



# CONCRETE CANVAS

## ROAD CASE STUDIES



RAIL



ROAD



MINING



PETROCHEM



AGRO



UTILITIES



MUNICIPAL



DEFENCE



DESIGN



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



2011 Expert's Choice Winner  
Most Innovative Product



2011 Brit Insurance  
Designs of the Year Nominee



2009 Winner  
Material ConneXion Medium Award  
Material of the Year



2007 Winner  
D&AD Yellow Pencil Award  
Product Design

Concrete Canvas® is a Geosynthetic Cementitious Composite Mat (GCCM), part of a revolutionary new class of construction materials. It is a flexible, concrete impregnated fabric that hardens on hydration to form a thin, durable, water proof and fire resistant concrete layer. Essentially, it's concrete on a roll. Concrete Canvas® GCCM (CC) is predominantly used for erosion control applications such as ditch lining and slope protection, offering a faster, more cost effective alternative to conventional concrete that reduces the need for road closures.

## Concrete Canvas® User Benefits

### Rapid Install

CC can be laid at a rate of 200sqm/hour, up to 10 times faster than conventional concrete solutions. CC has a working time of 2 hours after hydration and can be installed in wet weather conditions, reducing programme disruption.

### Easy To Use

CC is available in man portable rolls for applications with limited access. The concrete is pre-mixed so there is no need for mixing, measuring or compacting. Just add water.

### Low Project Cost

The speed and ease of installation mean CC is more cost-effective than conventional concrete, with less logistical complexity.

### Eco-Friendly

CC is a low mass, low carbon technology which uses up to 95% less material than conventional concrete for many applications. Up to 200sqm can be delivered on a single pallet; enough to replace two full mixer trucks.

## Concrete Canvas® Key Properties

### Erosion Protection

CC prevents surface erosion from weathering and has twice the abrasion resistance of OPC.

### Conforms To Profile

CC has excellent drape characteristics, allowing the material to conform to the organic profile of the substrate making it more homogeneous with the surrounding environment.

### Plant Not Required

CC can be supplied in man portable rolls eliminating the need for plant on site and allowing for installation in areas with restricted access. Prior to hydration, CC layers can be cut to length using basic hand tools, eliminating wastage.

### Reduced Maintenance

CC acts as an effective weed inhibitor, preventing costly maintenance required for unlined ditches.

### Ageing

Moss can grow on the fibrous top surface of CC resulting in it 'greening over', helping the CC to blend in with its surroundings. CC has a minimum design life of 50 years when installed correctly.

**The following pages contain a collection of case studies highlighting the advantages of using CC for a variety of applications in the road sector.**



## Project Info



11 / 12 / 2013



CC8™ Bulk Rolls



4250sqm



Transverse layers



A465 (Brynmawr),  
Wales, UK



Carillion for the Welsh  
Government



CC8™ used to line  
drainage channels as  
part of a Highways  
Agency road  
widening scheme



A completed section of ditch

In December 2013, Concrete Canvas GCCM\* (CC) was specified for use in lining drainage ditches along a 7.8km stretch of the A465, between Brynmawr and Tredegar in South Wales. The ditches form part of the A465 Dualling Project, which is part of the National Transport Plan, and will contribute to upgrading links to businesses and communities whilst improving safety.

Primarily commissioned by the Welsh Government, the scheme is under Highways Agency management with Carillion appointed as main contractor who subcontracted Walters UK to complete the principle earth works and pre-earthworks drainage. ARUP provided the design detail specifying CC.

8mm thick CC (CC8™) was used to line one main ditch and various smaller ditches on site. The main ditch is approximately 250m in length, 7m in width at the crest of the ditch and 3m wide at the base. 125sqm bulk rolls were deployed using an excavator and spreader beam before being batched to length using hand tools. Subsequent layers were overlapped by 100mm in the direction of the water flow and screwed in place at 150mm intervals. The CC8™ was installed at a rate of approximately 50sqm per day with a 3 man team (two of the crew laying the material and a third fixing it in place).

Prior to specification of CC8™, stone pitching with a paving slab invert was considered as a means of lining the ditch, but this would have resulted in a considerably longer install further delayed by weather conditions. In comparison, **CC8™ provided a significantly faster and easier installation negating any programme disruption due to the weather.**

\*Geosynthetic Cementitious Composite Mat





The ditch was excavated and graded to profile



Plant was used to unroll and place the material



Transverse layers with a 100mm overlap were screwed in place



Hydration of CC8 via bowser and petrol pump



Transverse layers backfilled into the anchor trench along crest



The finished ditch



CC junction



A completed section of ditch



CC accommodating a turn

## Project Info



01 / 08 / 2014



CC8™ Bulk Rolls



145sqm



Longitudinal layers



Karapiro Gully Viaduct,  
Waikato Expressway,  
Cambridge, New Zealand



Hydrock in conjunction  
with HEB Construction  
and NZ Transport Agency



CC8™ used to  
protect and stabilise  
a highway bridge  
batter.



Completed installation

In August 2014, Concrete Canvas® GCCM\* (CC) was used to protect and stabilise a batter underneath the Karapiro Gully Viaduct, Waikato Expressway, Cambridge, New Zealand. The bridge at 200 metres long and 40 metres high required vegetation to be cleared during construction resulting in the batter needing stabilising. Sprayed concrete was considered, but as the site is located in a gully, the limited plant access would have resulted in a much lengthier install. Furthermore the rebound associated with sprayed concrete would have created additional problems.

Installation was carried out by Hydrock in conjunction with HEB Construction for NZ Transport Agency. On the parts of the batter that could be vegetated, a geotextile was laid and hydroseeded. 8mm thick CC (CC8™) was used in conjunction with 12m engineering anchors on the rest of the slope to provide protection and stabilisation. Bulk rolls of CC8™ were delivered to site and dispensed using a digger and a spreader beam, before being cut to length using a disc cutter. Ensuring a 100mm overlap between layers, these lengths were lifted into place by a crane. As the CC8™ was lowered down the slope the soil nails were pushed through and capped, before the overlaps were screwed at 200mm intervals with 25mm screws. Where the CC8™ met the geotextile, the geotextile was lifted up and the CC8™ secured underneath it. The CC was hydrated using a 1000L bowser suspended from the crane and a hose.

**145sqm of CC8™ were installed by 3 people over 6 hours in damp conditions on a near vertical batter.** The site was difficult to access and CC did not require any additional equipment to be brought to site, resulting in large time and cost savings.

\*Geosynthetic Cementitious Composite Mat





Site pre-installation



CC8™ dispensed and cut to length



Engineering anchors pushed through the matting



The joints being screwed



Installation under the geotextile



The finished installation

## Project Info



18 / 11 / 2010



CC8™ Bulk Rolls



125sqm



Transverse layers



M4, Wiltshire, UK



Enterisemouchel



CC8™ was used to line a ditch located adjacent to the M4 that needed to be cleared and repaired.

enterisemouchel



Completed installation

In November 2010, Concrete Canvas GCCM\* (CC) was used to line a ditch located adjacent to the M4 in Wiltshire, UK. The ditch needed to be cleared and was in dire need of repair. Originally a series of pipes and headwalls had been considered however there was concern over pipe blockages and future maintenance issues, so an alternative design was sought. CC provided a solution that prevented erosion, suppressed weed growth and eliminated the maintenance issues associated with blocked pipes. Additionally there was a key requirement to introduce a series of cascades that would reduce the water flow rate. CC enabled simple and cost effective cascades to be constructed using concrete sandbags, over which the CC was easily laid.

The existing concrete ditch was cleared of any debris, such as rocks and vegetation, to ensure intimate contact between CC and the substrate, whilst a new section of ditch was excavated and graded to profile. A small anchor trench was created at each crest, before the cascades were constructed using concrete sandbags located every 3m along the base of the ditch. Bulk rolls of CC8™ were delivered to site and hung from a spreader beam which allowed the CC to be cut to specific profile length, avoiding wastage. The CC was then laid transversely across the ditch with a 100mm overlap between layers. The CC was pegged into the anchor trench through every overlap, but the overlaps themselves were not sealed so as to create weep paths that would prevent the build up of hydrostatic pressure behind the material. Holes were cut into the CC to accommodate inlet pipes and other existing infrastructure. After hydration, the anchor trenches were backfilled to prevent water ingress under the CC.

The project was deemed a success and **the speed and ease of install allowed a 20 linear metre section of ditch to be laid by a team of 3 in just 1 day.**

\*Geosynthetic Cementitious Composite Mat







Concrete sandbag cascades



Bulk roll and spreader beam



Cutting CC to length on site



Pegging into the crest



Completed installation

## Project Info



12 / 05 / 2014



CC8™ Batched Rolls



150sqm



Transverse layers



A66(W) County Durham, UK



A-one+ Integrated Highway Services (Area 14)



CC8™ used to prevent undercutting of the A66 Highway



Completed installation

In May 2014, Concrete Canvas® GCCM\* (CC) was used to line a drainage ditch to prevent erosion underneath the nearby A66 highway. It was not possible to stop or divert the water due to weather conditions so a solution that could be installed in a live water course was paramount. At the top of the ditch there was a termination of a culvert which needed to be accommodated.

Installation was carried out by A-one+ Integrated Highway Services (Area 14). An excavator was used to re-profile the ditch and culvert before 30 batched rolls of CC8™ were delivered to site. The excavator transported the batched rolls to sections of the ditch as required before they were unrolled by hand into position. The CC was laid progressively upstream, and pegged at the edges whilst allowing the live water course to flow under the material. Once the CC had been installed along the length of the ditch, a concrete sandbag header wall was built on top of the last CC layer. This would allow the water from the culvert to flow over the CC as intended. The overlaps were mechanically jointed with screws at 200mm centres; the joints weren't sealed so as to create natural weep paths allowing water ingress into the ditch and preventing the build-up of hydrostatic pressure behind the CC. Post hydration, the anchor trenches along the crest were backfilled to secure the CC in place and to provide a neat finish.

**150sqm of CC8™ were installed by 6 people in 2 days™ during torrential rain and in a live water course.**

*"We were delighted with the results and the job ran smoothly... We found the CC easy to install even in difficult periods of bad weather and with us not being able to stop the flow of water. I would definitely recommend this product and most certainly use it again"*

**Paul Wiles,**

**A-one+ Integrated Highway Services (Area 14) works supervisor**

\*Geosynthetic Cementitious Composite Mat





Site before works began



Grading



Batched CC8™ being unrolled



Allowing the live water course to help hydrate the CC



Concrete sandbag header constructed on top of the CC



The finished project

## Project Info



24 / 01 / 2011



CC8™ Bulk Rolls



250sqm



Transverse layers



M25 Widening, UK



Skanska Balfour Beatty



CC8™ was used as a faster, safer alternative to slabbing



*Aged installation*



*Culvert termination*



*Completed installation*



## Project Info



15 / 07 / 2013



CC5™ Bulk Rolls



1000sqm



Vertical layers



Zipaquirá-Bogotá Highway, Colombia



CC5™ used as an erosion control measure in order to protect Zipaquirá-Bogotá highways from a washout of fines and other debris



Completed slope

In July 2013, Concrete Canvas® GCCM\* (CC) was used as an erosion control measure on a slope adjacent to a section of the Zipaquirá-Bogotá Highway in Chinchilla, Colombia. The slope had suffered from slip and the erosion of fines due to adverse weather in the region, a situation exacerbated by leakage from a water pipe that had been installed across a significant section of the slope. There was potential for falling debris to cause an accident on the highway, or block the cycle path that ran alongside it. Shotcrete had been considered for the project. However, there was a concern that the associated rebound may cause damage to the highway and surrounding infrastructure.

Prior to installation the area affected was cleared of vegetation, loose soil and rock and other debris. Bulk rolls of CC5™ were then delivered to site and cut to length, ensuring that the CC could cater for the slope's varying profile whilst eliminating material wastage. Each length of CC was fixed to the top of the slope using 400mm steel ground pegs before being unrolled down the slope using a spreader beam and climbing equipment. Adjacent lengths of CC were overlapped by 100mm and screwed together at 200mm. Anchor bolts were used to fix the material to the foot of the slope and to the drainage outlet at one end of the slope. The installed CC was then hydrated.

**The 1000sqm installation was completed in 13 days in inclement weather by an installation team of 6.** The client and installation team were **impressed with the ease and speed at which CC was installed**, as well as the material's "consistency and functionality". Feedback provided by the project's head engineer in November 2013 stated that, after two weeks of very heavy rain, the CC was still stable and the slope had not shown any movement or further loss of fines.

\*Geosynthetic Cementitious Composite Mat





The slope prior to installation of CC, displaying signs of slip and erosion



A spreader beam and climbing equipment was used to lay lengths of CC



CC was fixed to the top of the slope using steel ground pegs



Adjacent layers of CC were overlapped by 100mm and screwed together



CC was hydrated using a hose and climbing equipment



Completed section showing CC tailored around existing infrastructure

## Project Info



08 / 08 / 2012



CC8™ Bulk Rolls



1125sqm



3 Longitudinal layers



Junction 12, M1,  
Bedfordshire, UK.



Costain and Carillion  
Joint Venture



CC8™ was used to  
line a ditch to prevent  
seepage and control  
water runoff.



Completed installation

In August 2012, Concrete Canvas® GCCM\* (CC) was used to line a 320 linear metre drainage ditch located at the top of a motorway batter. There were issues regarding seepage and a requirement to control water runoff. The site is located at junction 12 of the M1 in Bedfordshire, UK. CC was specified over traditional concrete solutions due to the speed and ease of install and the site accessibility issues that would have made conventional concreting difficult and time consuming.

Installation was carried out by Costain and Carillion as a joint venture. The ditch was excavated using plant and V bucket combination, and anchor trenches were created on either side of the ditch. Bulk rolls of 8mm thick CC (CC8™) were delivered to site and unrolled using a spreader beam hung from an excavator. The CC was unrolled in 3 longitudinal layers with an overlap of 100mm. The CC was fixed to the substrate with ground pegs at approximately 2m centres along the crest of the ditch. After hydration, the anchor trench was backfilled to prevent water ingress under the CC8™.

*“The project was a success as **the programme, originally scheduled for completion in 3 weeks, was completed in 5 days.** Having used the product on previous projects, I knew the speed and ease of installation would be of great advantage to us.”*

**Dale Flower BSc (Hons)**

**J12 Roadworks Section Engineer, Costain Carillion Joint Venture**

\*Geosynthetic Cementitious Composite Mat





Site prior to works



Graded ditch profile



Deployment of CC via spreader beam



3 layer longitudinal layout



CC pinned in anchor trench which was then backfilled after hydration



Completed installation