



CONCRETE CANVAS

USER GUIDE: GENERAL



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 part of a revolutionary new class of construction materials called Geosynthetic Cementitious Composite Mats (GCCMs). 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. The following guide provides useful information for installers, customers and specifiers of Concrete Canvas® GCCM (CC) and provides an overview of technical data, applications and properties of the material. The versatile nature of CC means that this document is not exhaustive and is intended for guidance purposes only.

Specification

Concrete Canvas® GCCM Types

CC is available in the following thicknesses and roll formats:

CC Type	Thickness (mm)	Roll Width (m)	Dry Weight (kg/sqm)	Batched Roll Coverage (sqm)	Batched Roll Length (m)	Bulk Roll Coverage (sqm)	Bulk Roll Length (m)
CC5™	5	1.0	7	10	10	200	200
CC8™	8	1.1	12	5	4.55	125	114
CC13™	13	1.1	19	N/A	N/A	80	73

Bulk Rolls / Batched Rolls

CC is available in two formats (roll sizes); bulk rolls or smaller, man portable batched rolls. The quantity per roll differs between the CC thicknesses as shown in the table above.

Bulk rolls weigh between 1.5T and 1.6T and are supplied on 6 inch cardboard cores which can be hung from a spreader beam and unrolled using suitable plant equipment (see right). Bulk rolls provide the fastest method of laying CC and have the additional advantage of reducing the number of joints required. Contact Concrete Canvas® Ltd for spreader beam hire.

Batched rolls are supplied on 3 inch cardboard cores with carry handles designed as a 2 to 4 man lift. All CC thicknesses can be supplied batched to custom lengths for a small additional charge.



Packaging / Transportation

CC bulk rolls are individually wrapped and palletised on heat treated wooden pallets measuring 1.2m x 1.0m. CC batched rolls are similarly supplied, individually wrapped in airtight PE packaging and palletised. 10 batched rolls fit onto a standard 1.2m x 1.0m pallet. All CC rolls are provided with a basic hydration guide in English.

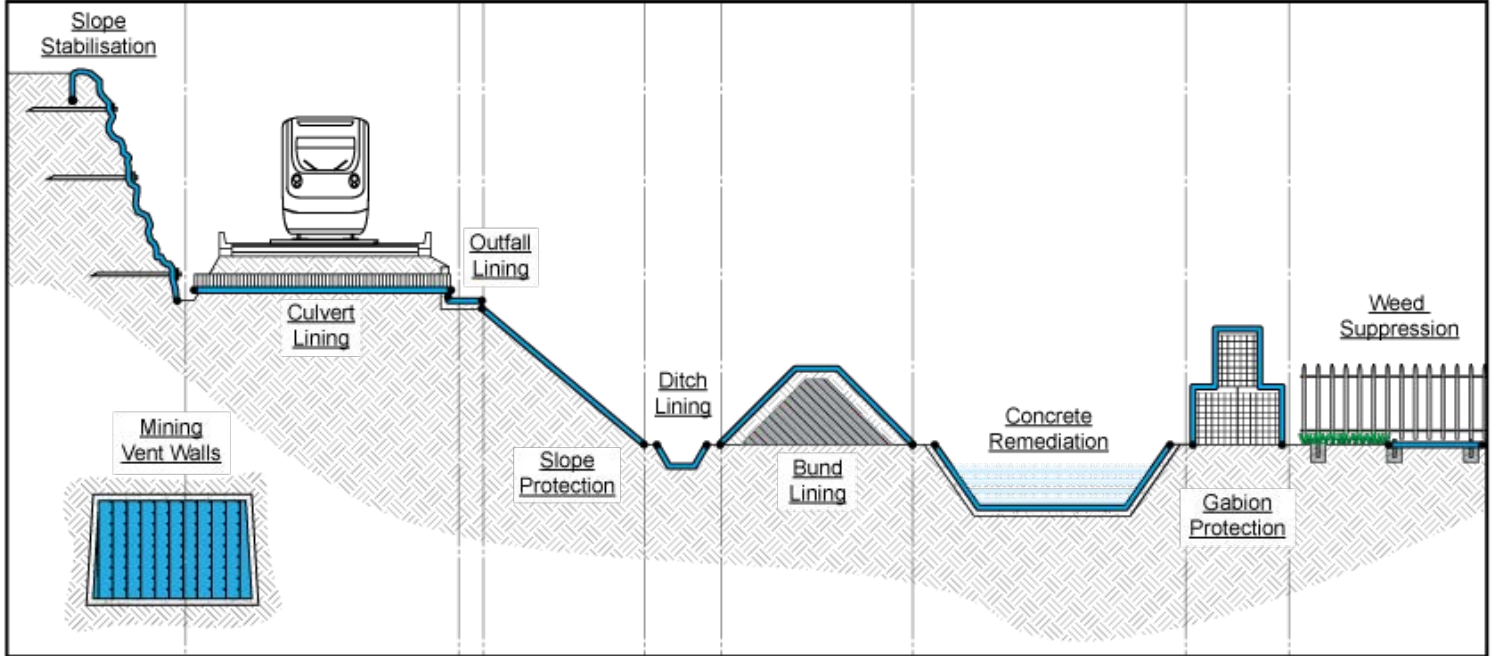
Typical container stuffing quantities are shown below, for full details of packing weights and dimensions please refer to the CC Shipping Information document.

	20ft Container*			40ft Container*		
	No. of Pallets	Qty (sqm)	Gross Weight (T)	No of Pallets	Qty (sqm)	Gross Weight (T)
Batched Rolls						
CC5™	10	1000	8.1	20	2000	16.2
CC8™	10	500	6.2	20	1000	12.4
CC13™	N/A	N/A	N/A	N/A	N/A	N/A
Bulk Rolls						
CC5™	8	1600	12.4	16	3200	24.8
CC8™	10	1250	15.5	16	2000	24.8
CC13™	10	800	15.5	16	1280	24.8

* Please check destination country transportation restrictions as container weight limits may vary.

Applications

CC is typically used to replace conventional concrete (in-situ, precast or sprayed) for erosion control, remediation and construction applications. Some typical examples are given below:



Ditch Lining

CC can be used to provide a hard wearing erosion control surface for lining ditches for drainage and irrigation. CC is typically used as an alternative to conventional concrete drainage and where vegetated or earth lined ditches are unsuitable due to high flow rates, containment requirements or the need to reduce maintenance. For full details of how to line a ditch with CC please see the *CC Installation Guide: Ditch Lining*.



Slope Protection

CC can be used to provide a hard wearing erosion control surface to protect slopes from environmental degradation. CC is typically used to replace shotcrete and where vegetated slopes are unsuitable due to ground water, arid climate or poor soil conditions. For full details of how to line a slope with CC and how to use CC for structural slope stabilisation please see the *CC Installation Guide: Slope Protection*.



Bund Lining

CC can be used to provide hard armour capping of secondary containment bunds around petrochemical tank farms, munitions depots and flood defences. CC is typically used to protect the bund from environmental degradation, animal damage, improve impermeability and prevent weed growth. For full details of how to line a bund with CC please see the *CC Installation Guide: Bund Lining*.



Concrete Remediation

CC can be used to reline concrete infrastructure which has become cracked and damaged and requires remediation. CC is used to extend the life of existing infrastructure, reduce leakage and improve flow characteristics. CC can be used as an alternative to rebuilding or where lining with a flexible membrane is unsuitable due to the flow conditions or durability concerns.

Culvert Lining

CC can be used to reline steel and concrete culverts which have degraded due to scour and corrosion. CC is used to extend the life of culverts and provide a hard wearing erosion control layer with improved impermeability and flow characteristics. CC can be used as an alternative to relining with bitumen, GRP, polyurethane or sprayed concrete.

Weed Suppression

CC can be used to provide long-term weed growth prevention in areas where maintenance is difficult such as around sensitive infrastructure or in remote locations. CC is typically used as a replacement for precast concrete slabs and where conventional geotextiles do not provide sufficient durability.

Outfalls / Spillways

CC can be used to protect surfaces located in high flow areas which are prone to erosion such as underneath culvert outlets, spillway surfaces and over-toppings. CC is typically used to replace conventional concrete solutions and is applied in the same manner as CC slope protection. Thickness selection should be made based on the maximum expected flow rate.

Gabion Protection

CC can be used to cover steel basket and geotextile gabions to prevent damage from corrosion, UV damage and vandalism. CC significantly extends the life of gabions providing a hard wearing surface that will last for decades. CC can also be used to cap earth filled gabions to prevent FOD (foreign object damage) in military applications and prevent water ingress which can lead to slump.

Mining Vent Walls

CC can be used to construct walls in underground mines to create ventilation stoppages and blast walls. CC typically replaces walls constructed using brattice cloth, breeze-blocks or plaster board where it provides a long-term solution that is fast to erect with a small logistical footprint.



Selection Guide

Application	CC5™	CC8™	CC13™	Comment
Ditch Lining	○	●	○	Recommend CC8™ unless either of the following conditions apply: Use CC5™ if relining existing concrete channels, hard substrates such as rock, or for temporary works. Use CC13™ if flow speeds are in excess of 8.6m/s, the ground will be trafficked or is particularly unstable or steep.
Slope Protection	●	○		Recommend CC5™. CC8™ may be used on unstable ground or for high flow conditions.
Bund Lining	●	○	○	Recommend CC5™. CC8™ or CC13™ may be used for areas of heavy traffic.
Concrete Remediation	●	○	○	Recommend CC5™ CC8™ or CC13™ may be used where voids are large or end use involves high flow rates or turbulent flow.
Culvert Lining	○	●	○	Recommend CC8™. CC13™ may be used for flows with high levels of debris or high flow conditions. CC5™ may be used for low flow conditions and low levels of debris.
Weed Suppression	●			Recommend CC5™.
Outfalls/Spillways		●	○	Recommend CC8™. CC13™ may be used for outfalls with a high level of debris or with high flow conditions.
Gabion Protection	●	●	○	Recommend CC5™ or CC8™. CC13™ may be used for applications with high flow conditions or prone to impacts.
Mining Vent/Blast Walls	●	●	○	Recommend CC5™ for vent wall applications. Recommend CC8™ for walls exposed to blast, depending on pressure loading

Properties

Water Impermeability

CC has excellent waterproof properties and offers a level of impermeability similar to clay. In geotechnical terms this is measured using a 'coefficient of permeability' value, k , which represents the rate of water flow through a unit area of material. CC has been tested to BS1377, the test samples had an impermeability of greater than $k = 1 \times 10^{-8}$ m/s with an average of $k = 1 \times 10^{-9}$ m/s which for practical purposes is classified as 'impervious' (see table below)*. In order to select a joint with an impermeability level suited to your applications please see the *CC User Guide: Jointing and Fixing*.



														CC	
k (m/s)	10 ⁰ =1	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	10 ⁻⁶	10 ⁻⁷	10 ⁻⁸	10 ⁻⁹	10 ⁻¹⁰	10 ⁻¹¹	10 ⁻¹²		
k (ft/day)	10 ⁵	10,000	1,000	100	10	1	0.1	0.01	0.001	0.0001	10 ⁻⁵	10 ⁻⁶	10 ⁻⁷		
Relative Permeability	Pervious				Semi-Pervious				Impervious						
Aquifer	Good				Poor						None				
Unconsolidated Sand and Gravel	Well Sorted Gravel		Well Sorted Sand or Sand and Gravel		Very Fine Sand, Silt, Loess, Foam										
Unconsolidated Clay and Organic					Peat		Layered Clay				Fat / Unweathered Clay				
Consolidated Rocks	Highly Fractured Rocks				Oil Reservoir Rocks			Fresh Sandstone		Fresh Sandstone, Dolomite		Fresh Granite			

* Impermeability values obtained from testing are indicative and values obtained in field use may vary from those obtained in lab conditions. For containment applications it is recommended to use CC as a protective overlay in combination with an appropriate sealed membrane liner. CC is not recommended as the sole barrier layer where impermeability is critical.

CC Properties

Durability

CC has excellent long term durability with approximately twice the abrasion resistance of most OPC (Ordinary Portland Cement) based concretes (ref DIN 52108). Accelerated age testing based on BS EN 12467 has shown that CC has a minimum life of 50 years in a UK climate. This is based on freeze-thaw, heat-rain and soak-dry cyclic testing during which time CC showed minimal degradation. The reinforcing fibres within CC mean it has excellent low-temperature performance and CC has also achieved over 200 cycles of freeze-thaw testing to ASTM C1185.

Environmental

CC offers many environmental benefits over conventional concrete, typically substituting for 100-150mm of poured concrete for surfacing applications, reducing the carbon footprint of construction works. The cement used within CC has a limited alkaline reserve, which means unlike most concretes it is not classified as an irritant and is less damaging to aquatic life (see the CC *MSDS*). CC has a very low wash-out rate, an analysis by CTL laboratories in the US showed that leachate levels were safely below the EPA (Environmental Protection Agency) limits (see the CC *Environmental Testing* report). CC can even be installed in live water courses. CC has been assessed and approved for use by the UK Environment Agency on a number of UK projects.

Fire

CC has excellent high temperature performance and can be used as a fire protection layer for certain applications. CC has been subjected to Reaction to Fire testing and has achieved Euroclass B certification to BS EN 13501 (see the CC *Fire Certification* document). CC has also been approved by the US Mine Safety and Health Administration (MSHA) to 30CFR, Part 7, subchapter B, Section 7.24. For further information on the performance of CC for a fire protection application please contact Concrete Canvas® Ltd.

Chemical

CC has excellent resistance to chemical attack and is generally much more resistant to aggressive compounds than conventional OPC based concretes. CC has been successfully tested by 56 day immersion in acid down to pH 4.0 and alkaline up to 12.5 with no loss of strength, (see the CC *Chemical Testing* document). CC also has excellent resistance to sulphates, sulphated water, ground and sea water, and has good resistance to many compounds that attack OPC including; sewage water, chlorides, tanning oils, vegetable oils and most mineral salts.

