GEWI ® Steel Soil Nails stabilize slopes on the Rock of Gibraltar

Reference Details:

Owner British Ministry of Defence, London, England +++ **Main Contractor** Edmund Nuttall, Camberley, Surrey, England +++ **Consultant** Gifford and Partners, Chester, England +++ **Alternative Design** Donaldson Associates, Uttoxeter, England

DSI Services Supply of 8,200 galvanised *GEWI* ® Steel Soil Nails.

Slope stabilization for decommissioned rainwater catchment system, Gibraltar, Spain

Collecting precious rainwater was a necessity a century ago because Gibraltar has no springs or rivers. Construction of the water catchment commenced in 1903 on the 35 degree sand slopes on the east side of Gibraltar over an area of 130,000 m^2. First the 250 m high slopes were trimmed as evenly as possible and timber piles were driven into them; rafters were nailed into the piles and covered with galvanised corrugated iron sheets. Rainwater was gathered into two horizontal channels running across the slope and fed into reservoirs with a storage capacity of 73,000 cubic meters.

Following construction of two reverse osmosis desalination plants in 1991 the high costs of maintaining the water catchments was no longer justifiable to the owners, the British Ministry of Defence. It was decided to decommission the structure and to hand the land back to the Gibraltar government. However, during the planning phase for the reconversion the slope was found to be in a 'critical' state, requiring comprehensive stabilization and a major scheme involving use of soil nails and seeded coir geotextiles was devised. Subsequently the slope will be planted with native species.

Because of the steepness of the slope, eight drilling rigs were specially developed and built for the contract by the installer for the required drilling operations. The rigs are winched into position over the borehole locations using cables securely fixed into the rock face above and can ascend the 600 m long slope at a rate of 3 meters per minute. Operated by a three man crew, each rig is a complete installation station comprising drill mast, control panel, power pack and grout batching plant, all mounted onto a twin-deck wheeled or tracked unit. Up to four soil nails can be installed by each rig per day.

DSI's new system of hot dip galvanised *GEWI* ® Steel Threadbars was selected for the soil nailing. The specially developed galvanising process, conforming to all current standards, provides a uniform protective coating to the threadbars; this allows nuts and couplings to be easily be fitted at the bar ends or any point where the threadbars may need to be shortened on site.

The geology of the slope comprises the following layers:

- wind-blown uncemented sand lying over variably
- cemented sand,
- limestone talus and
- limestone bedrock at depth.

The fully grouted *GEWI* ® Steel Soil Nails are installed in various lengths between 7 and 22 m long and pressure grouted over a 5 m fixed section within the cemented sands. A total of approximately 8,200 soil nails will be installed using 20 mm, 25 mm, 28 mm and 32 mm dia.threadbars.
The whole project was successfully completed in autumn 2002.

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