Geotechnical Division Case Study
Dinorwig Quarry

Rock Face Stabilisation

Griffiths were engaged by Engie in April 2022 to design and install a rock fall protection mesh above the main access road within the hydro electric plant located in the disused Dinorwig Quarry, North Wales.

The driving force of the works being the safety for staff and whilst accessing the main office complex of the site. The road was closed in January 2022 after a rockfall.

Griffiths engineers undertook an initial scoping visit to assess the risk of rockfall and consider potential solutions.

The solution required, significant heavy scaling and the installation of rock fall mesh to prevent toppling and sliding of large blocks and fragments of rock from the crest and faces of the existing blasted benches.

The works consisted of two distinct phases.

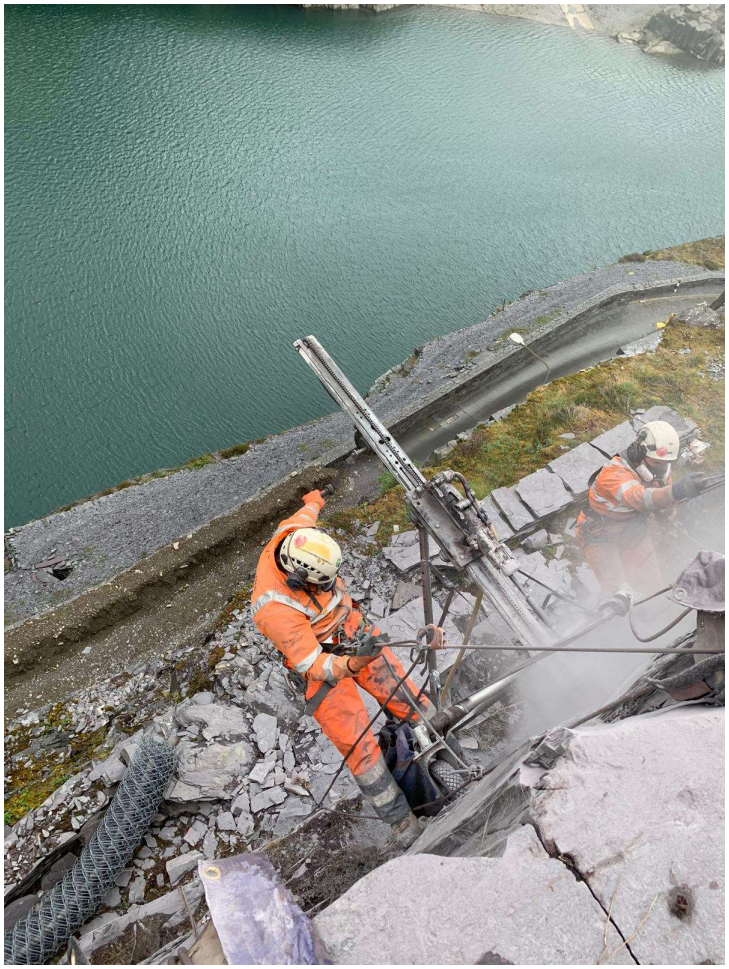
Scaling:

Significant quantities of relaxed and loose rock were present across the affected area. Griffiths rope access technicians worked methodically in a top-down manner, systematically removing loose materials, with single slabs of rock weighing up to 3T being removed.

A crash cushion was installed on the road and verges 30m below to capture and cushion the rocks being scaled. The cushion consisted of a layer of stone placed up to 1m thick. The primary purpose of the cushion was to protect buried services from damage to dissipate the energy of falling rocks safely.

Bolting and Meshing:

Installation of 225m2 of heavy duty high tensile spider mesh with smaller aperture mesh underlay, all secured by 37No 3m long 32mm diameter steel rock bolts fastened in a 41mm hole using lockset resin.



Pictured above: Rope Access Technicians drilling rock bolts

Griffiths developed the design, which was verified by our design partner Hydrock. The design was specifically tailored to allow construction in an area where access for conventional plant is not possible.

Griffiths arranged for the designer to undertake a tactile inspection of the rockface under the supervision of the Level 3 Rope Access Supervisor. This allowed for detailed discontinuity mapping to be completed to confirm rockfall failure mechanisms and the detailed design of the rock bolts and facing mesh to be completed.

The face was scaled to remove loose and dangerous blocks, to prolong the life of the rockfall protection system and most importantly to remove the risk of falling materials or rocks being dislodged above the working area. Scaling was completed with hand tools and air bags.

Utilising a unique light weight drilling frame, which could be man handled and hauled utilising rope access techniques and pulleys. The effective haul weight of the rig is 15kg, which allows the drilling rig to be taken virtually anywhere. The acrobatic nature of the drilling frame allowed bolts to drilled in difficult to reach locations and corners of the rockface. The go anywhere ability of this frame allows bolts to be ideally positioned to profile the mesh to a tight contour, which cannot be achieved by bigger plant.

Continuing with the Griffiths commitment to minimise the risk of HAVS and for zero hand drilled rock bolts, the drilling frame allows the drill to be operated without exposing the operator to vibration.

The SPIDER mesh is rockfall system by Geobrugg specifically designed for preventing / controlling larger block fall. It consists of three interwoven 3mm diameter high tensile wires with a large mesh aperture which allows the mesh to be profiled over corners of blocks so when the mesh is tensioned it provides active restraint to the face.

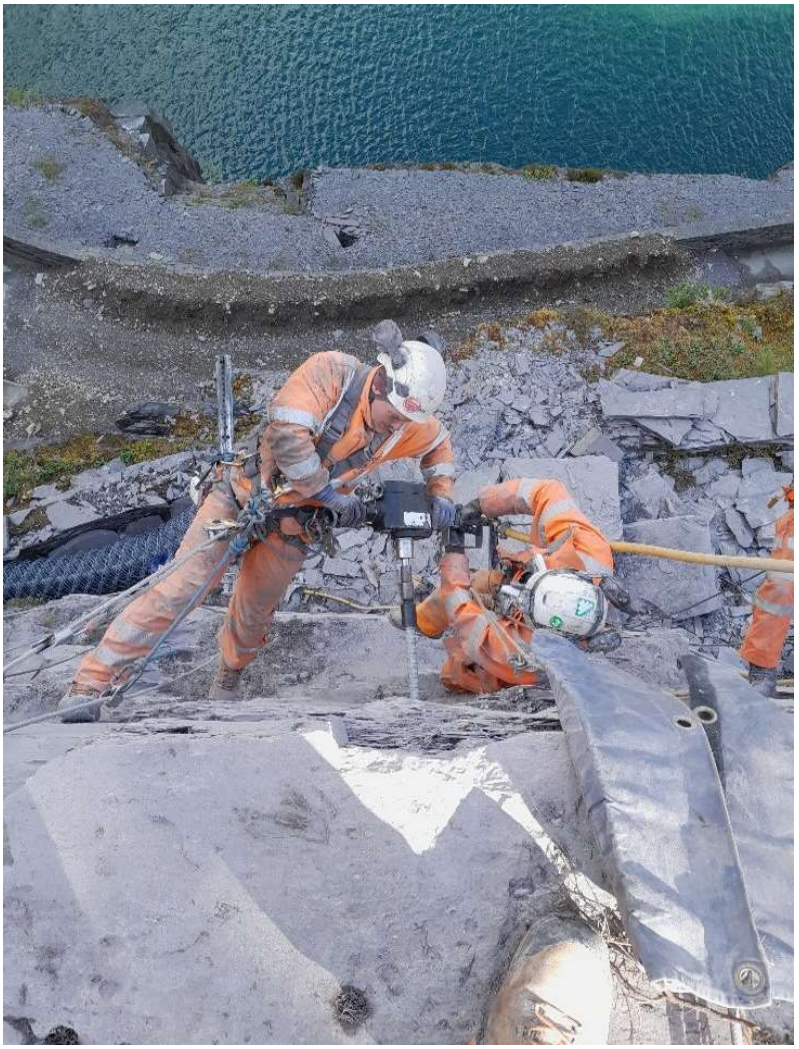
Rock bolts are installed on a diamond pattern along the face allowing the rock mass to be knitted together. The bolts are secured to the mesh utilising specifically designed spike plates to effectively distribute dynamic loads. A secondary smaller aperture mesh was laid underneath the SPIDER mesh to provide protection against raveling and minor rockfall.

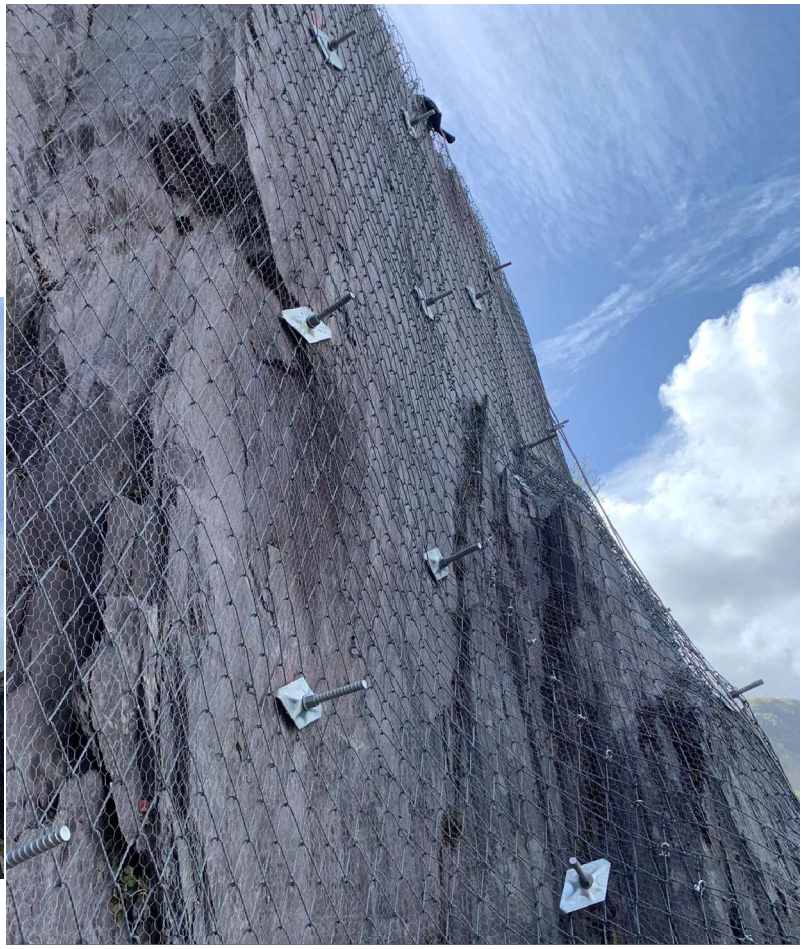
Pictured above:

SPIDER rock fall mesh being installed over buttress feature.

Project at a glance

Client: Engie
Location: Dinorwig Quarry, North Wales
Completed: May 2022
Value: £125,000





Pictured above:

Fig 1) Rock bolts being spun into resin by Rope Access Technicians.

Fig 2) Profiled SPIDER mesh.