

PROTECTION OF HIGHWAY FROM DEBRIS MAKAPU'U, HAWAII, USA

ROCKFALL DRAPERY SYSTEM

Product: Rockfall Protection Mesh

Problem

The Kalaniana'ole Highway forms part of the main highway which circles the beautiful Hawaiian island of Oahu. In many places the road is literally cut into the perimeter of the island, with vertical rock faces on one side of the road, and the Pacific ocean on the other. Erosion of the volcanic rocks cause boulders to break away from the surface and fall onto the highway below, placing road users at risk. On occasion, larger boulders have blocked the highway.

The road is a vital communications link, used daily by commuters and tourists. As Hawaii's main industry is tourism, any road closures impact the islands' economy.

Solution

Due to the adverse impacts, any long term detours or road closures were unacceptable to the Client. As the road is so narrow, any detour would involve an additional hour of driving, via Honolulu and over the Pali Highway.

The solution had to minimize disruption to traffic and be visually un-obtrusive. Rockfall barriers and walls were rejected due to lack of space. Placing 'tunnel' galleries over the highway, a popular solution in the European Alps, would have been visually intrusive.

Rockfall netting was selected as meeting the client's criteria, especially as it can be installed from above without closing the whole highway for extended durations.

The specification of the rockfall netting called for heavily galvanized steel mesh with a PVC coating to stand up to the aggressive maritime environment. Maccaferri also offered a black PVC coating to resemble the color of the rock slope, thereby camouflaging the mesh and reducing its visual impact.

Client:

STATE OF HAWAII DEPT. OF TRANSPORTATION,
HIGHWAYS DIVISION, HONOLULU, HI

Designer:

GEOLABS INC., HONOLULU, HAWAII

Main contractor:

ROYAL CONTRACTING CO. LTD. HONOLULU, HI

Specialist Sub-Contractor:

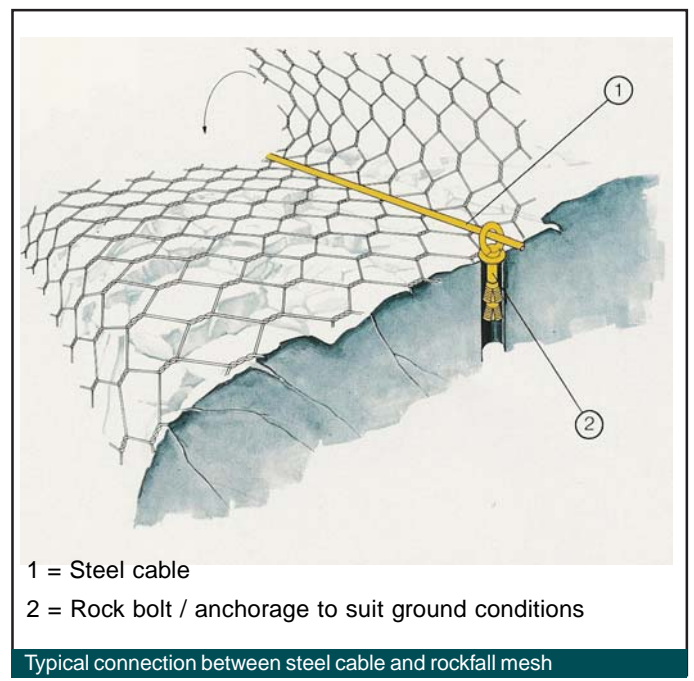
PROMETHEUS CONSTRUCTION, SANTA BARBARA, CA

Product used:

25,000 SQ.M ROCKFALL NETTING

Date of building:

NOVEMBER 2002



Rockfall mitigation measures are either 'Active'; measures that act upon the causes of the rockfall and inhibit its initiation, or 'Passive'; measures that control a rockfall once it has occurred.

The Kalanianoʻle Highway works are an 'active' installation. The rockfall protection netting acts as 'drapery', over the profile of the slope. The presence of the netting stops large rocks from detaching from the slope and falling. Any smaller rocks are allowed to fall in a controlled manner, between the rockface and the netting, to the bottom of the slope.

Main contractor, Royal Contracting Co. Ltd. placed steel plates on the roadway to minimize damage from rock impacts during construction. Short term road closures allowed rock blasting to remove vulnerable and overhanging rock outcrops. Prometheus Construction scaled the rock face to carry out the blasting and clean-up operations.

Helicopters were used to lift the rolls of rockfall netting into position, ready for them to be secured to the rock face. This was carried out during 20 minute long road closures, and traffic was allowed to proceed once the netting was secured. Helicopters are very effective when installing rockfall netting on large, high projects, where cranes would be slower, less maneuverable and require long term road closures.

The rockfall netting was attached to steel cables at the slope crest and the netting unrolled down the slope. The steel cables are secured to the slope using ground anchors and/or rock bolts to provide suitable resistance to pull out. Adjacent panels of netting are butted up to each other and laced or clipped together. A steel cable fastened the mesh at the toe of the slope. Periodically, rock debris trapped behind the protection netting at the toe of the slope will be cleaned out.

This project was one of the largest rockfall netting projects in Hawaii. The solution has since been used to protect a private housing development in Hawaii Kai.



Typical connection detail between panels of rockfall mesh



Completed installation - Black PVC is camouflaged on the rock face

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For over 120 years, Maccaferri has provided engineering expertise to clients around the world. We believe that the combination of our professionalism, design software, technical and site assistance service and our aim of providing the best products in the market, sets us apart from our competition. We hope you agree.

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