CONCRETE CANVAS®
*Concrete on a Roll*

2605.01.EN
MADE IN UK




CCX®
*Innovation on a Roll*

# CCX-UTILITY®
# CCX-MAT®

The King's Award for Enterprise: International Trade 2024

Innovation, Science and Technology Winner 2024

Department for Business & Trade Winner 2023

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RAIL ROAD MINING PETROCHEM AGRO PUBLIC WORKS UTILITIES DEFENCE DESIGN SHELTER

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CCX®
Innovation on a Roll

## CCX® GCCMs

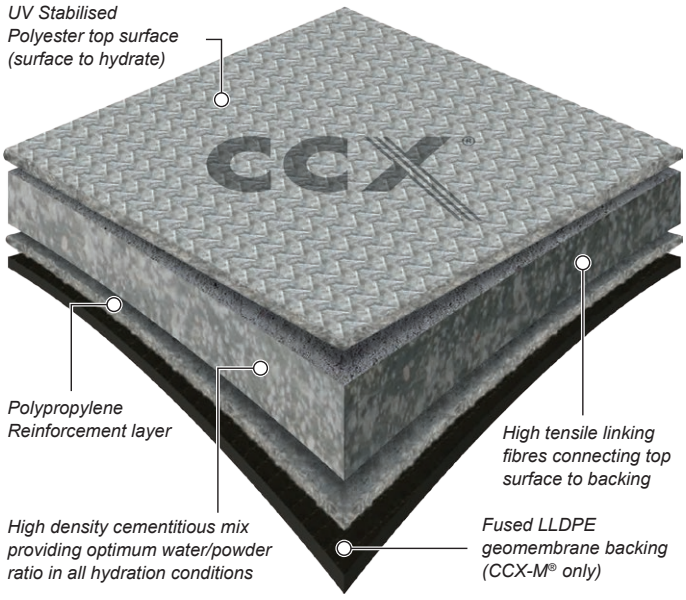
### What is it?

CCX® is part of a revolutionary class of construction materials called Geosynthetic Cementitious Composite Mats (GCCMs). It is a flexible, concrete filled geosynthetic, that hardens on hydration to form a thin, durable, concrete layer used for lining of uniformly graded channel and slope profiles. 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.

There are two variants of CCX®: CCX-UTILITY® (CCX-U®), for armouring applications and CCX-MAT® (CCX-M®) for erosion control applications.

**Both CCX® products exceed the minimum Type II GCCM requirements of ASTM D8364 - Standard Specification for GCCM Materials.**

### CCX® Cross Section




## Benefits of CCX-M® for Erosion Control

### 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-M® can accommodate a high level of differential ground movement due to the fibre reinforcement imbedded within its structure. This limits crack propagation whilst retaining low levels of permeability.

### Composite Solution

CCX-M® combines the low permeability of a geomembrane with the protection and durability of concrete. CCX-M® 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-M® 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-M®

### Low Permeability

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

### Durable

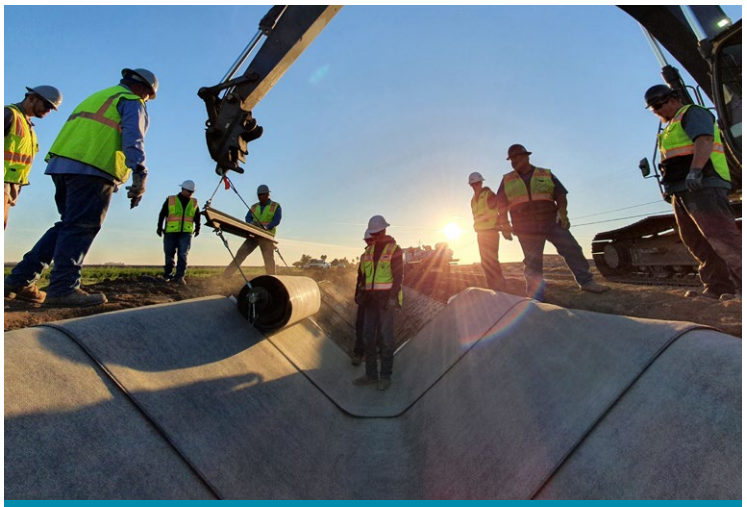
CCX-M® has a high degree of durability with abrasion resistance more than 3.5 times that of standard OPC concrete.

### Long-Term Performance

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

### Lower Carbon

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



*Unrolling of CCX-M® into an irrigation canal*



*CCX-M® hydration taking place*

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Innovation on a Roll

## CCX® GCCM Applications

### Bulk Water Infrastructure Lining & Remediation

CCX-M® 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-M® ensures the material has very low permeability. The composite concrete top cover provides a high degree of long-term durability. As a result, CCX-M® is the ideal solution for the lining and remediation of channels and irrigation canals, increasing their operational life and reducing water seepage losses.

### Slope Protection

CCX-U® is a variant of CCX® without an LLDPE backing. Whilst unsuitable for hydraulic applications such as channels, it may be used to line uniformly profiled slopes to counteract wind and rain erosion - see below.

### Irrigation

CCX-M® can be rapidly unrolled to line uniformly profiled irrigation canals. Joints can be thermally bond or sealed with an adhesive then fixed with screws, to provide a low permeability lining solution.

view video



### Drainage

CCX-M® can be rapidly unrolled to line a uniformly profiled channel. It is significantly faster, easier and less expensive to install than conventional concrete lined channels.

read case study



### Slope Protection

CCX-M® can be rapidly unrolled to line uniformly profiled slopes. CCX-U® may be used as an alternative to CCX-M® where erosion protection is required to counteract wind or rain acting directly on the slope only, or to armour the side slopes of geomembrane lined lagoons.

view video




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CCX® Innovation on a Roll

# DATA SHEET

## CCX® Properties 2605.01.EN

| Pre-set (Uncured) | Test Method | Unit | Typical Values | |
|---|---|---|---|---|
| | | | CCX-U® | CCX-M® |
| **ASTM D8364 'Standard Specification for GCCM Materials' Classification** | | | | |
| **GCCM Classification** | ASTM D8364 | Type | II | II |
| **Dimensions** | | | | |
| **Total Thickness** | BS EN 1849-2 | mm | 10 | 10.3 |
| **Membrane Thickness** | BS EN 1849-2 | mm | N/A | 0.3 |
| **Roll Sizes - W x L**** | * | m | 1.95 x 50 | 1.90 x 50 |
| **Area of CCX® per Roll** | * | $m^2$ | 97.5 | 95 |
| **Physical Properties** | | | | |
| **Mass per Unit Area** | BS EN 1849-2 | $kg/m^2$ | 13.5 - 15.5 | 14.0 - 15.5 |
| **Density** | BS EN 1849-2 | $kg/m^3$ | 1400-1600 | |
| **Density Increase on Curing** | * | % Increase | 20-25 | |
| **Other Properties** | | | | |
| **Working Time from Hydration** - refer to the CCX® Hydration Guide | * | Minutes | <30 | |

| Post-set (Cured) - at 28 Days from Hydration Unless Specified<br>(Hydrated by full immersion in accordance with ASTM D8030) | Test Method | Unit | Typical Values | |
|---|---|---|---|---|
| | | | CCX-U® | CCX-M® |
| **Mechanical Performance** | | | | |
| **Compressive Strength of Cementitious Mix** (water/cementitious materials ratio to ASTM D8329) | ASTM D8329 | MPa | 60 | 70 |
| **Flexural Strength** - at 24 Hours from Hydration | | | | |
| - Initial Breaking Load | ASTM D8058 | N/m | 2500 | |
| - Initial Flexural Strength | ASTM D8058 | MPa | 4 | |
| - Final Flexural Strength (MD/CD) | ASTM D8058 | MPa | 6 / 4.5 | 10 / 6 |
| **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) | * | % | N/A | >10 |
| **Environmental Durability** | | | | |
| **Freeze - Thaw Resistance** - retained Initial Flexural Strength after 100 cycles | BS EN 12467 | % | 100 | |
| **Weathering (UV) Resistance** - retained Initial Flexural Strength | BS EN 12224 | % | 90 | |
| **Microbiological Resistance** - retained Initial Flexural Strength | BS EN 12225 | % | 85 | |
| **Permissible Long Term pH Immersion Range** | * | pH | 6-9 | |
| **Root Resistance** | DD CEN/TS 14416 | - | Passed | |
| **Hydraulic Performance** | | | | |
| **Abrasion Resistance** - cementitious barrier depth of wear | ASTM C1353 / D8364 | mm/1000 Cycles | 0.2 | |
| **Manning's Roughness Coefficient** - refer to CCX® Manning's test report | ASTM D6460 | n | 0.010-0.015 | |

The above values are typical and provide an indication of product performance based on testing by BICS Laboratories Ltd or TRI Environmental. Values marked with an asterisk (*) are based on Concrete Canvas Ltd laboratories internal assessments and testing. For design values, contact Concrete Canvas Ltd. **CCX® Rolls are supplied by area so the listed length and width dimensions are typical values and tolerances are typically +5%/-2.5% . ***Probe did not make a full penetration through the product, therefore the depth of penetration is zero.

The primary function of the geosynthetic top surface is to constrain the cementitious material fill during installation. The top surface geosynthetic may degrade in high UV exposure or abrasive conditions, but the CCX® material will continue to provide its in-service armouring and erosion control functions as these functions are provided by the cured cementitious material and bottom geosynthetic layer(s). 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.

Further Info

CCX® DoP

Sustainability

British Assessment Bureau UKAS MANAGEMENT SYSTEMS 8289 ISO 14001 ENVIRONMENTAL MANAGEMENT

British Assessment Bureau UKAS MANAGEMENT SYSTEMS 8289 ISO 9001 QUALITY MANAGEMENT

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