nearby areas. Debris flow protection is required on the mountain slope present on eastern side of Kedarnath temple from base camp to the helipad location. The challenges faced in the project were:
1) Extreme weather, high altitude and limited working hours 2) No availability of heavy machinery 3) Transportation of material to installation location only possible manually by trekking 4) Solution required system that can be dismantled for easy of shifting to installation location and required no drilling operation.

Client: NEHRU INSTITUTE OF MOUNTAINEERING (NIM)
Designer / Consultant: MACCAFERRI ENVIRONMENTAL SOLUTIONS PVT. LTD.
Contractor: WOOD STONE
Products used (Qty.)
- Erdox 132 nos.

Date of construction: 04/2018 - 08/2018

Solution

Considering the extremely challenging site situation and requirement of system that can be dismantled, easy to transport and install, solution with Erdox units was selected due to its versatility for mitigating the problem of debris flow.

Multiple rows of Erdox units of reinforced and unreinforced types were installed to function as debris flow barrier on slope from base camp to the helipad location. Foundation was made of concrete pad embedded into a trench to provide the anchorage to the Erdox units.

Additionally, a protection fence of 3m height and 400m length made up of steel posts and High Energy Absorption (HEA) Panels as intercepting mesh is installed at toe of the slope as second layer of protection against debris flow from base camp to helipad location.

The solution is working effectively since its installation.

Figure 1. Protection fence with Posts and HEA Panel

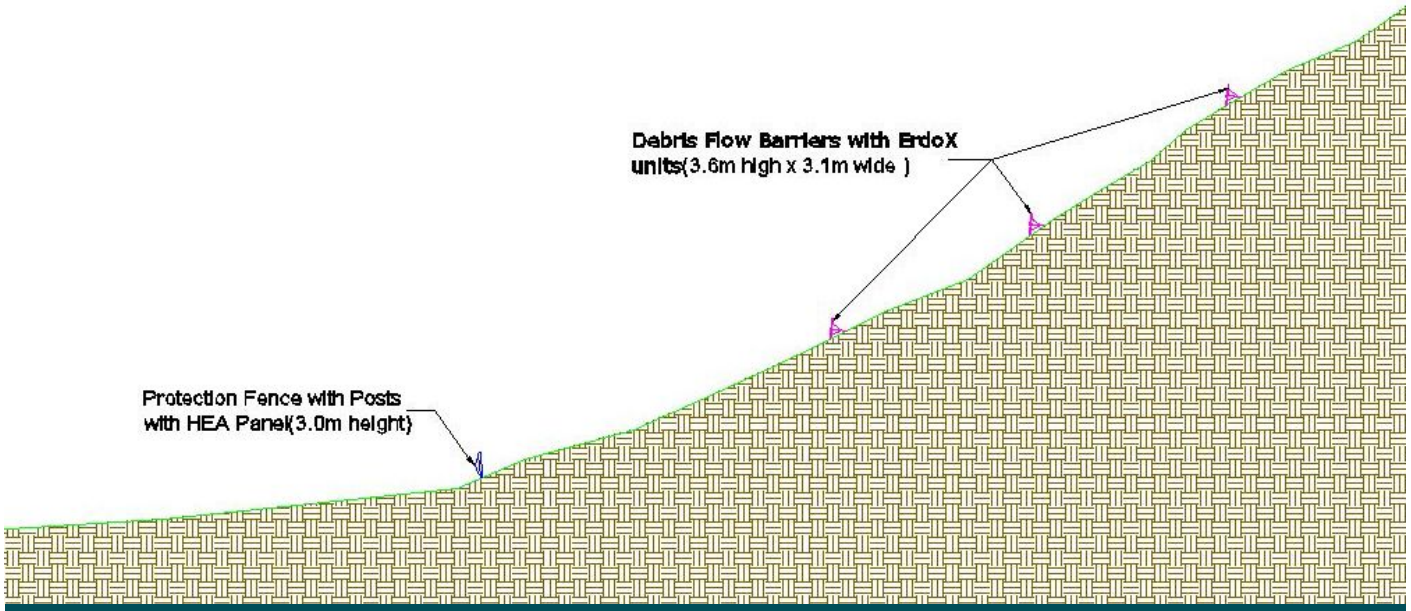
Figure 2. Installation in progress

Figure 3. Installed Erdox units & protection fence

Figure 4. Installed Erdox units

Figure 5. Installed Erdox units (during snowfall)

Figure 6. Debris trapped by Erdox immediately after installation



Schematic cross section

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