



CONCRETE CANVAS® Concrete on a Roll

SLOPE PROTECTION CASE STUDIES



RAIL



ROAD



MINING



PETROCHEM



AGRO



UTILITIES



PUBLIC WORKS



DEFENCE



DESIGN



SHELTER



Winner
Technical Innovation Award



Innovation Award
ICE Wales Cymru Awards 2017



2014 Fast Track 100
16th fastest growing
company in the UK.



2014 Queen's Award
for Enterprise in
Innovation



2013
Macrobert Award
Finalist



2013 Innovation Award Winner
Railtex Exhibition



2012 R&D 100
Award winner
R&D Magazine



2009 Winner
Material ConneXion Medium Award
Material of the Year



D&AD Yellow Pencil Award
Winner
Product Design

Project Info



30 / 08 / 16



CC5™ Bulk Rolls



500m²



Vertical layers



Highway A24,
Nó da Régua, Peso da
Régua, Portugal



Rodio Portugal SA



Protection and
stabilisation of a slope
next to Highway A24,
joining on to existing
concrete infrastructure



The installation team at Highway A24 had to use climbing equipment due to the restricted access of the site

In August 2016, Concrete Canvas® GCCM* (CC) was used to protect two slopes alongside Highway A24, Nó da Régua, Peso da Régua, Portugal. Part of each slope had previously been lined using conventional concreting methods, however, to protect the rest of the slopes, an alternative was sought. Shotcrete was considered, but the rebound would require closing the highway lanes, creating traffic issues.

To prepare the slope, vegetation and large rocks were removed. Bulk rolls of CC5™ were delivered to site, mounted onto a spreader beam and hung from a truck crane at the base of the slope. The roll was then positioned at the top of the slope, the edge of the material fixed at the crest with ground pegs and the material unrolled downwards, with subsequent layers overlapping by 100mm. The CC was fixed to existing concrete infrastructure using masonry screws, and along overlaps with stainless steel screws at 200mm intervals, with alternating screws positioned closer to the edge, forming a triangular shape. Once installation was completed, the CC was hydrated, with re-hydration given an hour later due to high temperatures of 40°C.

A total of 480m² of CC5™ were installed by 4 people in three 8-hour days, on a limited access site. Rodio Portugal SA were impressed with the speed and ease of installation, and will consider CC for use in future projects. The adjacent lanes were able to remain open for the duration of the installation, with no traffic disruption caused. The client was very happy with CC's method of operation, with the simplicity and cleanness of its application, making it a possible contender for use in future projects.

*Geosynthetic Cementitious Composite Mat





The CC was mounted onto a spreader beam and hung from a truck crane



380mm ground pegs were inserted every 1m



Vegetation and any large rocks were removed, prior to installation



Every other screw was closer to the edge, forming a triangular shape



Hydration was achieved using two 1000ltr water tanks with spray nozzle



The completed installation of slope

Project Info



20 / 10 / 14



CC5™ Batched Rolls



1,230m²



Vertical layers



Jalan Kasawari 11,
Puchong, Selangor,
Malaysia



Daengco Sdn Bhd



CC used to prevent the erosion of a slope located between a road, primary school and a series of houses.



Completed project

In October 2014, Concrete Canvas® GCCM* (CC) was used to prevent erosion of a slope in Jalan Kasawari 11, Puchong, Selangor, Malaysia.

The slope is located between a road and primary school at the top and residential dwellings in close proximity at the toe. Due to the high levels of rainfall and runoff flowing over the slope there was concern that the slope would eventually fail, putting lives at risk. Shotcrete was considered for the installation, however the large amount of plant required would have posed a risk to the students and teachers at the primary school, as well as requiring closure of the road - the only vehicular access route to the school.

Vegetation and loose rocks were removed from the slope before batched rolls of CC5™ were delivered to site. The CC was pegged at the crest through the overlap before being unrolled down the slope by hand, with the installation team ensuring there was a 100mm overlap between subsequent layers. Pegs were also used where necessary down the face of the slope, to ensure intimate contact with the substrate. The overlaps were jointed with screws before hydration.

In total, 1230m² for CC5™ were installed in just 4 days, on a difficult to access site with no disruption to the local residents and no lane possession. The local council was pleased with the installation and have since ordered more material for other similar projects, with neighbouring councils now following their lead.

*Geosynthetic Cementitious Composite Mat





Site before works began



Unrolling the CC



Fixing at the crest with ground pegs



Screwing overlaps



Hydration



The completed project 18 months after installation

Project Info



29 / 12 / 14



CC8™ Bulk Rolls



3,550m²



Vertical layers



Undisclosed Tank Farm,
Oman



Undisclosed



CC8™ was used to prevent weathering of a roadside slope which was leading to rockfall onto the road.



Completed installation

In December 2014, Concrete Canvas® GCCM* (CC) was used to protect a roadside slope (leading to a petrochemical facility) that was suffering from weathering erosion, resulting in rockfall onto the road. CC was installed as a trial, with shotcrete installed simultaneously on a different section, to establish which method was better for the application and environment.

Loose rock was removed from the slope face and bulk rolls of CC8™ were delivered to site, mounted onto a spreader beam and hung from a crane. The rolls were lifted to the crest and the leading edge pegged in an anchor trench. The rest of the CC was then unrolled down slope and cut to length. This process was repeated with layers overlapping by 100mm. The overlaps were sealed with CT1 sealant and screwed at 100mm centres in 2 offset rows. Pegs were also inserted where needed as extra precautions against high flow rates. At the base, mortar was used to seal the CC to existing concrete infrastructure, and pipes were installed to allow egress of water, preventing the build up of hydrostatic pressure behind the CC. Once installation was completed, the CC was hydrated; this was repeated an hour later.

A total of 3,550m² of CC8™ were installed in just 5 days, while the shotcrete installation took 12. Additionally, the shotcrete required the entire road to be closed for the duration of the works, while lane possession was not required for CC. On review of the installations, the shotcrete is already showing signs of failure with noticeable cracking occurring; as a result of this and the rapid installation times of the CC, the material provides significant cost savings compared to shotcrete. Due to the success of the installation, the client is looking into further projects on which to use CC.

*Geosynthetic Cementitious Composite Mat





CC being lifted into position



CC jointed with two offset rows of screws



Hydration



Anchor trench at the crest of the slope



The finished project

Project Info



06 / 02 / 15



CC8™ Bulk Rolls



125m²



Vertical layers



Recife, Pernambuco
Brazil, Bairro Imbura,
Brazil



SPI Brazil



CC8™ used to protect a
residential slope facing
severe erosion issues.



Completed installation

In February 2015, Concrete Canvas® GCCM* (CC) was used to protect a residential slope in Recife, Brazil.

The slope was facing severe erosion problems which had led to the collapse of a house at the crest of the slope. Shotcrete was considered, but due to the varying profile of the slope and the site location this would have been logistically complex and was therefore ruled out. A gel and geotextile combination was also an option, however, it was decided this solution was too fragile to cope with the anticipated weathering erosion. Additionally, previous installations of this material had been subject to theft. Due to CC's resistance to impact, UV degradation and its estimated 50 year life-span, it was installed as a trial to assess its suitability for 1,400 similar projects within the municipality.

The slope ranges in height from 5m to 12m and is surrounded by housing. Loose soil, rock and vegetation was removed and the surface re-graded to ensure intimate contact between the CC and the substrate. The nearby stairs and a masonry wall were repaired with concrete as part of the works. A bulk roll of CC8™ was delivered to site and mounted onto a spreader beam hung from a crane. For the smaller lengths, the CC was unrolled on the flat, cut to specific length and positioned onto the slope by hand, with the installation crew ensuring there was a 100mm overlap between layers. For the steeper, taller parts of the slope the CC roll was positioned at the top of the slope and spooled down, reducing the manual handling requirement.

The works were carried out by SPI Brazil for Defesa Civil Recife (Civil Defense Recife Municipality).

*Geosynthetic Cementitious Composite Mat





Extensive erosion of the slope



Ground preparation



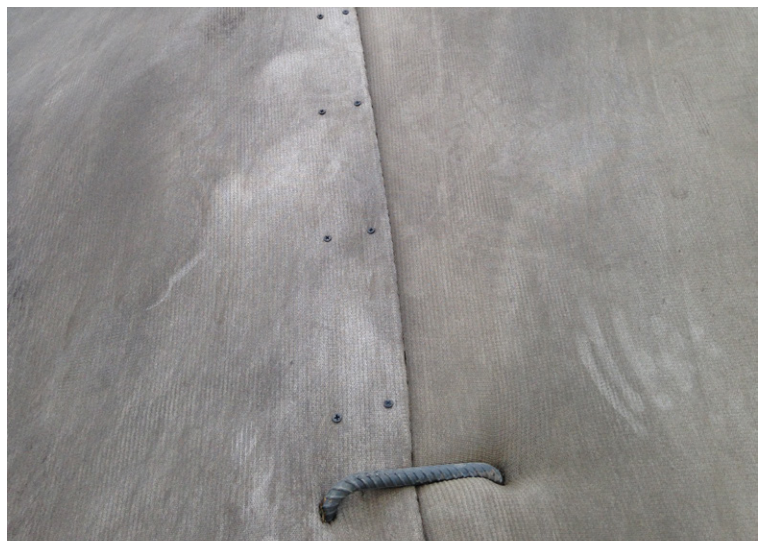
CC spooled down the slope



Hydrating under the overlap



Joints were screwed every 200mm with a double row of screws



Pegs were inserted through every overlap at 2m intervals



Hydration



Mortar joint



The finished painted slope



The finished project

The CC was initially fixed at the top of the slope to allow the installation crew to hydrate under the overlap before fixing and jointing. 400mm ground pegs were then inserted through the overlaps at 2m intervals to fix the CC to the slope. To joint the overlaps a double row of screws were applied at 200mm centres using an auto feed screwdriver, then hydration was completed using an 8000L bowser and hose with spray nozzle attached. A concrete mortar was used where CC terminated onto masonry infrastructure and, once set, the slope was painted to match the surroundings.

125m² of CC8™ were installed in just 9 hours by a team of 6 supervised by SPI Brasil in temperatures of up to 35°C. The project was a huge success with the client calling it an 'innovative solution' that was faster and cleaner to install than shotcrete with less weight burden being placed on the slope. As a result of this project, CC has the potential to be listed in the Brazilian National suppliers system, showing that it has been approved for use by the state.

Project Info



02 / 11 / 16



CC13™ Bulk Rolls



1040m²



Vertical layers



Pontypridd, Wales,
UK



Natural Resources
Wales (NRW)



CC was used to provide
slope protection to
sections of the River
Taff's banks



Cyfoeth Naturiol Cymru
Natural Resources Wales



Completed installation adjacent to the River Taff, Pontypridd

In November 2016, Concrete Canvas® (CC) GCCM* was used to line sections of embankments of the River Taff in Pontypridd, South Wales. A particular section of the river, within the Treforest Industrial Estate, was showing signs of degradation; the existing concrete riprap was heavily cracked, spalled and showing established vegetation growth. Lining of the slope was required to provide an effective erosion protective layer to prevent further scour.

The area was approx. 220m in length and 4m high, terminating halfway up the slope. Re-pointing of the riprap was considered, but would be costly and wouldn't address underlying drainage issues, while replacing the riprap entirely would be considerably costlier and access would prove difficult. Several other options were considered, but following the success of similar works at Crindau in Newport, CC was chosen instead. The works were specified and carried out by Natural Resources Wales (NRW).

Prior to installation, the riprap was removed using plant to avoid the possibility of large voids compromising the stability of the CC. The slope was then graded to a profile specified by NRW, all debris and vegetation removed, and a layer of separation geotextile laid.

The CC was then laid over the geotextile, with layers overlapped by 100mm, and screwed together through the overlap at 150mm intervals. The lack of sealant and the use of the geotextile would allow the release of any build-up of hydrostatic pressure, as well as creating a natural water transition between the substrate and CC.

*Geosynthetic Cementitious Composite Mat





The rip-rap embankment prior to installation



An area of the concrete curb which had badly cracked



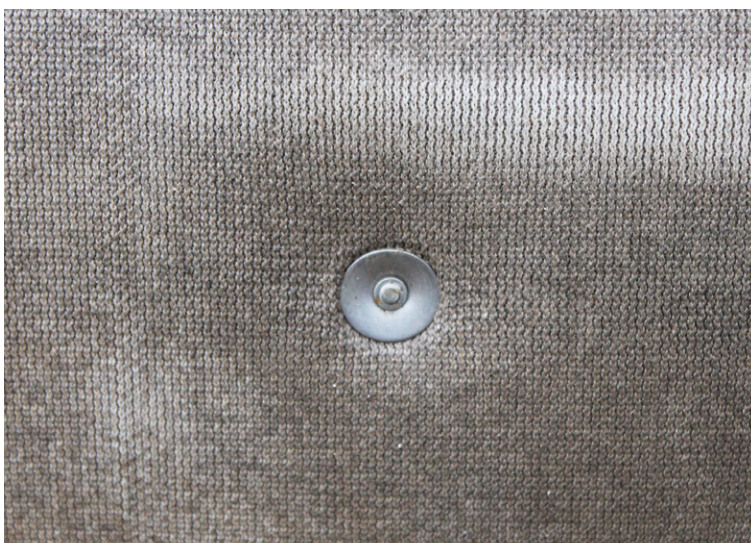
Site before works



Deployment of CC over the geotextile



Fixing of the CC layers using screws



Hilti shot fired masonry nail with washer to secure the CC to the curb



Hydration of CC



Anchor trenching of CC13 midway up the embankment.



Grouted termination to rip-rap



Completed installation

At the crest, the edges of the CC were captured and pinned using steel pegs within an anchor trench, which was then backfilled. The concrete kerb at the toe of the slope allowed the CC to be fixed using masonry anchors. The side edges of the CC were also anchor trenched within concrete poured backfill to prevent ingress. A series of drainage chambers were installed along the length of the embankment. The CC was hydrated directly from the river.

In total, 1040m² of CC13™ were installed in an ambitious and complex project undertaken by Natural Resources Wales, who were very pleased with the outcome.



In 2017, a trial colouring treatment was applied to the slope

“Concrete Canvas is an excellent innovative product for two important reasons: firstly, it offers the required erosion protection to protect a critical asset and prevent future erosion. Secondly, it minimises the environmental effects that you would normally associate with other concrete products. It also has the added bonus that the product is maintenance free and quick to install, therefore offering huge cost benefits.”

Phil Poole
Operations Delivery Technical Support Team Member
Cyfoeth Naturiol Cymru / Natural Resources Wales

Project Info



18 / 09 / 13



CC5™ Bulk Rolls



200m²



Vertical layers



Taupiri, New Zealand



Fletcher Construction,
Brian Perry Civil,
PC Environmental



CC used as a capping
layer over a geogrid to
prevent erosion of a
bridge abutment



Completed section of slope lined with CC5

In September 2013, Concrete Canvas® GCCM* (CC) was used as an erosion control solution on a section of bridge abutment in Taupiri, New Zealand. The CC was being installed as a capping layer to an existing geogrid system. Shotcrete was initially considered for the project, but would require specialist equipment and labour, as well as extending the installation time. The works were carried out by Fletcher Construction, Brian Perry Civil and PC Environmental.

Bulk rolls of CC5™ were delivered to site and cut to lengths of between 1m and 7m to match the varying height of the slope. This ensured that there was no wastage as each length was tailored to match the slope face exactly. Using a rough terrain cherry picker and spreader beam, each length was then lifted to the top of the slope and fixed in place using 300mm steel ground pegs at the crest and toe. This became more difficult on the sections of abutment directly under the bridge, an issue that was solved by reversing the process and fixing the CC to the toe of the slope first. Subsequent layers of CC were then positioned with an overlap of 100mm to the adjacent layer and screwed together with 30mm screws at 200mm intervals using an auto-fed screwdriver. Once the CC had been secured, it was then hydrated using on-site equipment and a water truck.

Fletcher Construction were very impressed with the ease with which CC was installed. Project time was also considerably reduced; the 200m² installation was completed by a team of 3 in just over 5 hours, whereas shotcreting the slope was estimated to take 1-2 days.

*Geosynthetic Cementitious Composite Mat





The abutment had been prepared with a geogrid prior to installation of CC



CC5 was cut to length on site to match the varying height of the abutment



A cherry-picker was used to lift sections of CC to the top of the slope



CC fixed in place with ground pegs and hydrated



Completed section of abutment