

Project Info



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CC5™ Bulk Rolls



760m²



Vertical layers



Linha do Douro, Mosteirô,
Baião, Portugal



Maranhão, Sociedade
de Construções, SA



CC5™ used to protect a
steep slope overlooking
a single track railway



MARANHÃO
SOCIEDADE DE CONSTRUÇÕES, LDA.
ALVARA N.º 5147



Infraestruturas
de Portugal



Completed installation in Linha do Douro, Portugal

In December 2016, Concrete Canvas® GCCM* (CC) was used to protect a slope in Linha do Douro, Mosteirô, Baião, Portugal.

The slope was situated alongside a single track railway and the installation undertaken in very cold conditions for the area, with temperatures dropping to around 5°C. Shotcrete was also considered but CC was chosen as it didn't require closure of the single-track railway which would have created significant disruption and problems for users of the railway and the public management company, Infraestruturas de Portugal. The works were carried out by Maranhão, Sociedade de Construções, SA for Infraestruturas de Portugal.

In preparation for the installation, vegetation, large rocks and other debris were removed from the slope, and the CC delivered in bulk rolls of CC5™. The CC was then mounted onto a spreader beam and suspended from an excavator for easy deployment. It was then unrolled down the slope and cut to length, with ground anchor systems and ground pegs used to fix the CC to the substrate at the crest of the slope, and down its length, eliminating voids beneath the material. Layers of the CC were overlapped by 100mm and jointed using screws at intervals of 200mm, with every other screw closer to the edge to create a triangular shape, to help prevent ingress. Masonry screws were also used at one side of the slope, where the CC terminated and met an existing stone wall. Once the installation was complete, the CC was hydrated twice, with a one hour rest period in between. A local fire department provided a fire tanker with around 5000L of water to ensure sufficient hydration could be given to the material.

*Geosynthetic Cementitious Composite Mat





Large rocks, debris and vegetation were removed prior to installation



The CC was delivered to site in bulk rolls



The crew had to use climbing equipment due to the steepness of the slope



The CC layers were laid down the slope and overlapped by 100mm



The CC was cut to fit around the pre-fitted weep holes



A combination of fixing and jointing methods were used



Screws were used to joint the layers together



Screws were inserted in a triangular shape for greater ingress prevention



Works were carried out over 2 days



Hydration was given in two stages



Masonry screws were used to fix CC to an existing stone wall (left)



Edges at the crest were buried under a poured concrete drainage channel



Completed slope installation

Following installation, a poured concrete drainage channel was installed along the crest of the slope, running along the side and down around the toe. This was created to carry rainwater around the slope rather than over it and onto the tracks below. The installation of this system will not only provide further protection to the tracks, but should also mean a longer lifespan of the CC on this slope.

In total, 760m² of CC5™ were installed in just 2 days by a team of 5 in cold weather conditions. The client was very happy with the overall process of installation, and is already looking to use CC on future projects. The use of CC meant that the line could stay open, was a more ecological solution, and the speed and ease of installation, and lack of plant requirement meant that the nearby residents were not disturbed by the installation process.

“We’re dealing with an excellent advantage for slope protection where it’s necessary for a fast intervention, as well as a perfect finish of the slope itself.”

Filipe Sales
Project Manager/ Engineer, Maranhão, Sociedade de Construções

“For us, the main advantage is the transportation to the difficult access areas, and the execution even with trains circulating. This way we are able to work on sites with difficult access to shotcrete plant and execute the works without interfering with the trains’ traffic.”

Eva Rodrigues
Designer, Infraestruturas de Portugal