



 **CONCRETE CANVAS®**  
Concrete on a Roll

# INSTALLATION GUIDE: CHANNEL LINING



RAIL



ROAD



MINING



PETROCHEM



AGRO



PUBLIC WORKS



UTILITIES



DEFENCE



DESIGN



SHELTER

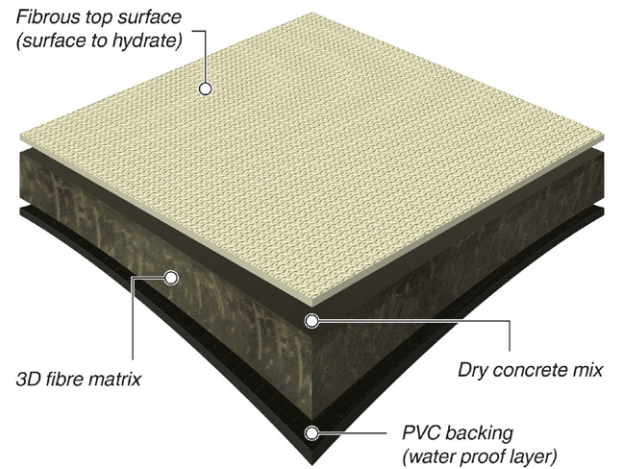
## 1.0 Introduction

### 1.1 Background

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 can be described as ‘concrete on a roll’ and is used for a wide variety of applications including the rapid lining of drainage channels, providing slope protection, weed suppression, culvert repair and general concrete remediation.



### 1.2 Scope

- This document provides guidance procedures for the installation of CC as **channel lining** in a manner that maximises safety, efficiency, and the physical integrity of the material and channel.
- This document provides useful information for installers, customers and specifiers of Concrete Canvas® GCCM (CC) and provides an overview of installation techniques for the lining of channels.
- The versatile nature of CC means that this document is not exhaustive and is intended for guidance purposes only. Exceptions to this guideline may be required to address site-specific and/or product-specific conditions.
- The performance of the CC is wholly dependent on the quality of its installation. It is the installer’s responsibility to adhere to these guidelines where applicable and to the project specification and drawings.



CC Channel Lining, Glyncorrwg Colliery, Wales, UK

## 2.0 Specification and Installation Essentials

### 2.1 Specifying the correct CC Thickness

CC is available in 3 thicknesses, CC5™ (5mm), CC8™ (8mm) and CC13™ (13mm).

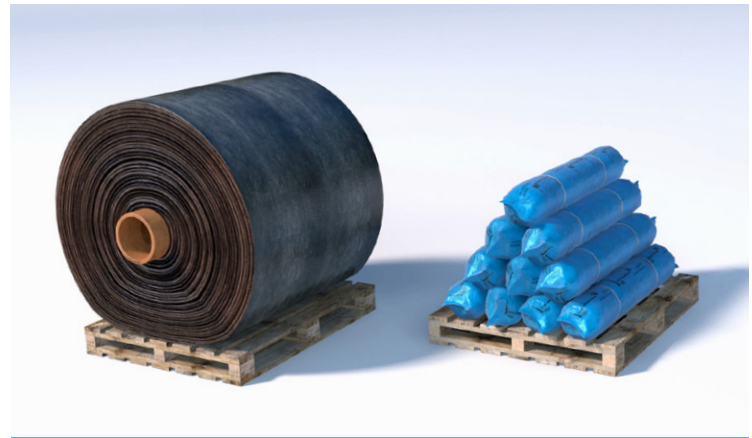
- CC5™ can be used to line channels with a solid substrate such as when relining an existing concrete channel or laying over a hard substrate such as rock. CC5™ may also be used for temporary works.
- CC8™ is the standard thickness specified for channel lining and is recommended unless either of the conditions above or below apply.
- CC13™ should be considered where a channel is to be trafficked, is exposed to high levels of debris, where water flow rates are above 8.6m/s or where the ground is particularly steep or unstable.

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

### 2.2 Specifying the correct CC Roll Format

CC is available in **Bulk Rolls** or as smaller **Batched Rolls**.

- **Bulk Rolls** offer the quickest installation but must be deployed using heavy lifting equipment and a spreader beam. Bulk Rolls are generally more efficient to use than Batched Rolls, in terms of material use and transportation.
- For sites where this isn't suitable, man portable **Batched Rolls** can be installed without the need for plant and are well suited to smaller scale works in restricted access areas.
- CC is now also available in **Wide Rolls** of up to 4 times the standard roll width. Contact Concrete Canvas for further details.



CC Bulk Rolls and Batch Rolls



Wide Rolls of up to 4 times the standard roll width are now available



Manual lifting of CC Batch Rolls

## 2.0 Specification and Installation Essentials

### 2.3 Specifying the correct CC Layup

CC can be laid along the length of the channel (longitudinal) or across the width (transverse).



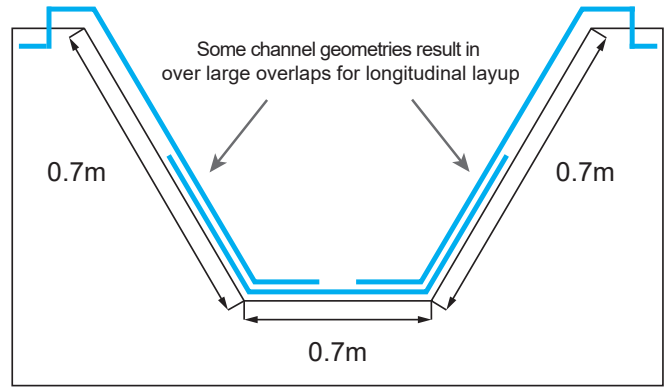
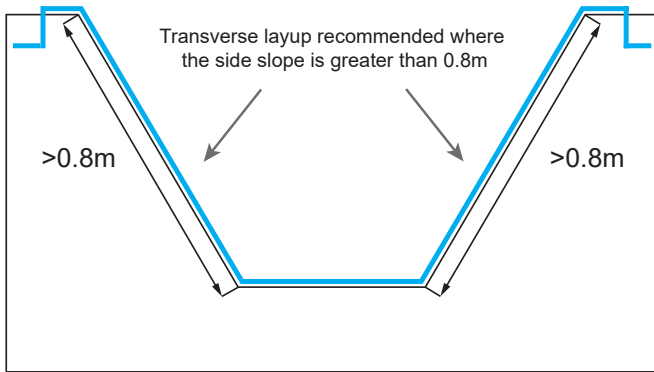
Longitudinal Layup



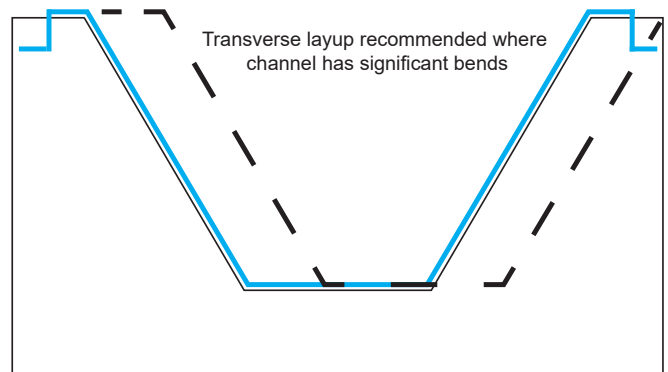
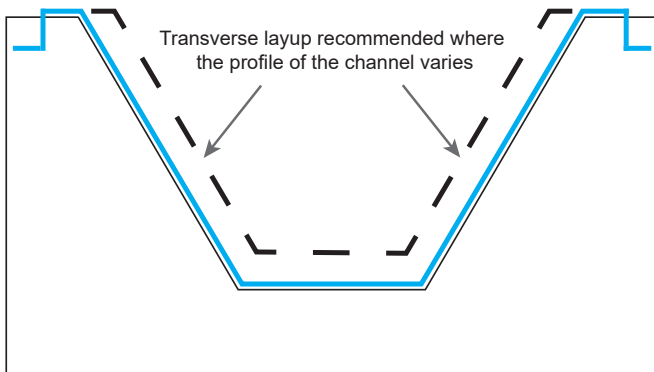
Transverse Layup

Laying longitudinally is typically faster than laying transversely. However a transverse layup may be preferable if:

- The channel side slope is greater than 0.8m as this makes securing the CC difficult when using a longitudinal layup.
- or
- The channel geometry means that longitudinal layup is materially wasteful.



- The channel profile varies significantly along the channel length.
- or
- The channel has significant and/or frequent sharp bends.

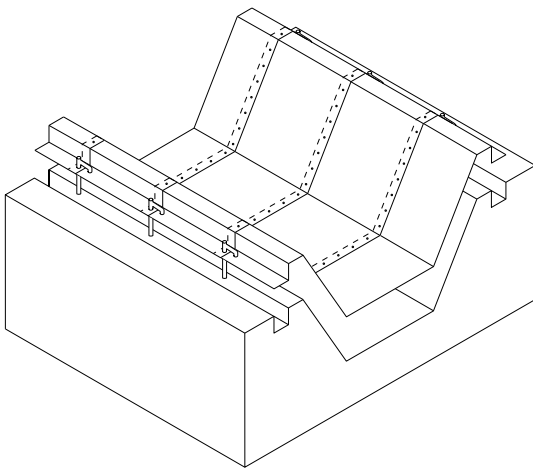
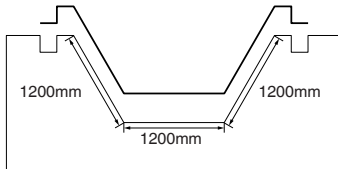


## 2.0 Specification and Installation Essentials

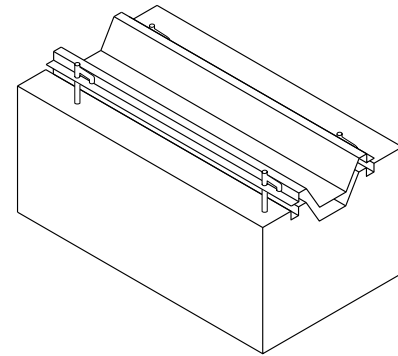
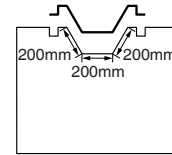
### 2.3 Specifying the correct CC Layup cont.

Typical layups are shown below. Consult *CC Standard Detail Drawing* for detailed information.

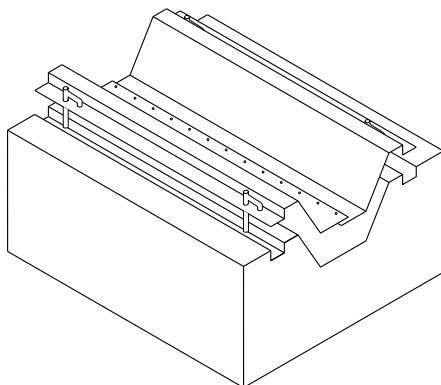
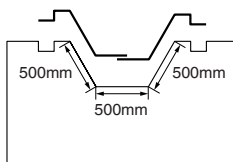
CC in a Transverse Layup



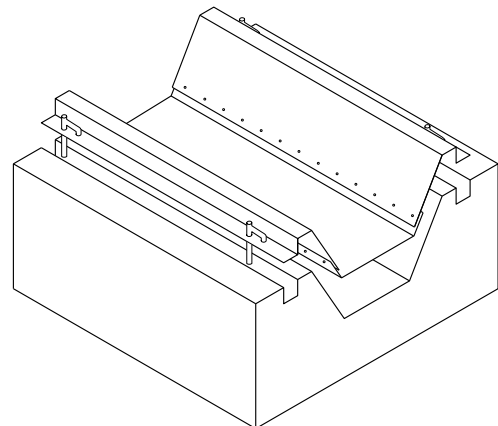
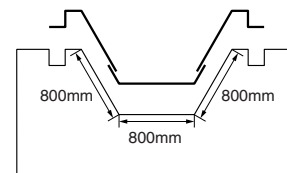
1 Layer of CC in a Longitudinal Layup



2 Layers of CC in a Longitudinal Layup



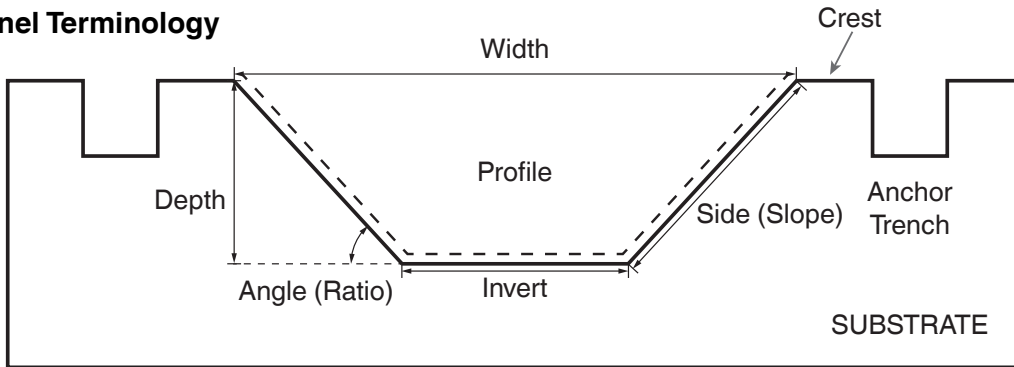
3 Layers of CC in a Longitudinal Layup



## 2.0 Specification and Installation Essentials

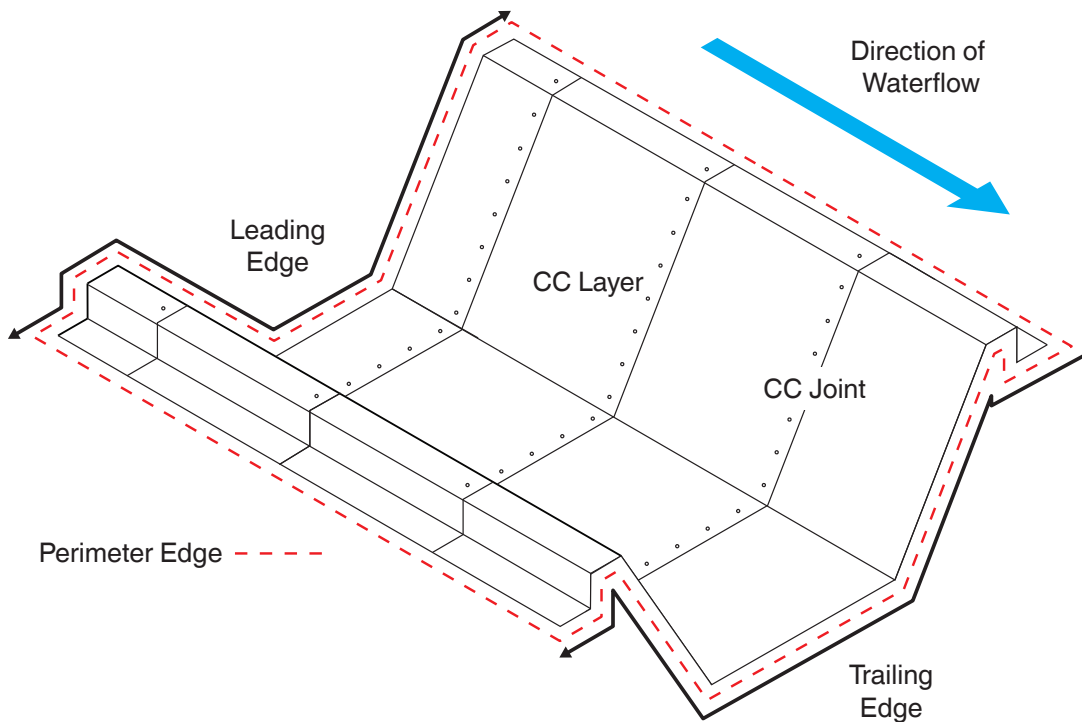
### 2.4 Terminology

#### Channel Terminology

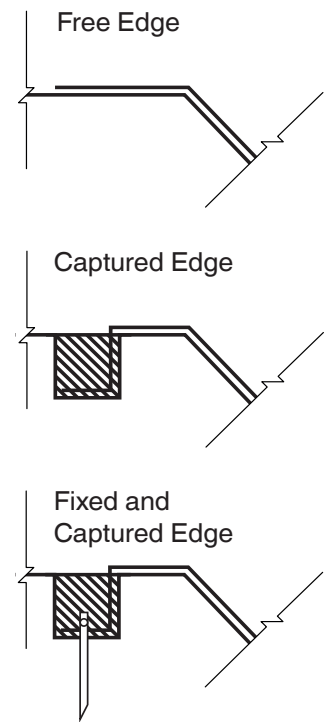


Termination Trenches at Leading and Trailing Edges.

#### CC Layup Terminology



#### CC Edge Terminology



### 2.5 Typical Jointing and Fixing Detail

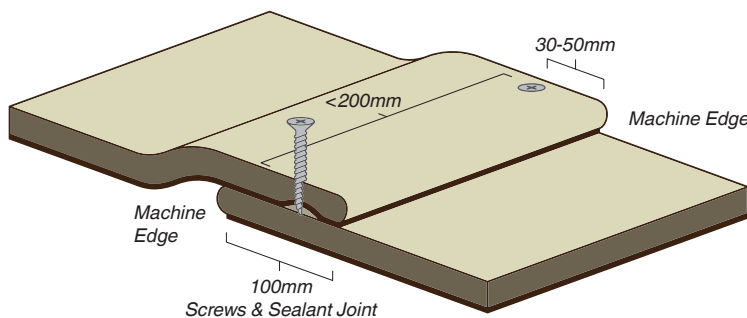


Illustration of a Screwed Overlap Joint

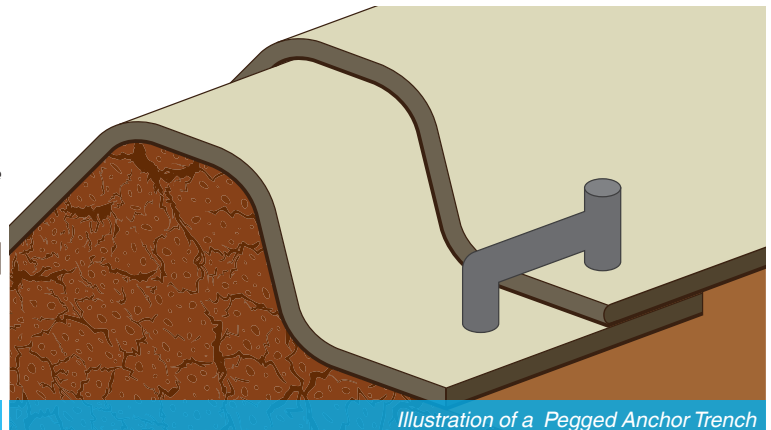
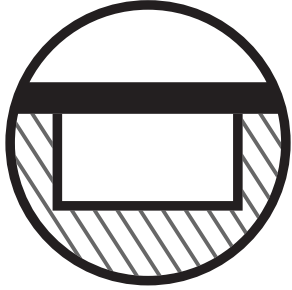


Illustration of a Pegged Anchor Trench

## 3.0 Four Key Installation Principles of CC

The unique material properties of Concrete Canvas (CC) mean that it can be used for a variety of applications. Following the Four Installation Principles below will help ensure a successful installation.



### Avoid Voids

#### 1. Avoid Voids

Prepare the substrate so it is well compacted, geotechnically stable and has a smooth and uniform surface.

- For soil substrates, remove any vegetation, sharp or protruding rocks and fill any large void spaces. Ensure the CC makes direct contact with the substrate to minimise soil bridging or potential soil migration under the layer.
- For concrete substrates, remove any loose or friable material, cut away any protruding exposed re-bar and fill any large cracks or voids.

#### 2. Secure Canvas

It is important to ensure that the CC is **Jointed** at every overlap between layers and that those layers are **Fixed** to the substrate.



### Secure Canvas

- **Jointing:** Overlapped CC layers should be securely jointed together, typically this is achieved using stainless steel screws applied with an auto-fed screw gun at regular intervals. Correct screw placement will help ensure intimate contact between CC layers, prevent washout of the substrate, and limit potential weed growth. An adhesive sealant can be applied between the layers to improve the joint impermeability.

A non-penetrative method of jointing is to 'thermally bond' the CC layers together. This also improves joint impermeability. For more jointing options see the [CC User Guide: Jointing and Fixing](#).

- **Fixing:** When fixing to a soil substrate, ground pegs (eg J-pegs) are typically used. On rock or concrete substrates, CC layers can be jointed together and fixed to the substrate using masonry bolts, percussion anchors or shot fired masonry nails. Stainless steel fixings with washers are recommended.

#### 3. Prevent Ingress

It is important to prevent water or wind ingress between the CC and the substrate, both around the perimeter of the installation and along the joints.

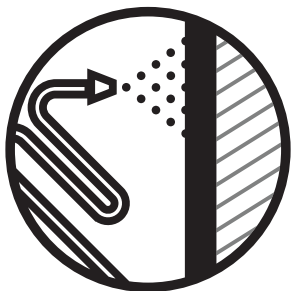


### Prevent Ingress

- For soil substrates, this is typically achieved by capturing the entire perimeter edge of the CC within an anchor trench.
- On rocky or concrete substrates, the perimeter edge should be sealed with a concrete fillet or an adhesive sealant.
- All overlapped CC layers should be lapped in the direction of water flow.

#### 4. Hydrate Fully

It is critical to properly hydrate CC, taking into account the quantity of material used and ambient temperature conditions.



### Fully Hydrate

- Always ensure hydration through the fibrous top surface.
- Ensure to hydrate any overlapped areas and anchor trenched material prior to backfilling.
- Spray the fibre surface with water until it feels wet to touch for several minutes after hydration (the 'Thumb Test').
- Follow the [CC User Guide: Hydration](#).

## 4.0 Installation Methodology

### 4.1 Equipment Required

- Sufficient CC to complete project
- Safety mask and gloves
- Cutting equipment, snap off knife or disc cutter
- Metal or plastic fixing pins
- Lump Hammer
- Screwdriver and stainless screws or alternative method to join the CC layers
- Water supply

See [CC Equipment List](#) for full details. Dust hazard. Wear appropriate PPE. Consult [CC SDS](#) document.



Equipment required

### 4.2 Site Preparation

- Divert water (if lining an existing watercourse)
- Remove vegetation and grade channel to a uniform profile. CC will conform closely to the underlying channel profile
- Remove sharp or protruding rocks >25mm and fill large voids
- Excavate anchor trench into the shoulders of the channel (min. 150mm)
- Excavate Leading and Trailing Edge termination trenches (min. 150mm) along invert and side slopes (if CC is not to be fixed into existing infrastructure)



Substrate preparation & anchor trench

### 4.3 Deployment

- Verify if longitudinal or transverse layup deployment of CC is specified
- Begin at downstream end of channel and work up gradient
- Remove packaging and unroll CC in channel profile to suit specified layup, ensuring the fibrous top surface faces upwards, with the PVC membrane in contact with the ground.
- Inspect CC to ensure intimate contact with substrate and adjust to remove any void space behind.
- For transverse layup installations, tuck the Edge of the CC into the anchor trench before cutting to length
- If cutting with a disc cutter, it is recommended to wet the cut beforehand to minimise dust generation
- Ensure the Edge of the **first layer** of CC is either :
  - Suitably terminated into existing infrastructure and fixed to prevent water ingress, e.g. a screwed and sealed knuckle joint– see the [CC User Guide: Jointing and Fixing](#) for methodology or;
  - Tucked into a termination trench which is backfilled to prevent scour beneath CC.



CC orientation and contact with substrate



CC tucked into anchor trench prior to cutting



## 4.0 Installation Methodology contd...

### 4.4 Overlapping Layers

- When positioning subsequent layers ensure there is at least a 100mm overlap in the direction of water flow (shingled like roof tiles) and that the material is in intimate contact with the ground.

### 4.5 Jointing and Fixing

- Fix the material along the shoulder of the channel by inserting fixing pins through each overlap or at 2m intervals for longitudinal installations.
- Hydrate the material under the overlapped sections of the CC. Once hydrated, the material remains workable for 1 to 2 hours.
- Insert stainless screws at 200mm centres, at approximately 30–50mm from the edge of the CC. Ensure there is no rucking at the joint and both layers are in contact with each other
- Care shall be taken during installation to avoid damage occurring to the CC. Should the CC be damaged during installation and before hydration, the layer should be removed and replaced.
- It is essential that all exposed (i.e. unjointed) Edges of the CC should be secured during the installation to prevent water ingress underneath the CC which may cause wash-out of the substrate and subsequent undermining.
- Only install what can be fully installed and hydrated before the end of construction day to minimise any adverse effect on the installation and/or performance capabilities of the product.
- If installation continues the following working day, protect the Edge of the last layer of CC overnight with waterproof sheeting to enable jointing on return to work
- Ensure the Edge of the **last layer** of CC is either :
  - Suitably terminated into existing infrastructure and fixed to prevent water ingress, e.g. a screwed and sealed knuckle joint– see the [CC User Guide: Jointing and Fixing](#) for methodology or;
  - Tucked into a termination trench which is backfilled to prevent scour beneath CC.



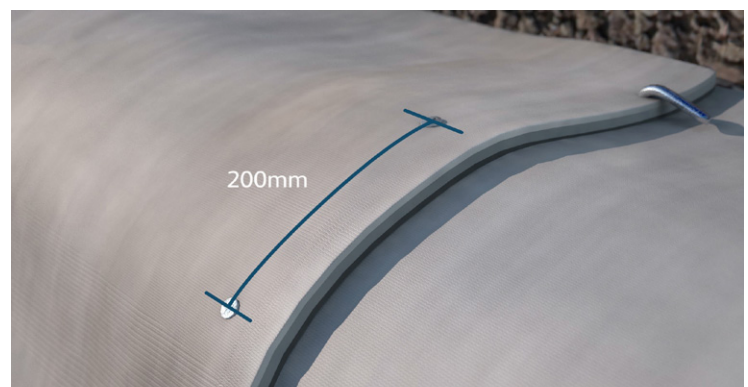
Overlap CC Layers by a minimum of 100mm



Overlap in Direction of Water Flow



Hydration Under Joints Before Fixing



Fixing and Anchor Trench Pinning

## 4.0 Installation Methodology contd...

### 4.6 Hydration

- After fixing and jointing, spray the CC with water to hydrate.
- Spray the fibre surface multiple times until the CC is fully saturated. The wet CC will first darken and then become lighter as it absorbs the water.
- Do not spray high pressure water directly onto the CC as this may wash a channel in the material.
- CC can be hydrated using fresh water or salt water and will hydrate and set underwater.
- It is not possible to over hydrate CC.
- A minimum volume of water equal to 50% of the material weight is required. For example, CC8 requires 6 litres of water per square meter.
- To check proper hydration, the CC should feel wet to the touch several minutes after hydration.
- It is not recommended to rely on rainfall to provide hydration.
- To determine whether the CC has been sufficiently hydrated simply press your thumb into the CC and release. If water is present in the depression in the CC, it has been sufficiently hydrated. If no water is observed, then more water must be applied.
- For more information on hydration and for extreme temperature installations, please consult the [CC User Guide: Hydration](#).



Hydration



Hydration Touch Test

### 4.7 Setting

- **There is a working time of 1-2 hours after hydration.**
- **Backfill anchor trenches to create a neat termination and encourage surface water runoff to flow over the anchor trench and in to the CC channel.**
- **CC hardens to 80% strength in 24 hours and is then ready for use.**



Ensure Adequate Hydration, Don't Rely on Rainfall

### 4.8 Maintenance and Repair

- CC lined channels require minimal maintenance, provide long term scour protection, reduced silt generation and effective weed suppression.
- If damage is found during a periodic inspection, a patch can be placed over the damaged area extending a minimum of 150mm in all directions beyond the damaged area and attached with mortar or an approved sealant.



Backfill Anchor Trench

## Detailing Examples



Baffles can be formed by laying CC over fabricated wooden structures or sandbags



Sand bags can be used to compress joints during setting



A suitable mortar can be used to join and seal CC to existing infrastructure



Retrospective pipe penetration



CC can be easily manipulated to form ditch junctions and terminals



CC can be installed around existing infrastructure

## Additional Reference Material:

- [CC User Guide: Jointing and Fixing](#)
- [CC Standard Detail Drawing - Transverse](#)
- [CC Standard Detail Drawing - Longitudinal](#)
- [CC & CCH User Guide: Hydration](#)
- [CC Equipment List](#)

Pacifictek

Bellavista - Channel Lining  
La Serena, IV Region, Chile.

18,000m<sup>2</sup> - CC5™ (Bulk Rolls)  
June 2017

