CONCRETE CANVAS®

Concrete on a Roll

2212.01.EN

MADE IN UK

CCX™

Innovation on a Roll

The Queen's Awards for Enterprise: International Trade 2019

Board of Trade Winner 2018

Winner Technical Innovation Award

ice award winner 2017
ICE Wales Cymru Project Awards

Innovation Award ICE Wales Cymru Awards 2017

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CCX™
Innovation on a Roll

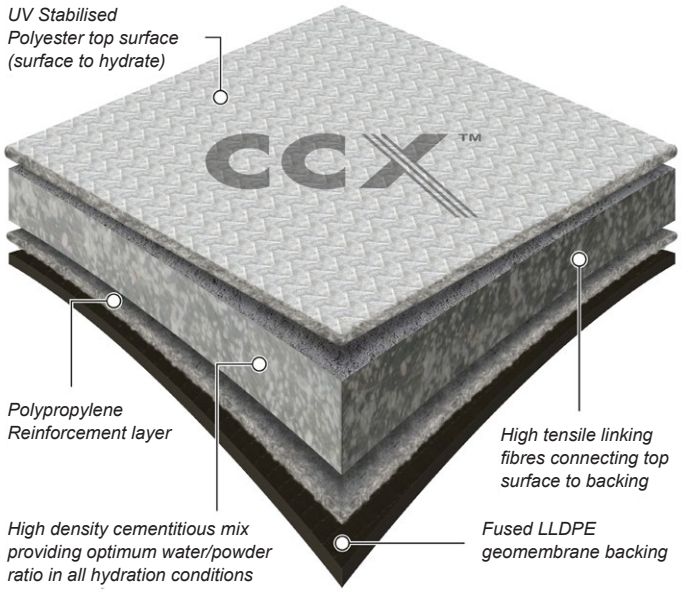
CCX™ GCCM/B

What is it?

CCX™ is part of a revolutionary class of construction materials called Geosynthetic Cementitious Composite Mats and Barriers (GCCM/Bs). It is a flexible, concrete filled geosynthetic, that hardens on hydration to form a thin, durable, water proof concrete layer. Essentially, it's *Concrete on a Roll™*. CCX™ allows concrete installation without the need for plant or mixing equipment while also reducing vehicle movements and contractor burden. Simply unroll and just add water.

CCX™ consists of two interconnected layers of geotextile that encapsulate a specially formulated dry concrete mix. An LLDPE geomembrane backing ensures the material has very low permeability. CCX™ can be hydrated either by spraying or by being fully immersed in water. There are two variants of CCX™: CCX-MAT™ (CCX-M™) for erosion control applications & CCX-BARRIER™ (CCX-B™) for containment critical applications (Coming Soon). **CCX™ products exceed the minimum requirements of ASTM D8364 - Standard Specification for GCCM Materials.**

CCX™ Cross Section



Benefits of CCX™ as a Bulk Water Infrastructure Liner

Rapid Installation

The speed of installation and high early strength gain means that infrastructure down-time is minimised. In critical infrastructure, where maintenance shut-down periods are fixed, this allows for much greater areas to be lined or repaired.

Reduced Seepage

Over time conventional concrete liners can suffer from widespread cracking due to differential ground movement, leading to significant seepage losses, undermining and, in the worst instances, complete channel collapse. CCX™ can accommodate a high level of differential ground movement due to the fibre reinforcement imbedded within the its structure. This prevents crack propagation whilst retaining low levels of permeability.

Composite Solution

CCX™ combines the low permeability of a geomembrane with the protection and durability of concrete. CCX™ can be installed as rapidly as conventional geosynthetics and 24 hours from hydration will cure to create a hard-wearing concrete liner which is ready to use.

Low Logistical Footprint

CCX™ has an un-hydrated unit weight of 14.5-15.5kg/m^2 compared to ~220kg/m^2 for 10cm of cured concrete. This means it is typically more than 10x more efficient in terms of the logistical footprint, requiring fewer trucks and reducing operational overheads.

Properties of CCX™

High Impermeability

CCX™ has an LLDPE geomembrane backing ensuring the material has very low permeability, significantly reducing or eliminating seepage losses.

Durable

CCX™ has a high degree of durability with abrasion resistance more than 3.5 times that of standard OPC concrete.

Long-Term Performance

CCX™ has very good long-term performance with a life expectancy in excess of 50 years.

Lower Carbon

CCX™ is a carbon efficient concrete solution that offers significant embodied carbon reduction compared to conventional concrete linings.

A CCX™ Irrigation Canal Installation

A CCX™ Bulk Water Infrastructure Remediation Installation

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CCX™ GCCM/B Applications

Bulk Water Infrastructure Lining & Remediation

CCX™ can be rapidly unrolled to line earth canals as well as remediating existing concrete bulk water infrastructure. It is significantly faster, easier and more cost effective to install than conventional lining methods.

The LLDPE geomembrane backing to CCX™ ensures the material has very low permeability. The composite concrete top cover provides a high degree of long-term durability.

As a result, CCX™ is the ideal solution for the lining and remediation of channels and irrigation canals, increasing their operational life and reducing water seepage losses.

1

Deploying Bulk Roll of CCX™

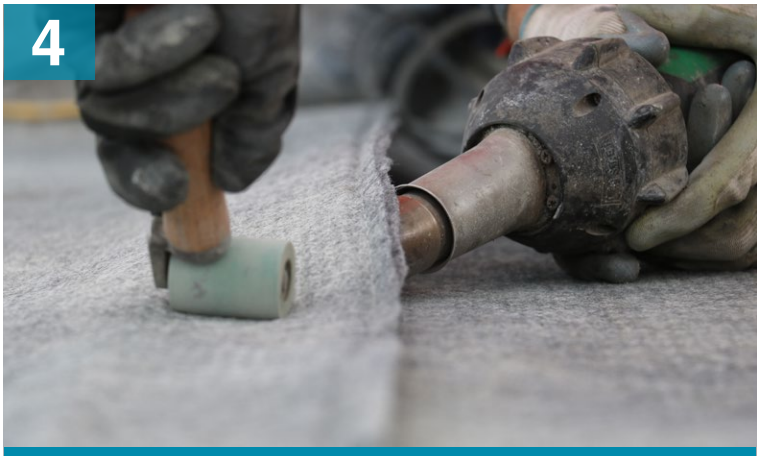
2

Pegging CCX™ within anchor trenches

3

Thermal welding of CCX-B™ LLDPE backing

4



Thermally bonding overlapping layers of CCX™

5

Hydration of CCX™

6

Backfilling anchor trenches to prevent ingress

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CCX™ Innovation on a Roll

DATA SHEET

CCX™ Properties — 2203.01.EN

Pre-set (Uncured)	Test Method	Unit	Typical Values	
			CCX-M™	CCX-B™
ASTM D8364 'Standard Specification for GCCM Materials' Classification				
GCCM/B Classification	ASTM D8364	Type	II	II
Dimensions				
Total Thickness	BS EN 1849-2	mm	10.3	11
Membrane Thickness		mm	0.3	1.0
Roll Sizes - W x L*		m	1.90 x 50	1.90 x 50
Area of CCX™ per Roll		m^2	95	95
Physical Properties				
Mass per Unit Area	BS EN 1849-2	kg/m^2	14.5 - 15.5	
Density	BS EN 1849-2	kg/m^3	1500-1600	
Density Increase on Curing		% Increase	20-25	
Peel Strength - strength of internal linking fibres (MD**)	BS EN ISO 13426-2	kN/m	>4.0	
Other Properties				
Working Time from Hydration - refer to the CCX™ Hydration Guide		Minutes	<30	

Post-set (Cured) - at 28 Days from Hydration Unless Specified (Hydrated by full immersion in accordance with ASTM D8030)	Test Method	Unit	Typical Values	
			CCX-M™	CCX-B™
Mechanical Performance				
Compressive Strength of Cementitious Mix (water/cementitious materials ratio to ASTM D8329)	ASTM D8329	MPa	>70	
Flexural Strength - at 24 Hours from Hydration (MD**)				
- Initial Breaking Load	ASTM D8058	N/m	>2500	
- Initial Flexural Strength	ASTM D8058	MPa	>4.0	
- Final Flexural Strength	ASTM D8058	MPa	>10	
Dynamic Puncture Resistance (depth of perforation)	BS EN ISO 13433	mm	0***	
Pyramid Puncture Resistance	BS EN ISO 14574	kN	>15	
Differential Ground Movement (strain to exposure of geomembrane)		%	<10	
Environmental Durability				
Freeze - Thaw Resistance - retained Initial Flexural Strength after 100 cycles (MD**)	BS EN 12467	%	100	
Weathering (UV) Resistance - retained Initial Flexural Strength (MD**)	BS EN 12224	%	90	
Microbiological Resistance - retained Initial Flexural Strength (MD**)	BS EN 12225	%	87	
Chemical Resistance - retained Initial Flexural Strength (MD**)				
- Method A - Acid - 10% solution H_2SO_4	BS EN 14414	%	N/A	38
- Method B - Alkaline - saturated suspension $Ca(OH)_2$	BS EN 14414	%	N/A	100
- Method C - Solvation & Swelling - 35% vol diesel, 35% vol paraffin, 30% vol lubricating oil HD30	BS EN 14414	%	N/A	83
- Method D - Synthetic Leachate	BS EN 14414	%	N/A	100
Root Resistance	DD CEN/TS 14416	-	Passed	
Hydraulic Performance				
Abrasion Resistance - cementitious barrier depth of wear	ASTM C1353	mm/1000 Cycles	<0.2	
Manning's Roughness Coefficient - refer to CCX™ Manning's test report	ASTM D6460	n	0.010-0.015	
Impermeability - Geomembrane Barrier				
Water Permeability	BS EN 14150	m/s	N/A	6×10^{-12}
Gas Permeability	ASTM D1434	$\frac{cm^3.cm}{cm^2.s.Pa}$	N/A	5×10^{-13}

*CCX™ Rolls are supplied by area so the listed length and width dimensions are typical values and tolerances are typically +5%/-2.5% . ** Machine direction. ***Probe did not make a full penetration through the product, therefore the depth of penetration is zero.

Information is provided based on current test data and may be subject to change as new information becomes available. The versatile nature of CCX™ means that all application conditions cannot be anticipated. Concrete Canvas Ltd makes no warranties and assumes no liability in connection with this information. Project specific testing may be required to determine the suitability for CCX™ material use in a particular application.

ISO 9001 CERTIFIED

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