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# CONCRETE CANVAS<sup>®</sup>

*Concrete Impregnated Fabric*

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RAIL



ROAD



MINING



PETROCHEM



AGRO



UTILITIES



PUBLIC WORKS



DEFENCE



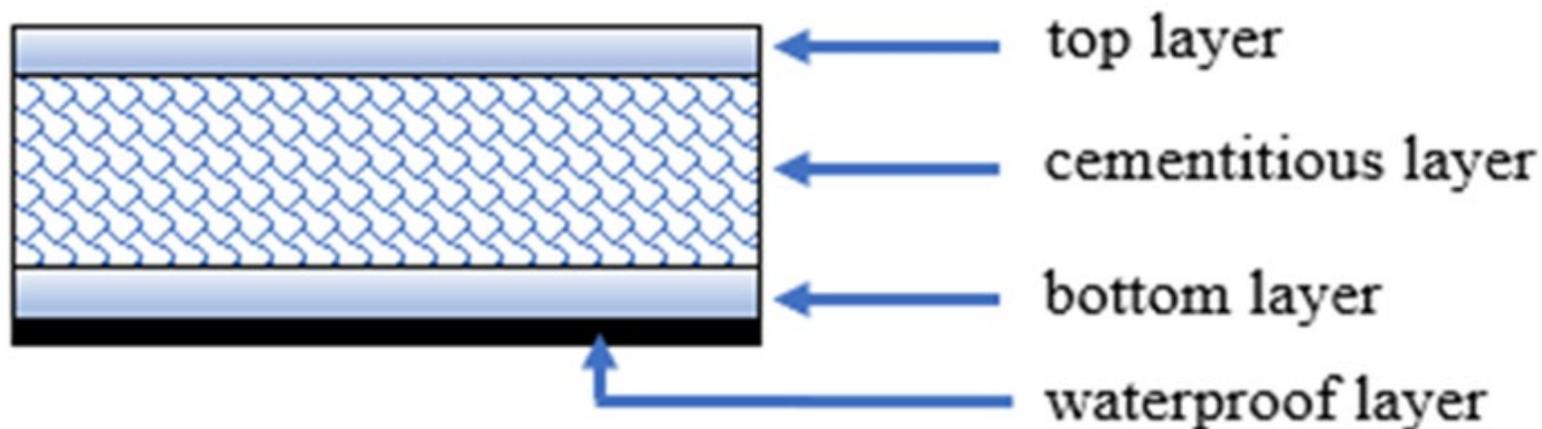
DESIGN



SHELTER



ASTM D8058 - (Terminology 3.2.7) defines Geosynthetic Cementitious Composite Mat (GCCM) as 'a **factory-assembled** geosynthetic composite consisting of a **cementitious layer** contained within a layer or layers of geosynthetic materials that becomes **hardened** when **hydrated**'.





## How does it work?

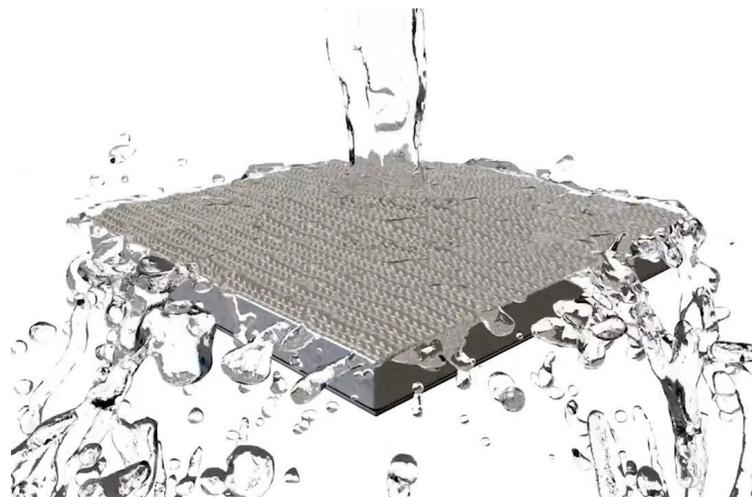
Soft & Flexible



Add Water

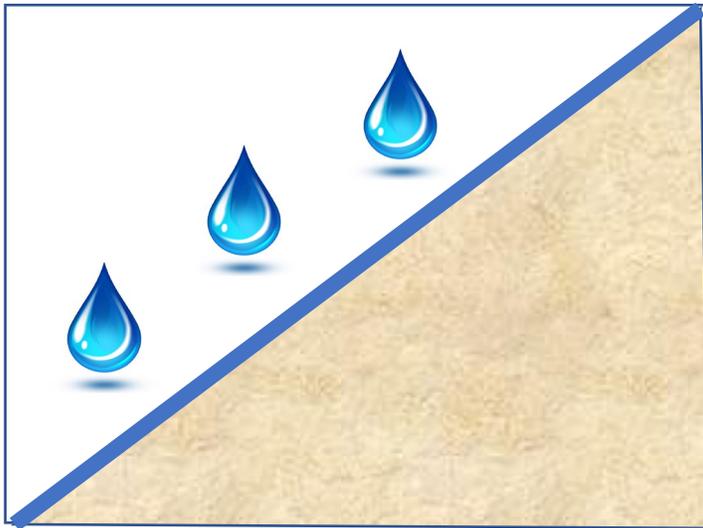


Harden





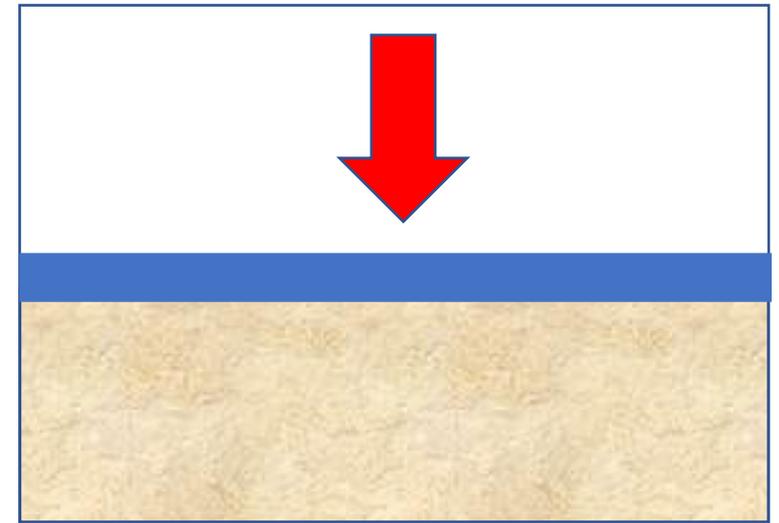
Erosion control



Containment

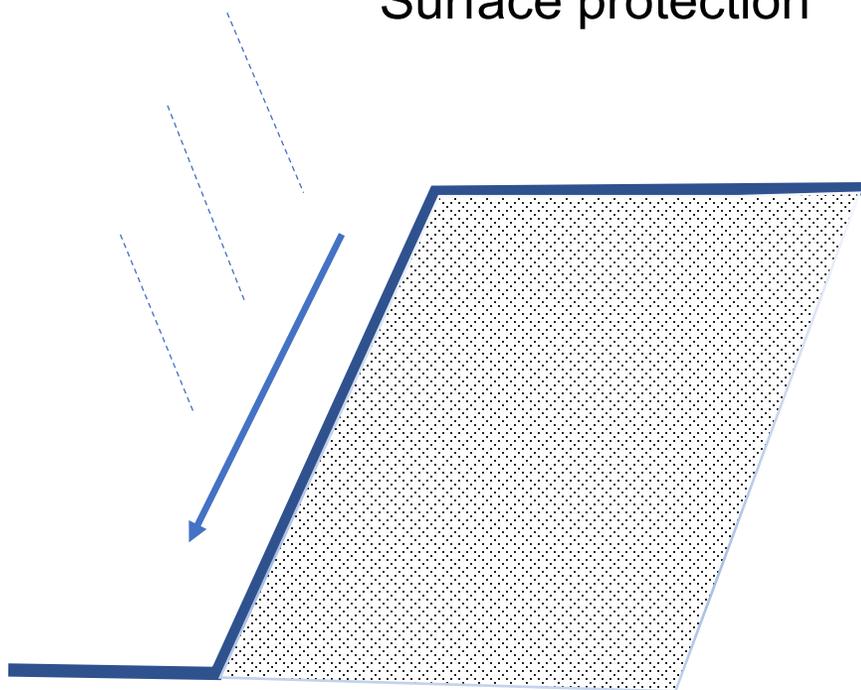


Protection



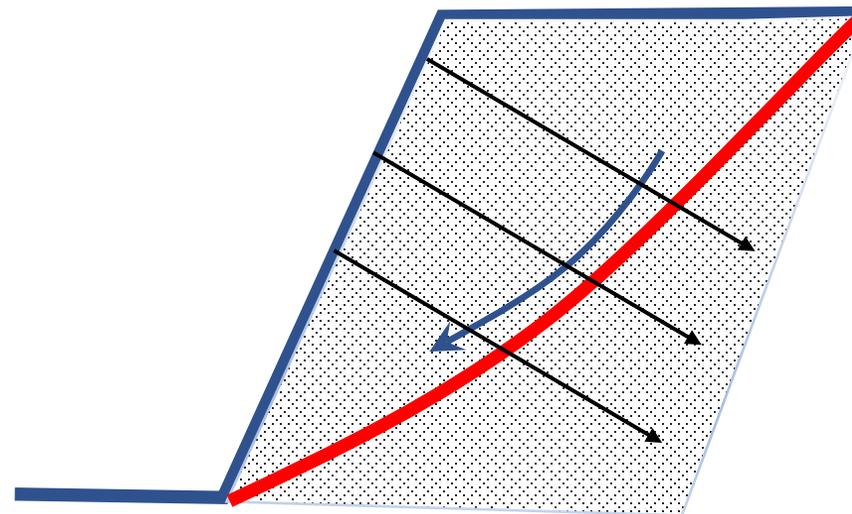


Surface protection



Surface failure cause by rain

Not for reinforcement.



Deep slip failure cause by surcharge or pore water pressure





Channel lining



Slope protection



Pond Slope Protection



Concrete remediation





## Key Features of Concrete Canvas®

- *Very fast installation – to meet deadlines/emergency repair*
- *Very easy to install – just add water and minimum tools are required*
- *Durable for entire project duration*
- *Practically no maintenance required*
- *Two in one solutions - impermeable + protection*
- *Low logistic footprint compared to pour concrete*
- *No harmful leachate discharge to watercourse*
- *Suitable for difficult to access project site*



## Key Benefits of Concrete Canvas®

- *High Level of productivity*
- *No replacement or repair cost if installed properly*
- *No down time*
- *Extremely low water seepage ( $k=1 \times 10^{-9} \text{m/s}$  - joint) to the ground*
- *Complies to ASTM D8364 GCCM standard of specification.*
- *Complies with US EPA and M.Geok regulation*

## LOW LOGISTICAL FOOTPRINT

1 CC Bulk Roll provides the equivalent coverage area of two 6m<sup>3</sup> ready-mix cement trucks

- Reduced vehicle movement
- Reduced transportation CO<sub>2</sub>
- Reduced H&S implications





## Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

### Concrete Canvas® 'T Series' Product Range

from

Concrete Canvas



EPD of multiple products (CCT1®, CCT2® and CCT3®), based on the average results of the product group and worst-case results where the average exceeded 10% variability.

Programme:	The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0006165
Publication date:	2024-12-17
Valid until:	2029-12-17

*An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at [www.environdec.com](http://www.environdec.com)*



enistic

## LIFE CYCLE ASSESSMENT (LCA)

- Independent Life Cycle Assessment of the Global Warming Potential (GWP) of CCT2™ was undertaken independently by Ricardo Energy and Environment (REE)
- CCT2™ was compared to 150mm of ST4 (20N) poured concrete for a hypothetical channel, 200km from factory and 20km from ST4 batching plant
- 'Cradle to Grave' assessment included Upstream (sourcing raw materials), Core (manufacture), Transport, Installation, Use, Removal and End of Life
- CCT2™ has a GWP that is 62% lower than the ST4 poured concrete alternative
- Sensitivity analysis also shows that CCT2™ has a lower GWP than 100mm of poured concrete
- Concrete Canvas and REE have created a tool for calculating the project specific GWP for all CC products and comparing to the ST4 poured concrete alternative.



## Low Alkaline Washout Test



### ENVIRONMENTAL DATA

Concrete Canvas® (CC) is part of a revolutionary new class of construction materials called Geosynthetic Cementitious Composite Mats (GCCMs). It is a flexible, concrete filled geotextile that hardens on hydration to form a thin, durable and water proof concrete layer. Essentially, it's Concrete on a Roll™.

**Lower Carbon**  
CC is a carbon efficient material that offers significant embodied carbon reduction compared to traditional concrete methods. CC enables up to 150mm of poured concrete to be replaced with just 7mm for many erosion control and weed suppression applications. As a result, material savings of 95% can be achieved for a typical construction project.

In addition CC reduces the transportation requirement of construction work. A single pallet of 7mm thick CC (CCT2™) contains 125m<sup>2</sup> of concrete surfacing, the same coverage using poured concrete would require two 6m<sup>3</sup> ready-mix trucks. In other words, a single truck load of CC Bulk Rolls replaces a further 33 vehicle movements.

Global consultancy Ricardo Energy and Environment recently prepared an Independent Life Cycle Assessment of the carbon impact for the Concrete Canvas CCT2™ material, which resulted in a CO<sub>2</sub>e that is 60% lower than the poured concrete alternative. View the [CC Carbon Report](#) for further information.

**Low Washout**  
CC traps dry concrete powder in a 3-dimensional fibre matrix. Testing based on BS4443 to indicate the effect of underwater setting, shows that CC loses only 5% by mass. By comparison, specialist underwater concrete typically lose between 10-15%, whilst also requiring much larger initial volumes.

CC has been independently tested by the CTL Group laboratories in the US which measured leachates from CC both during hydration and post-set. All leachate levels were found to be below the levels set by the US Environmental Protection Agency (EPA).

**Limited Alkaline Reserve**  
CC uses a specialist high early strength concrete with a limited alkaline reserve. Unlike most concretes, it is not classified as an irritant and is less damaging to the environment.

**Environment Agency Use**  
CC was first specified for use by the Environment Agency (EA) Biodiversity team in 2010 on the Church Village Bypass Project. Benefits cited included 'surface roughness to provide diversity in the channel's morphology' and its ability to introduce 'strossiness in the channel line'.

Since 2010 CC has been used in multiple installations on a case-by-case basis including projects for the Environment Agency (EA), Natural Resources Wales (NRW) and Scottish Environmental Protection Agency (SEPA).

**Greening**  
Untreated CC will naturally 'green' over time as the textured top surface allows moss growth, whilst the fibre-reinforced concrete layer will prevent root-growing vegetation, which would otherwise restrict water flow and increase maintenance costs.

**Manufacture**  
Concrete Canvas Ltd is ISO9001 certified; we pride ourselves on the responsible sourcing and production of our products. CC is BSA certified with a durability in excess of 120 years when used in erosion control applications. All materials are sourced to minimise environmental impact. For example, the PVC we use is a high grade phthalate free (no DOP) compound. This is designed to maximise the products life expectancy and minimise its impact on the environment.







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The nearest licensed supplier to your location (indicated by a map icon) is listed below. If you are unable to find a supplier, please contact us for more information. All materials are sourced to minimise environmental impact. For example, the PVC we use is a high grade phthalate free (no DOP) compound. This is designed to maximise the products life expectancy and minimise its impact on the environment.

## M.Geok Harmless to Environment Test



**Testreport PB2023003165**

**Kiwa GmbH**  
Analytik und Umwelt  
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Fax +49 38208 637 28  
[www.kiwa.com](http://www.kiwa.com)




Die Akkreditierung gilt für die in der Urkundenanleihe D-PL-11217-02-02 aufgeführten Prüfverfahren.

<b>Project/Object #:</b>	1.1/12531/0873.D.1-2023
<b>Reference no. of the client #:</b>	A 044/ 2023
<b>Auftragsdatum #:</b>	18 October 2023
<b>Kiwa-ANr.:</b>	032300300
<b>Investigation Order:</b>	Test for environmental harmlessness acc. to M Geok E, section 6.29 (2016)
<b>Description of sample #:</b>	CCX-M
	Supervised by: Kiwa GmbH TBU Herr Matthias Käsekamp Gutenbergstraße 29 48268 Greven
<b>Numbers of samples:</b>	1
<b>Sample was taken #:</b>	by the client
<b>Date of sample receipt:</b>	23 October 2023
<b>Test period:</b>	23 October 2023 to 29 November 2023
<b>This report was created by:</b>	Dr. Katharina Schneider

## CTL leachate Test

Concrete Canvas CCX™  
Leachate Testing  
CTL Group Project No. 201319

Page 1 of 8  
September 05, 2023

### ENVIRONMENTAL TESTING

The environmental testing program of Concrete Canvas Ltd's CCX™ Geosynthetic Cementitious Composite Mat (GCCM) is designed to evaluate the leachate coming off from the CCX™ during its initial hydration state and after thorough hydration. The experimental program consisted of two stages: Stage 1) a controlled volume of water was sprayed on to a CCX™ of known dimensions held at a defined slope at specific pressure. The water coming off from the CCX™ was collected and analyzed for its constituents. Stage 2) a large quantity of water was sprayed on to the hardened CCX™ to simulate run off on the cured CCX™, again leachate was collected and analyzed for its constituents.

### EXPERIMENTAL PROGRAM

**Stage 1. Controlled volume of water spray on unhardened CCX™**

Two pieces of CCX™ (Sample A and Sample B, 12" X 12" each) were extracted from the interior portion of a large roll. The edges of each sample were sealed using commercially available silicon glue. To simulate the edge effect, the fourth edge of Sample A and Sample B was sealed in a way that had an opening of 0.75" and 1.5" respectively. After the silicon glue was set the samples were positioned on the sloped surfaces that were prefabricated using plexiglass, the entire setup was then placed inside a spill safe container as shown in Figure 1. Using a custom-built pressurized water tank (Figure 2), 1.25 gallons of DI water was sprayed onto the samples while maintaining a flow pressure of 32 - 35 psi. Figure 3 illustrates the wetting setup of the CCX™. The quantity of water was selected based on the ASTM C 1185 (Section: 15.4.2.1 Heat/Rain Roof Structures). The standard states that an average rainfall in a period of one hour would yield 60 gallons of water over 48 Sq. ft. which is equal to 1.25 gallons over 1 Sq. ft. The pressure in the water tank was provided by connecting an air compressor to the tank. During spraying, care was taken to spray the water evenly across the entire surface area of the sample. It took approximately 60 seconds to spray 1.25 gallons of de-ionized (DI) water under pressure (0.0208 gal/sec). Upon completion of wetting, water retained in the spill safe container was collected and stored for chemical analyses.

**Stage 2: Three gallons of water spray on hardened CCX™**

In the second stage of leachate evaluation, a large quantity of water was sprayed onto the hardened CCX™. After the wetting in Stage 1, the entire setup (slopes with CCX™) was stored at 23°C and 50% RH for 96 hours. Upon completion of the curing period (96 hours), 3 gallons of deionized (DI) water (max capacity of the tank) was sprayed on to the hardened CCX™ while maintaining a flow pressure of 32-35 psi. Upon completion of spraying, the water retained in the spill safe container was collected and stored for chemical analyses.



# ASTM Standards for GCCM

## ASTM D8364

**ASTM D8364 -**

**'Standard Specification for Geosynthetic Cementitious Composite Mat (GCCM) Materials**

Property		Test Method	State of GCCM	Minimum Values Unless Specified		
				Type I	Type II	Type III
Thickness		D5199	Uncured cured 24h	4.5mm	7.0mm	
Mass Per unit area		D5993	Uncured	6.5kg/m <sup>2</sup>	10.5kg/m <sup>2</sup>	
Density		D5993/D5199	Uncured	1250 kg/m <sup>3</sup>		
Flexural Strength	Initial breaking load	D8058	Cured 24h	625N/m	1500N/m	3750N/m
	IFS			3.5 Mpa		
	FFS			4.0 Mpa		
Compressive Strength of Cementitious Mix		D8329	Cured 28 days	40 Mpa	50 Mpa	60 Mpa
Pyramid puncture		D5494, TypeB	Cured 28 days	2 kN	3.5 kN	4.5 kN
Abrasion (Max value) Cementitious Barrier Depth of Wear		C1353/C1353M	Cured 28 days	0.3mm		
Tensile Strength	Final	D6768/D6768M	Uncured	8 kN/m		
	Initial		Cured 28 days	3.5 kN/m	6.5 kN/m	9 kN/m
	Final			10 kN/m	19 kN/m	
Freeze-Thaw	Residual IFS (D8058)	C1185	Cured 28 days 200 cycles	> 80% (pass)		



## IMPORTANCE OF ASTM D8364 SPECIFICATION

- Independent documents by ASTM Committee
- Minimum technical specification for GCCM products
- Manufacturing quality control requirement
- Prevent product and project failure
- Promote development of GCCM



# EXAMPLE OF POOR GCCM





Poor packaging exposing cement



Top geotextile degraded and exposing bottom geotextiles and HDPE membrane



## EXAMPLE OF POOR GCCM THAT NON COMPLIANCE TO ENVIRONMENTAL STANDARD



Test Item(s)	Limit	Unit	MDL	001
Soluble Lead (Pb)	90	mg/kg	5	ND
Soluble Antimony (Sb)	60	mg/kg	5	ND
Soluble Arsenic (As)	25	mg/kg	2.5	ND
Soluble Barium (Ba)	1000	mg/kg	10	ND
Soluble Cadmium (Cd)	75	mg/kg	5	ND
Soluble Chromium (Cr)	60	mg/kg	5	8
Soluble Mercury (Hg)	60	mg/kg	5	ND
Soluble Selenium (Se)	500	mg/kg	10	ND
American Society for Testing and Materials-ASTM F 963-17(Clause 4.3.5)-soluble heavy metal in Substrate Materials/paint and similar surface-coating materials.				
Test Method: With reference to ASTM F 963-17(Clause 8.3), Analysis was performed by ICP-OES.				



Permissible limits set by USA Environmental Protection Agency (EPA) Resource Conservation Recovery Act (RCRA) TCLP and European Environmental Harmless test of M.Geok

Analyte	USA - EPA RCRA TCLP Max Conc (mg/L)
Antimony (Sb)	1
Arsenic (As)	5
Barium (Ba)	100
Beryllium (Be)	0.007
Cadmium (Cd)	1
Chromium (Cr)	5
Copper	-
Lead (Pb)	5
Mercury (Hg)	0.2
Nickel (Ni)	70
Selenium (Se)	1
Silver (Ag)	5
Thallium (Tl)	7
Zinc	-



# INSTALLATION



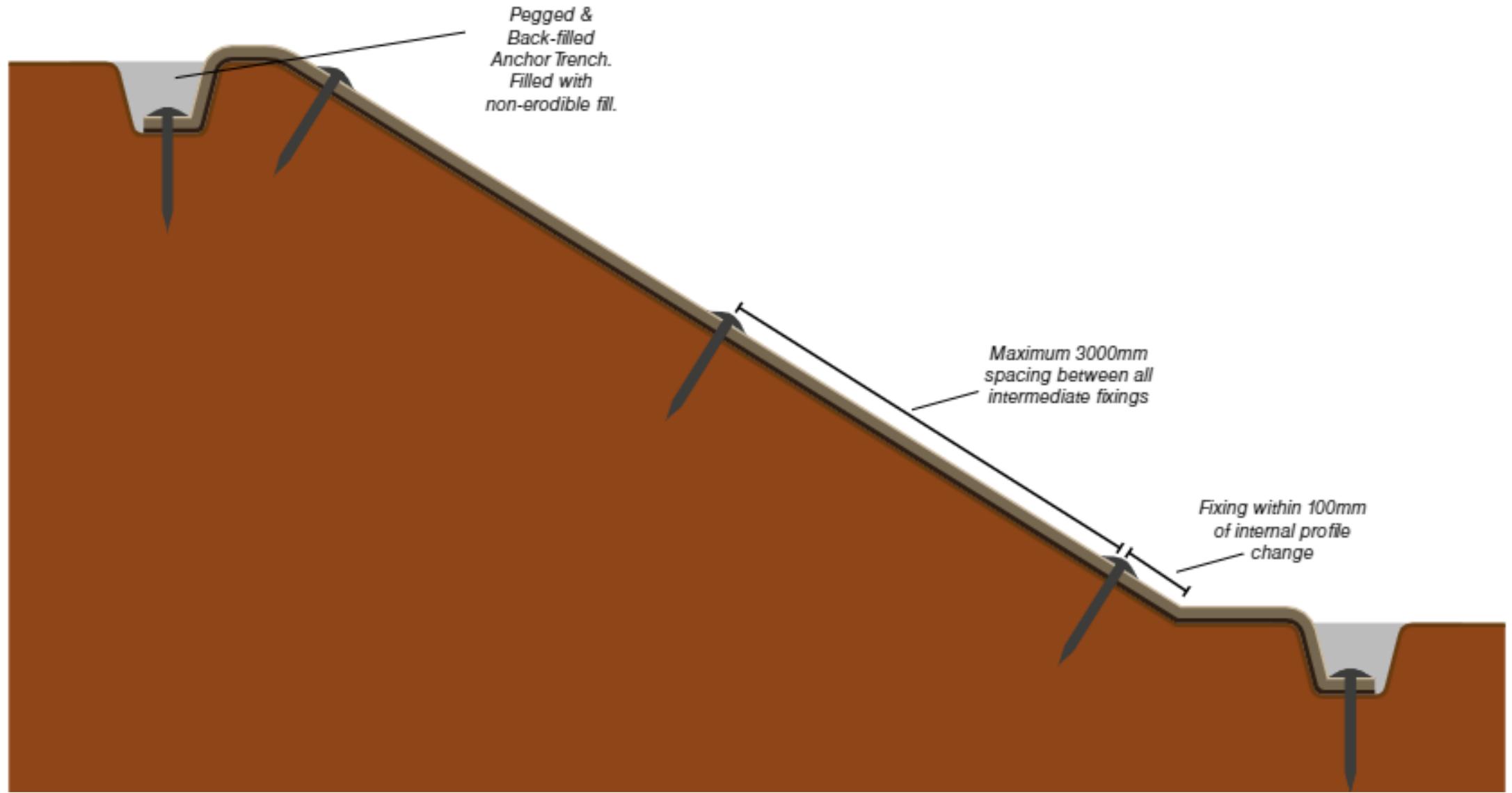
## Subgrade Preparation

- Remove vegetation / sharp or protruding rocks.
- Subgrade should be firm and stable
- Proper anchor trench should be prepared on crest and toe





# ANCHOR TRENCH & FIXING





## Type of GCCM Joints

- Shingled Joint with screw
- Shingled Joint with Screw & adhesive
- Thermal bonding

## Joint Strength and permeability

- The joint strength and impermeability are depending on type of joints.
- Shingled Joint with screw is the most common joint for slope protection and channel lining.
- Thermal Bonding has the lowest impermeability and highest joint strength mostly used for applications that need waterproof.



# WINDSOR PIN TEST ON FLEXURAL STRENGTH AFTER INSTALLATION



**CONCRETE CANVAS**  
Concrete on a Roll

2507.01.EN  
  
MADE IN UK



**CCX**  
Innovation on a Roll

**USER GUIDE:  
CONCRETE COA**



**CONCRETE CANVAS**

**USER GUIDE:  
CONCRETE COA**

## Non-destructive testing of cured GCCM using the Windsor Pin System to ASTM C803

CCCMs are concrete Impregnated fabrics which harden on hydration to form a fibre reinforced concrete layer. Correct hydration of the GCCM is critical to ensuring the material reaches the data sheet values. Please refer to the 'CC User Guide - Hydration' for detailed guidance on hydration procedure and curing conditions.

This User Guide details a method for conducting Construction Quality Assurance (CQA) on cured GCCM material (min 24 hours after initial hydration) in field conditions to verify the material has been correctly hydrated and cured in accordance with the manufacturer's guidelines. A failed test is an indication of improper installation rather than a material non-conformance.

This User Guide is based on ASTM C803 and utilises the industry standard 'Windsor Pin System' (WPS) - a spring-loaded device that is designed to quickly and accurately measure the strength of cured concrete. The WPS uses the principle that the depth of penetration is inversely proportional to the strength of the material tested.

### Equipment

The following equipment is required:

1. Windsor Pin Instrument - for firing of pins into the GCCM.
2. Reference bar - for test firing of pins to confirm proper operation of unit.
3. Go/No-Go Gauge - for testing 'fired' pins to determine usability
4. Firing Pins - for use with the above - the 'fresh' pin length is 80.5mm (1.2')
5. Checklist
6. Bulb Air Blower - for cleaning out test hole to ensure accurate measurement
7. Calibration Certificates
8. Le-Hex wrench - for removal of the ring from the depth micrometer.
9. Depth Micrometer Probe - for calculating the depth of pin penetration.
10. 3/8" Wrench - for tightening the retractor nut
11. Case - for carrying the Windsor Pin System and accessories
12. Spacer Plate (8mm) - for use with the above when testing CCT1\* and CCHT1\*

### Test Locations

CQA testing should be conducted in accordance with the test plan provided by the on-site Quality Assurance Engineer (for example 1 test area every 500m<sup>2</sup>) or as detailed in the project specification by the Design Engineer. Alternatively, specific test areas may be identified by the client or contractor where there is cause for concern that insufficient hydration or curing may have occurred.

Material should be left a minimum of 24 hours to cure from the initial hydration. For each identified test area, a minimum of 7 pin penetration tests should be conducted. The pin penetrations should be located evenly spread in an array with each test located between 80mm to 150mm from at least one other test and at least 50mm from the edge of the GCCM.

### Instructions For Use

#### 1. Pin Penetration Tests

- 1.1 Insert the pin into the ring barrel of the Windsor Pin Instrument
- 1.2 Using the 3/8" wrench tighten the loading nut until the trigger mechanism latch closes to hold the spring in place.



W-P-2000 Windsor Pin System



Spacer Plate (8mm) to be used when testing CCT1\* & CCHT1\*



Windsor Pin System Contents

\*Geopolymer Cementitious Composite Mix



Initial flexural strength meets 3.5Mpa after 24 hours hydration as per ASTM D8364

**CONCRETE CANVAS**

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This document is a representation of the product information provided by the manufacturer. It is not intended to be used as a substitute for the manufacturer's instructions. The manufacturer's instructions should be consulted for full details of the product and its use. The manufacturer's instructions are available on the manufacturer's website.

**POOR INSTALLATION**





# SINGAPORE PROJECTS



- Pierce Rd Slope Erosion Control - SLA
- CCT1 Batched rolls



- Mandai – PUB/N Park project.
- CCT1 Batched rolls





# BRIDGE ABUTMENT PROTECTION





# TEMPORARY SLOPE PROTECTION PROJECT



- CR203 project
- CCX-U 25 & 50m length rolls
- 5 years duration



# TEMPORARY SLOPE PROTECTION PROJECT





# TEMPORARY SLOPE PROTECTION PROJECT





CRISP bund lining project  
(Erosion control)  
CCT1 bulk rolls  
Speedy installation  
Better durability



MRT project  
Temporary slope protection





# TEMPORARY SLOPE PROTECTION PROJECT – MAY FLOWER MRT STATION





# INTERNATIONAL PROJECTS





- Water storage
- CCX-M bulk rolls
- 475m<sup>2</sup>







## Concrete Canvas Patent Protection:

### Patents:

ARIPO (AP3189), ARIPO (AP4445), ARIPO (AP7027), AU (2010209524), AU (2015202219), AU (2017364316), AU (2022204822), BR (PI1005309-3), BR (1120190103660), CA (2655054), CA (2749991), CL (54.867), CL (69.031), CN (ZL201080005835.6), CN (2017800837323), CN (ZL2022107248835), EAPO (040388 (AM, AZ, KG, KZ, RU, TJ, TM)), EAPO (048274 (AM, AZ, BY, KG, KZ, RU, TJ, TM)), EP (2027319 (BE, DE, ES, FR, GB, IE, IT, PL, TR)), EP (2393970 (GB)), EP (3323922 (BE, CH, CZ, DE, FR, GB, GR, IE, PL, TR)), EP (3415672 (BE, CH, CZ, DE, FR, GB, GR, IE, PL, TR)), GB (2455008), ID (IDP000046015), IL(230745), IN (332239), IN (454741), IN (488554).

## Concrete Canvas is a registered trademark in:

European Union, Albania, Argentina, Armenia, Australia, Azerbaijan, Bahrain, Bosnia-Herzegovina, Botswana, Brazil, China, Colombia, Costa Rica, Croatia, Egypt, Ghana, India, Iran, Japan, Kazakhstan, Kenya, Lesotho, Liberia, Macedonia, Madagascar, Malaysia, Mexico, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Namibia, New Zealand, Oman, Paraguay, Philippines, Saudi Arabia, Serbia, Sierra Leone, Singapore, Sudan, Swaziland, Switzerland, Syrian Arab Republic, Turkey, Turkmenistan, Ukraine, Uruguay, Zambia, United Kingdom and United States of America.

# CONCRETE CANVAS®

## PRESS RELEASE

**CONCRETE CANVAS SUCCESSFULLY ASSERT INDONESIAN IP RIGHTS: PT PANDU EQUATOR PRIMA AGREES TO CEASE SALES OF “CEMENT BLANKET” SUPPLIED BY TAIAN NUOLIAN ENGINEERING MATERIALS CO., LTD**

JUNE 16<sup>TH</sup> 2025

On 03 June 2025, PT Pandu Equator Prima signed an undertaking to:

- **immediately stop** importing, distributing, promoting, and selling a product marketed as a “Cement Blanket” GCCM in Indonesia (a GCCM manufactured in China by **Taian Nuolian Engineering Materials Co., Ltd** and imported into Indonesia by PT Pandu Equator Prima); and
- refrain from dealing in **any other product that infringes Concrete Canvas’** Indonesian patent IDP000046015.

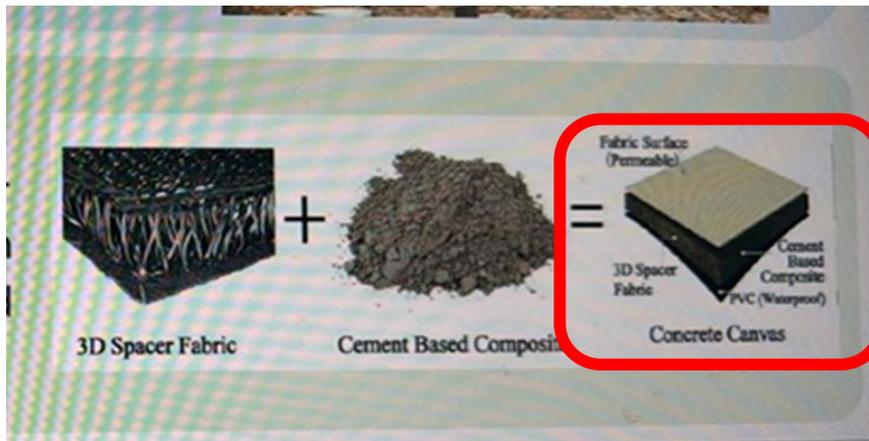
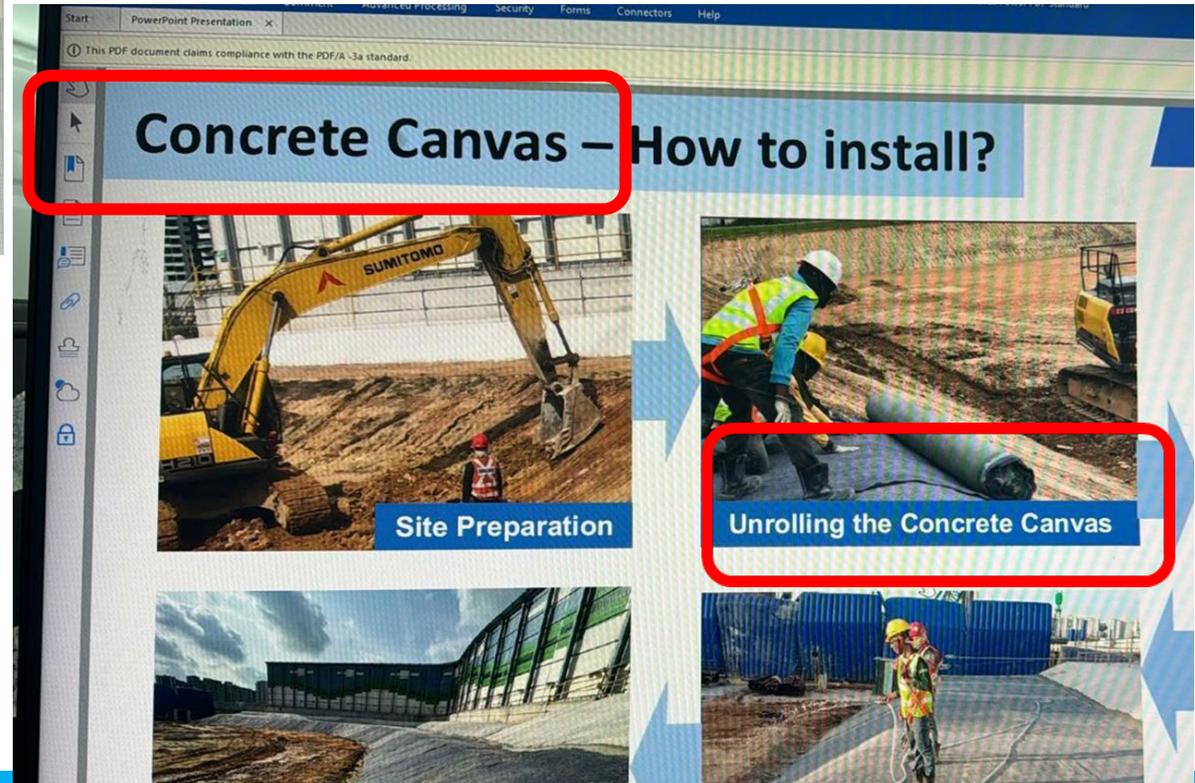
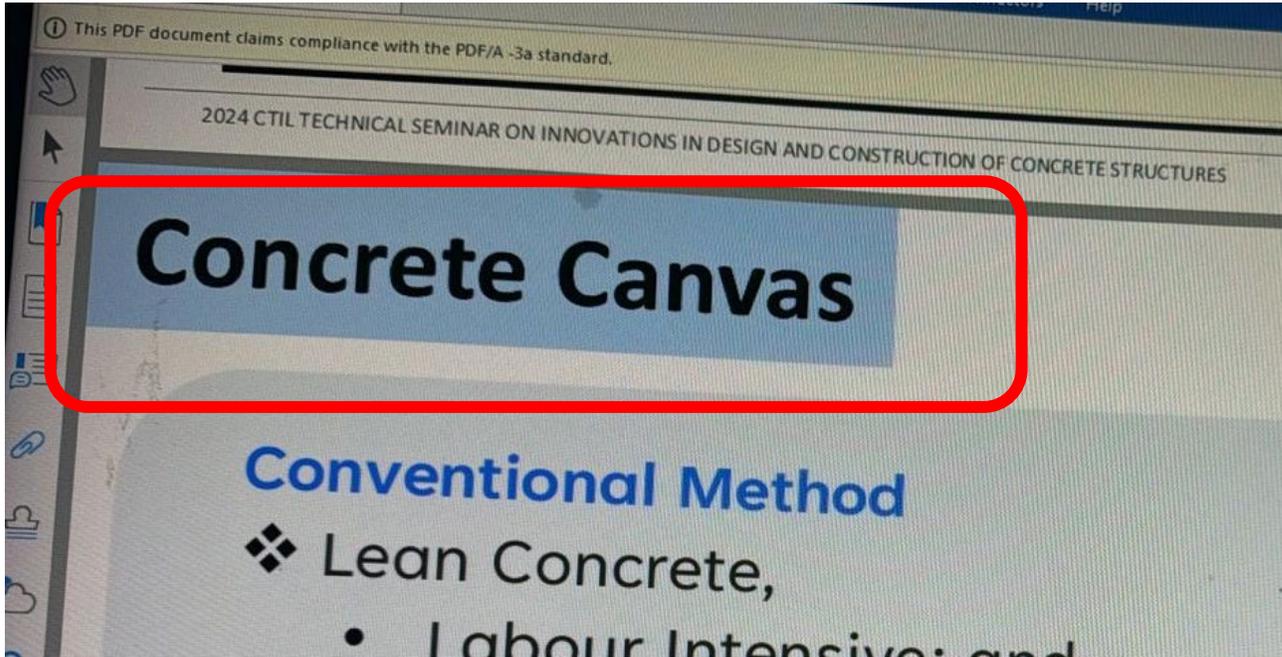
The undertakings follow a letter from Concrete Canvas Technology Ltd.’s solicitors which explained that:

- the Cement Blanket GCCM allegedly infringes the claims of Concrete Canvas’ Indonesian patent IDP000046015; and
- PT Pandu Equator Prima’s marketing material advertising the alleged infringing Chinese product included images of Concrete Canvas’ installations being passed off as installations of the alleged infringing Chinese product.

Indonesian patent IDP000046015 is one of many granted patents in a second-generation patent family directed to Concrete Canvas’ proprietary GCCM technology, covering a GCCM product configured to control maximum allowed water to cement ratio upon hydration of the material to within a certain range.

Concrete Canvas will robustly seek to enforce their intellectual property rights where they are being infringed by a manufacturer, distributor or otherwise. Such enforcement will occur at a time and in a jurisdiction where Concrete Canvas can best accomplish its objectives. Patents exist to protect and encourage investment in innovation. It is in all of our interests to respect the law, including patent law. Further information on Concrete Canvas Technology’s patents and trademarks can be found at: <https://www.concretecanvas.com/patent-trademark-info/>.

-ENDS





**Thank You**