CONCRETE CANVAS®

Concrete Impregnated Fabric

1511.EN.CP

MADE IN UK

CONCRETECANVAS

OUTFALL 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

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CONCRETE CANVAS

OUTFALL

Project Info

- 01 / 06 / 2014
- CC5™ Batched Rolls
- 45sqm
- Transverse layers
- Naganohara-town, Gunma-Prefecture, Japan
- Watanabe Kensetsu Co.
- CC5™ used to line an outfall to prevent erosion.

Completed installation

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 CC was installed by Watanabe Kensetsu Co. for the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The outfall was causing large amounts of soil erosion and the 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.

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 5mm thick CC (CC5™) were delivered to side. The CC layers were manoeuvred into place by the labourers, who ensured each layer overlapped the previous by 100mm. Each CC layer was pegged at the crest and the overlaps were screwed at 200mm centres. The edge of each CC layer was folded back underneath itself to provide a neat termination. Hydration was achieved using a hose and bowser combination.

45sqm of CC5™ were installed by 4 people in 3 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

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Ground preparation

Overlapping the CC

Overlapping the CC

Edge treatment

Hydration

The finished project

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Completed CC slope protection installed in under 1 hour

12.01.12 CC Slope Stabilisation Trial, RAK, UAE

Al Jais is a Wadi in the heart of Ras Al Khaimah. In January 2012 the RAK Government began a road-building project to allow tourists to reach the peak of the mountain range.

For this project, the Resident Engineering Company was Halcrow, with GMC as contractors. The key issues for the road was inclement weather; large volumes of rain, which fall in a short period of time and in many cases only once every couple of years, cause erosion of the slopes which in turn fall and block the road or wash parts of it away. Halcrow sought a fast and effective solution for creating gullies on the mountain side to channel the water. Due to the steepness of the slopes conventional methods, such as precast channels or insitu concrete with form work and steel were difficult to implement and added significant time, potential for injuries and increased costs.

Concrete Canvas® GCCM* (CC) offered an innovative, rapid and reliable solution to the problem, reducing risks significantly and decreasing installation time by only needing to be pegged into the slope. The installation team were roped off so they could work on the very steep slopes with safety and relative ease. Minimal heavy plant was needed on site, with a single crane used to lift and position the bulk rolls of CC. Hydration was achieved by pouring water down the gully.

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Graded slope beneath culvert

Batched rolls of CC13™ were used

The uppermost most CC layer was Hilti nailed to the top lip

Subsequent CC layers were screwed together

CC13™ batched rolls being craned into position from road access

5 CC layers were installed in total

CC layer edges were fixed with ground pegs at overlapping joints

Once installed, the CC layers were hydrated from a bowser

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CONCRETE CANVAS

OUTFALL

Project Info

- 09 / 01 / 2013
- CC8™ bulk rolls
- 600sqm
- Transverse layers
- Cannock Wood Minewater Treatment Scheme, UK
- J N Bentley Ltd
- The Coal Authority
- CC was used to line a slope running from a water inlet structure down into a wetlands area, primarily to protect the existing pond liner from UV damage.

Low Temperatures

Completed spillway

In January 2013, Concrete Canvas® GCCM* (CC) was specified to line a slope running from an inlet structure down into a wetlands area in the Cannock Wood Minewater Treatment Scheme in Staffordshire. CC was chosen to protect the existing pond liner from UV damage, providing a viable alternative to a standard geotextile due to its increased durability and speed of installation, and resistance to UV degradation, physical damage and puncture.

CC8™ was installed in transverse layers, starting at the base of the slope, using a Komatsu 210 excavator and spreader beam equipment. The first layer was fixed directly to the existing pond liner using CT1 adhesive, with subsequent layers overlapped by approximately 100mm in the direction of water flow and fixed in the same way. At the top of the slope, CC was fixed to the inlet structure using a combination of CT1 adhesive, hammer screws and a length of GRP batten, helping to prevent water ingress. Hydration was achieved by flooding the weir from an adjacent pond and letting it run over onto the CC.

Installation of 600sqm of CC8™ was completed by a two-man team in two days, despite working in low temperature conditions. Both the installation team and the client were very happy with the installation, citing CC's ease and speed of installation and its increased durability compared to other geotextile solutions.

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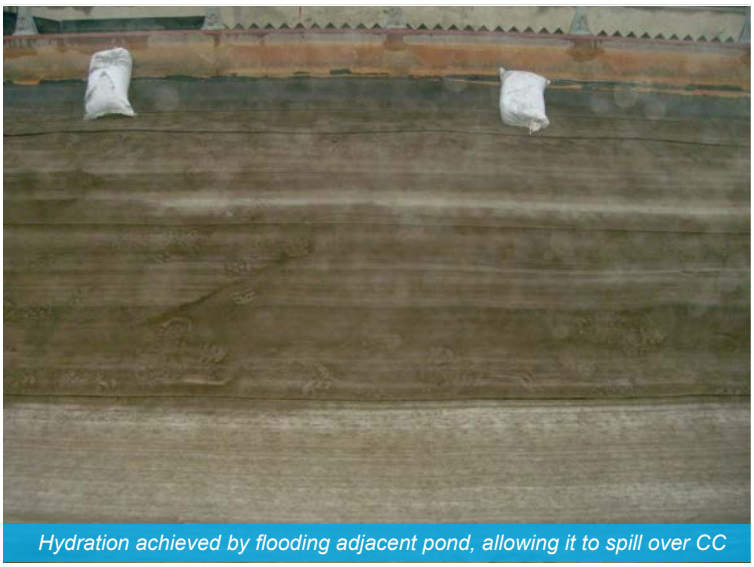
Spillway prior to installation of CC

CC bulk rolls deployed from excavator using spreader beam

First layer of CC cut to length on site and fixed with CT1 adhesive

Adjacent layers of CC overlapped by approx. 100mm and fixed with CT1



Hydration achieved by flooding adjacent pond, allowing it to spill over CC

CC fixed to inlet structure using CT1, hammer screws and GRP batten

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CONCRETE CANVAS

DATA SHEET

Concrete Canvas® GCCM Material Data

Concrete Canvas® GCCM Physical Properties*

Product	Thickness (mm)	Batch Roll Size (sqm)	Bulk Roll Size (sqm)	Roll Width (m)
CC5™	5	10	200	1.0
CC8™	8	5	125	1.1
CC13™	13	N/A	80	1.1

Product	Mass (unset) (kg/m²)	Density (unset) (kg/m³)	Density (set) (kg/m³)
CC5™	7	1500	+30-35%
CC8™	12	1500	+30-35%
CC13™	19	1500	+30-35%

Pre-Set Concrete Canvas® GCCM Properties

Setting

Working Time

1-2 hours subject to ambient temperature

CC will achieve 80% strength at 24 hours after hydration.

Method of Hydration

Spray the fibre surface with water until it feels wet to touch for several minutes after spraying.

Re-spray the CC again after 1 hour if:

- Installing CC5™
- Installing on a steep or vertical surface

Notes:

- An excess of water is always recommended. CC will set underwater and in seawater.
- CC must be actively hydrated. For example do not rely on rainfall or snowmelt.
- Use a spray nozzle for the best results (see CC equipment list). Do not jet high pressure water directly onto the CC as this may wash a channel in the unset CC.
- CC has a working time of 1-2 hours after hydration. Do not move or traffic CC once it has begun to set.
- Working time will be reduced in hot climates and increased in very cold climates.
- CC will set hard in 24 hours but will continue to gain strength over time.
- If CC is not sufficiently wetted, or dries out in the first 5 hours, the set may be delayed and strength reduced. If the set is delayed avoid trafficking the material and re-wet with an excess of water.

Refer to the *Concrete Canvas Hydration Guide* for installation in low temperatures or drying conditions.

- Low Temperature Conditions occur the ground surface temperature is between 0 and 5°C and rising or is expected to fall below 0°C in the 8 hours following hydration.
- Drying Conditions occur when there is one or more of: high air temperature (>22°C), wind (> 12km/h), strong direct sunlight or low humidity (<70%).

Post Set Concrete Canvas® GCCM Properties

Based on Concrete Canvas GCCM ® hydrated in accordance with the Concrete Canvas® Hydration Guide.

Strength

Very high early strength is a fundamental characteristic of CC. Typical strengths and characteristics are as follows:

Compressive tests based on ASTM C109 – 02 (initial crack)
- 10 day compressive failure stress (MPa) 40

Bending tests based on BS EN 12467:2004 (initial crack)
- 10 day bending failure stress (MPa) 3.4

Tensile data (initial crack)

	Length direction (kN/m)	Width direction (kN/m)
CC5™	6.7	3.8
CC8™	8.6	6.6
CC13™	19.5	12.8

Reaction to Fire

CC has achieved **Euroclass B certification**:
BS EN 13501-1:2007+A1:2009 B-s1, d0

Flame Resistance: **MSHA ASTP-5011**
Vertical and Horizontal Certification Passed

Age Testing (minimum 50 year expected life)

Freeze-Thaw testing (ASTM C1185) 200 Cycles
Freeze-Thaw testing (BS EN 12467:2004 part 7.4.1) Passed
Soak-Dry testing (BS EN 12467:2004 part 5.5.5) Passed
Heat-Rain testing (BS EN 12467:2004 part 7.4.2) Passed
Water impermeability (BS EN 12467:2004 part 5.4.4) Passed**

Other

Abrasion Resistance (ASTM C-1353)
Approximately 7.5x greater than 17MPa OPC Passed

Manning's Value (ASTM D6460) n = 0.011

Root Resistance (DD CEN/TS 14416:2005) Passed

Chemical Resistance (BS EN 14414)
- Acid (pH 1.0) (56 day immersion at 50°C) Passed
- Alkaline (pH 13.0) (56 day immersion at 50°C) Passed
- Hydrocarbon (56 day immersion at 50°C) Passed
- Sulfate Resistance (28 day immersion at pH 7.2) Passed

Impact Resistance of Pipeline Coatings
ASTM G13 (CC13™ only) Passed

Permissible Shear & Velocity CC8™ (ASTM D-6460)
- Shear (Pa) 1200
- Velocity (m/s) 10.7

Product exceeded large scale testing capabilities and was not tested to failure.

To achieve these permissible values, the CC material must be properly anchored with a system designed to meet or exceed these values.

Other Information

* Occasionally there will be a Beam Fault (fabric imperfection under 100mm wide running across the width) in a Bulk Roll. This fault is unavoidable due to the manufacturing process and the fault will be clearly marked with a white tag, there will be a maximum of (1) one Beam Fault in any Bulk Roll. A joint may need to be made on site where there is a Beam Fault as the material at a fault will not reach the performance specified in this Data Sheet. The maximum un-useable material due to any Beam Fault will be 100mm. There are no beam faults in standard batched rolls.

* Indicative values

** For containment applications it is recommended to use CC Hydro™

CE
Concrete Canvas Ltd.
CF37 5SP, United Kingdom
11
EN12467:2004
Concrete Canvas:
Fibre cement sheet
NT
Oversize sheets
Class 1, Category A
Reaction to Fire B-s1,d0

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