SLOPE PROTECTION

Project Info

- 04 / 01 / 17
- CC5™ Bulk Rolls
- 600m²
- Horizontal and Vertical layers
- Caisan, Chiriqui, Panama
- Servicios de Ingeniería Geosintética, SA
- CC5™ was used to protect a slope affected by water erosion in Caisan, Panama.

Completed installation in Caisan, Panama

In January 2017, Concrete Canvas® GCCM* (CC) was used to provide erosion protection to a steep slope in Caisan, Paredones, in the province of Chiriqui in Panama.

The slope had been badly affected by water erosion and internal faults and required protection in order to prevent rockfall from the slope onto the road and micro-electric turbine below. Due to the steepness of the slope, access was difficult, meaning the works would have to be carried out using climbing equipment, and would also make the job more time consuming.

The alternative considered was poured concrete, reinforced with a metal mesh, however, this would have been time consuming, very expensive and would have required specialist equipment and personnel. In comparison, CC allowed for a quick installation, with no risk of rebound, and would provide much needed protection to road users, the micro-electric turbine and prevent any further erosion. The area also faced inclement weather during the day, with some light rain showers, while the nights were cold, which would cause further problems and delays for conventional concrete methods.

The works were carried out by Servicios de Ingeniería Geosintética, SA (SIGSA) for IDEAL and CILSA.

*Geosynthetic Cementitious Composite Mat

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SLOPE PROTECTION

Inserting anchor bolts into the slope before installation

Steel bars and screws were used to fix the CC at the crest

Epoxy sealant was used to seal overlaps of the CC and prevent ingress

Screws were inserted at the overlaps to fix the CC

Hydration was given via hose every hour

Cement was used to cover and seal the edges of the CC at the crest

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The team had to use harnesses and climbing equipment to work on the steep slope

In preparation for the installation, the existing protective mesh and green mantle erosion control that had been installed on the site were removed, and all loose material, rocks and other debris was also removed from the slope. The ground was then cleaned with shovels and rakes and the loose material collected using a backhoe and transported from the site in a tipper. Soil nailing was then carried out, consisting of 24 anchor bolts, each 4 metres long, being driven into the slope at 10°.

The CC was then delivered to site in bulk rolls of CC5™, which was laid both vertically and horizontally on the slope according to the ground conditions, with overlaps of 100mm, which were then sealed with an epoxy sealant. The CC was fixed along the crest of the slope using a steel bar and screws at intervals of approximately 100mm; cement was later used to seal the edges of the CC at the crest of the slope to prevent water ingress. The CC was then fixed down the slope along the overlaps using further screws at similar intervals to ensure the CC lay flush against the substrate. To protect the CC material from the cold temperatures overnight, protective materials were placed over the CC. The CC was then hydrated using an AGU and hose every hour.

In total, 600m^2 of CC5™ were installed in 20 days by 6 people, in inclement weather. The clients were pleased with the outcome of the installation and want to apply CC to the adjacent slopes on the remaining land. Installation of CC on this slope face will prevent rocks from the slope falling onto the sensitive infrastructure and road below. Since the installation, the client has noted that the slope has successfully withstood heavy rain without adverse effect.

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