



CONCRETE CANVAS® Concrete on a Roll

PUBLIC WORKS CASE STUDIES



The Queen's Awards
for Enterprise:
International Trade
2019



Board of Trade
Winner
2018



Winner
Technical Innovation Award



Innovation Award
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PUBLIC WORKS



UTILITIES



DEFENCE



DESIGN



SHELTER

Project Info



Autumn 2011



CC13™ bulk rolls



100m²



Transverse layers



Olney, IL, USA



Milliken



CC13™ was used for the extension of a boat ramp at East Fork Lake.




Installation underway at East Fork Lake, Illinois

In Autumn 2011, Concrete Canvas® GCCM* (CC) was used to extend a boat ramp at a lake in Olney, Illinois, USA. The East Fork Lake in the City of Olney, IL, is a significant recreational draw for boating and fishing enthusiasts. The lake has only one public access boat ramp, built in the 70s, to accommodate small fishing boats and recreational watercraft. However, the ramp is now not long enough to accommodate longer boat trailers, especially when water levels have dropped.

A temporary solution was given with a gravel extension, however, this began to get pushed away, meaning frequent maintenance. As a result, a more permanent measure was needed. Poured concrete was considered but would require building of a coffer dam, de-watering around the ramp area and 1-2 weeks for installation, as well as being costly. The second option was to use a combination of gravel, capped with CC, which would take 1-2 days and would be able to be installed underwater with just two days of excavation work to prepare the site.

Prior to installation, the excavation contractor used a backhoe with 20m reach to remove the existing gravel and some subsurface mud/soil to provide a consistent base for the new gravel under layer. The contractor then prepared a bed of new stone to 45cm depth, graded to extend the angle of the existing concrete ramp. The dimensions of the area to be added were the full ramp width of 10m and length extension of approximately 6m.

*Geosynthetic Cementitious Composite Mat





Removal of old gravel ramp extension



Unrolling the CC



Connecting the CC panels with hog rings



Deploying the CC into the lake

The project then began with the underwater contractor (diver) surveying and guiding the excavation contractor. The diver made adjustments to the gravel surface to ensure it was level, and the excavation contractor then created two large panels of CC from two pre-cut widths of CC13™ connected by hog rings. The panels were pulled into place using the backhoe, with the diver guiding installation. A final layer of CC was placed perpendicular to, and under, the panels at the interface between the concrete slab and the gravel bed to provide additional stability. The panels were secured to the concrete slab using a 70mm wide steel hold-down bar across the width of the ramp, and anchoring to the slab using screws inserted through the bar and CC layers into the slab.

The ramp was kept closed to the public for a week following installation to ensure it was fully hydrated and set and fit for public use.

In total, 100m² of CC13™ was installed by two teams of contractors, with supervision from Milliken. Concrete Canvas solved an ongoing challenge for the City of Olney in a cost and time effective manner using this versatile, innovative material.

Project Info



01 / 03 / 12



CC13™ Bulk Rolls



200m²



Transverse layers



Derby, UK



Jackson Civils



CC13™ was used to repair and protect gabions which provided flood defence to a residential area in Derby, UK.



Completed installation

In March 2012, Concrete Canvas® GCCM* (CC) was used to repair a gabion wall structure in Derby, UK. The gabion wall, which provided flood defences to a residential area, had become damaged and unstable as a result of vandalism and weathering erosion.

Following the increase in extreme weather events in the UK, particularly flooding, organisations and private parties have been working to improve flood defences, aiming to protect homes and businesses against the threat of flood damage in future. The works for this installation were carried out by Jacksons Civils.

Prior to installation, the CC was delivered to site in bulk rolls, which were batched into shorter lengths on site to match the variable gabion profiles. A spreader beam and plant were then used to lift and place the batched CC lengths onto the gabions. CC layers were overlapped and hog ringed along the edges. The layers were fixed to the gabion structure using re-bar staples. This was repeated along the full length of the gabions, with additional staples used at corners and intersections of adjoining gabions for additional security. The CC was then fully hydrated.

In total, 200m² of CC13™ was installed. The client was impressed by the quick and easy installation and improved longevity of the gabions following the addition of the CC.

*Geosynthetic Cementitious Composite Mat





Section of gabion prior to installation



Site prior to installation



CC was delivered to site in bulk rolls and batched to length on site



The CC was secured with hog rings and staples



Completed installation



Completed corner detail

Project Info



01 / 06 / 14



CC5™ Batched Rolls



45m²



Horizontal layers



Mt Asama, Naganohara-town, Gunma-Prefecture, Japan



Watanabe Kensetsu Co.



CC5™ used to line an outfall to prevent erosion.



Completed installation at Mt Asama, Japan

In June 2014, Concrete Canvas® GCCM* (CC) was used to line an outfall at the base of Mt Asama in Naganohara-town, Gunma-Prefecture, Japan. The works were carried out by Watanabe Kensetsu Co. for the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

The outfall was causing large amounts of soil erosion and water was penetrating the slope, risking slip. In-situ concrete was considered, however with limited site access it would have been difficult getting the raw material to site. Additionally, in-situ concrete would have taken much longer and works would have been halted by inclement weather.

Prior to installation, the ground was compacted and any areas of deep erosion were filled to prevent any voids under the CC. The outfall was then profiled by hand and batched rolls of CC5™ were delivered to site. The CC layers were manoeuvred into place and overlapped by 100mm. Each CC layer was fixed to the substrate and overlapped layers were jointed using SS screws at 200mm intervals. The edge of each layer was folded back underneath itself to provide neat termination.

45m² of CC5™ was installed by four people in just three hours in wet weather conditions. The client was impressed with the speed of and ease of installation and deemed the project a huge success.

*Geosynthetic Cementitious Composite Mat





Installation site after ground preparation



The CC was laid horizontally down the slope



Installation progress



The CC edges were folded beneath themselves for neat termination



Hydration of the completed installation



Completed installation

Project Info



25 / 07 / 13



CC8™ Bulk Rolls



490m²



Longitudinal layers



Pontardullais, South
Wales, UK



Gulliford Try on behalf of
Environment Agency



CC8™ used to line
a channel in an
environmentally sensitive
area to help redirect
surface run-off from a
nearby slope causing
surface erosion and slip.



Completed installation at Pontardullais site

In July 2013, Concrete Canvas® GCCM* (CC) was specified by the UK Environment Agency to line a channel in Pontardullais, South Wales. The channel would help redirect water run-off from a nearby slope that was causing surface erosion and slip. The works were carried out by Galliford Try on behalf of the Environment Agency.

The site was situated in an environmentally sensitive area, which meant the materials used for the project had to be given careful consideration. Poured concrete and pre-cast concrete channels would often be considered for installations like this, however, the unique properties of CC, including its limited alkaline reserve and low wash out rate, as well as its fast installation rates, made it the better option.

Prior to installation the channel profile was excavated and cleared of any vegetation and debris before bulk rolls of CC8™ were delivered to site. Spreader beam equipment and heavy plant was used to dispense the CC along the length of the channel in two longitudinal, overlapping layers. The overlaps were screwed together at 200mm intervals, and the CC fixed to the crest of the channel with steel ground pegs. The material was then hydrated using on-site equipment.

In total, 490m² of CC8™ was installed in just eight hours by a team of four. The Client was very happy with the outcome of the project, as well as the speed and ease of install. CC has been a popular choice with the EA for several projects across the UK, as well as with similar projects as a result of their success.

*Geosynthetic Cementitious Composite Mat





CC was delivered to site in bulk rolls



A spreader beam and heavy plant were used to deploy and lay the CC



Screws were used to joint the CC at the overlaps



The CC was fixed to the ground at the edges using ground pegs



Completed installation



Completed installation - downstream view

Project Info

-  15 / 01 / 2013
-  CC5 batch rolls
-  30m²
-  Vertical and Transverse layers
-  Coatham Marsh Nature Reserve, UK
-  Environment Agency UK
-  Concrete Canvas was used by Tees Valley Wildlife Trust to construct a 5m long artificial sand martin bank at Coatham Marsh nature reserve.



Completed sand martin bank

In January 2013, Tees Valley Wildlife Trust (TVWT) began construction of a 5m long artificial sand martin bank at Coatham Marsh nature reserve to enhance wildlife habitat on the site. The work formed part of a project funded by the Environment Agency (EA) who are currently involved in improving coastal defences along Redcar seafront, and saw a need to balance this construction with some improvements for local wildlife.

Most artificial sand martin banks are constructed from concrete blocks, with sand and/or earth banked up behind. However, TVWT wanted to limit the amount of concrete that would be used in the project, due to the difficulties and logistics involved with repairing or removing it in the future. There was also the issue of limited site access, unpredictable weather and a limited budget to contend with. Concrete Canvas was chosen because it provided a solution to these problems - it can be supplied in man-portable rolls, uses less concrete than traditional solutions, can be installed in the rain and offers significant cost savings over many traditional concrete products.

The main shape of the sand martin bank was defined by a 5m long timber sub-structure. Timber posts were driven into the ground, then braced and reinforced by a frame and shuttering. CC8 was laid vertically over the shuttering, pulled taught to ensure it followed the contours of the frame as closely as possible and fixed using wide-head screws and galvanised nails. Crosses were then cut into the canvas to allow the insertion of the plastic nesting tubes. Once these were secured in place the CC8 was hydrated using man-portable containers. The material was re-wetted the following morning to ensure it set completely. Sandbags were then stacked inside the timber structure to reduce any sinkage, before the back of the structure was covered with mounded up soil, which will eventually green over and allow the structure to blend in to the landscape.

TVWT and their installation team were very impressed by Concrete Canvas, commenting on its ease of installation and flexibility. CC has provided a very resilient basis for the structure, without any of the associated difficulties of mixing concrete on a remote and environmentally-sensitive site.

*Geosynthetic Cementitious Composite Mat

Project Info



06 / 02 / 15



CC8™ Bulk Roll



125m²



Vertical layers



Recife, Pernambuco
Brazil, Bairro Imbura,
Brazil



SPI Brazil



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



Completed installation

In February 2015, Concrete Canvas® GCCM* (CC) was used to protect a slope in Recife, Brazil. The slope was facing severe erosion problems that had already led to a house at the crest of the slope collapsing. The works were carried out by SPI Brasil for Defesa Civil Recife (Civil Defense Recife Municipality).

Shotcrete was considered, but the varying profile and site location meant this would have been logistically complex and was ruled out. A gel and geotextile combination was also considered but was too fragile to cope with the weathering erosion. Due to CC's resistance to impact, UV degradation and 50-year life-span, it was installed as a trial to assess its suitability for 1,400 similar projects within the municipality.

The slope ranged from 5m to 12m in height and was surrounded by housing. Debris was removed and the surface re-graded. The CC was delivered to site in bulk rolls, mounted onto a spreader beam and hung from a crane for easy deployment. For the smaller lengths, the CC was unrolled on the flat, cut to length and positioned by hand. For the rest, the CC roll was positioned at the top of the slope and spooled down and cut to length, reducing manual handling. All layers were overlapped by 100mm.

*Geosynthetic Cementitious Composite Mat





Slope prior to installation works



Deployment of CC



Hydrating the CC



Completed, painted installation

The CC was initially fixed at the top to allow hydration under the overlaps before fixing the CC to the slope with 400mm ground pegs at 2m intervals. A double row of screws were then applied at 200mm intervals, and hydration was completed using an 8000L bowser and hose. Concrete mortar was then used where the CC terminated onto masonry, and the CC was painted once set to match its surroundings.

In total, 125m² of CC8™ was installed in just 9 hours by a team of six, in temperatures of up to 35°C. The project was a success, with the client calling it an “innovative solution”, and noting their satisfaction with the ease and speed of install.

Project Info



11 / 08 / 15



CC5™ Bulk Rolls



400m²



Transverse layers



Enna Province, Sicily



Geo Consulting
Service



CC5™ was used to
cover a slope 281m
in length, and 14m
in height in Piazza
Armerina, Sicily



Completed installation in Enna, Sicily

In August 2015, Concrete Canvas® GCCM* (CC) was used to protect a steep slope in the Piazza Armerina in the Enna Province, Sicily. The slope was 281 metres in length, and 14 metres high, and had been exposed after a historical wall, built in the 1900s, collapsed. The slope was in need of temporary protection to prevent further collapse and damage to the area.

An HDPE geomembrane had initially been considered, however, this area of Sicily is subject to very high summer temperatures and strong winds in winter; conditions the material would not have coped with. Shotcrete was also considered, but the expense and logistical difficulties ruled it out. As a result, CC was found to be the only option. The works were carried out by Geo Consulting Service, headed by Gaetano Palazzo.

Prior to installation, debris was removed from the slope and an anchor trench dug at the crest. The CC was delivered to site in bulk rolls, cut to profile length and deployed down the slope, jointed with screws at intervals of 200mm, and then ground pegs every 1m in the anchor trench along the top of the slope, before being hydrated.

In total, 400m² of CC5™ was installed over a period of four days by a team of three people, including two rock climbers, in temperatures upwards of 35°C. The client was very happy with the ease of installation of the CC and how well it met their needs.

*Geosynthetic Cementitious Composite Mat





Slope before installation



Two rock climbers assisted with the installation



Screws were used to fix and join the layers of CC



Completed installation

“After 2 years the CC5™ protection is still there, the original request was for a temporary protection, until the municipality could find the money to rebuild the collapsed wall, but until now the funds to rebuild have not materialised and the situation has not changed, and will in all likelihood not do so for another 2 years.”

Gaetano Palazzo
Geo Consulting Service

Project Info



02 / 11 / 16



CC13™ Bulk Rolls



1,040m²



Vertical layers



Pontypridd, 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

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. Remediation 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.

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 of geotextile laid.

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

*Geosynthetic Cementitious Composite Mat





The site prior to installation



Deployment of the CC



Hydration directly from the river



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. Hydration was given via hose using water from the river.

In total, 1,040m² of CC13™ were installed in an ambitious and complex project undertaken by Natural Resources Wales, who were very pleased with the outcome of the project.

“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