



 **CONCRETE CANVAS®**

Concrete on a Roll

 **CCHYDRO™**

Containment on a Roll

INSTALLATION GUIDE: BUND LINING



The Queen's Awards
for Enterprise:
International Trade
2019



Board of Trade
Winner
2016



Winner
Technical Innovation Award



Innovation Award
ICE Wales Cymru Awards 2017



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RAIL



ROAD



MINING



PETROCHEM



AGRO



PUBLIC WORKS



UTILITIES



DEFENCE



DESIGN



SHELTER

1.0 General

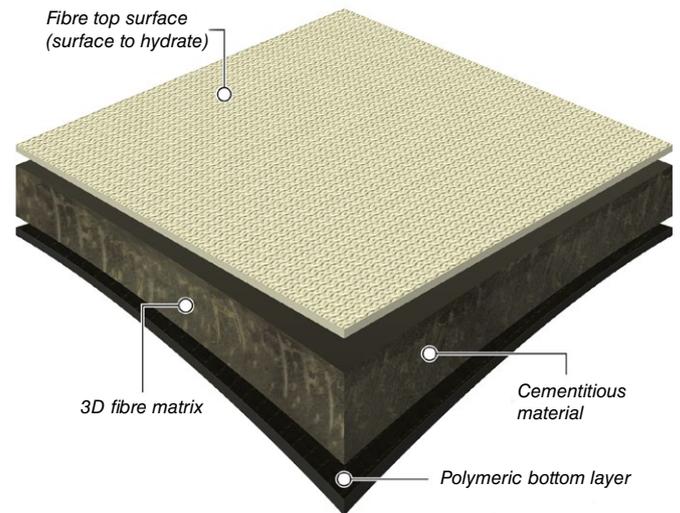
Concrete Canvas® (CC) is the original Geosynthetic Cementitious Composite Mat (GCCM) and the first product to declare conformance to ASTM D8364 'Standard Specification for GCCMs'. It is a flexible, concrete filled geotextile that hardens on hydration to form a thin, durable and waterproof concrete layer. Essentially, it can be described as *Concrete on a Roll*™ and is used for a wide variety of applications including the lining of secondary containment bunds to provide erosion control, weed suppression, protecting against animal damage and reducing maintenance.

CC Hydro™ (CCH) is a Geosynthetic Cementitious Composite Barrier (GCCB) and combines the company's GCCM technology with a high impermeability, chemically resistant geomembrane backing. This high-performance barrier is thermally welded together with an air channel for on-site testing and is used for containment critical applications.

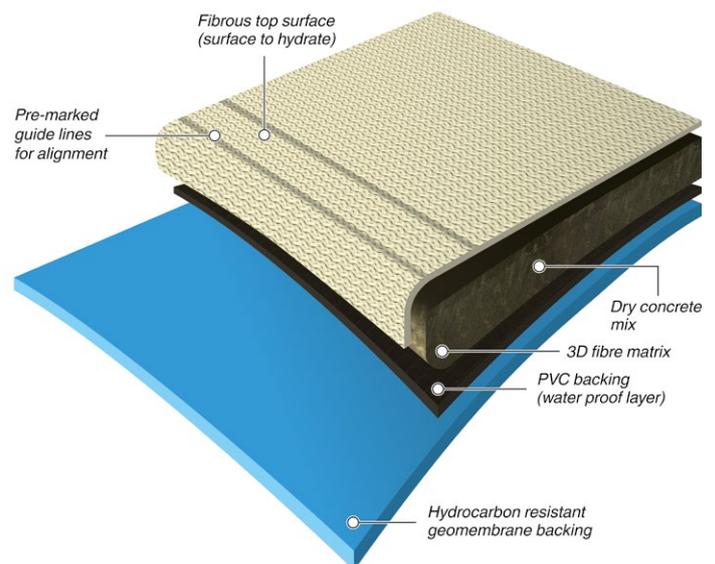
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Subject to the above, this document provides information based on standardised details, which may assist in the installation of CC and CCH for bund lining.

- This installation information should be read in conjunction with the construction drawings taking account of the designer's project specifications. Consult the [CC Specification Guide: Containment Structures](#) for detailed installation advice.
- The versatile nature of CC and CCH 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 conditions.
- The performance of the CC and CCH is wholly dependent on the quality of its design and installation. It is the installer's responsibility to adhere to these guidelines where applicable and to the project specification and construction drawings.



Typical CC cross section



Typical CCH cross section

2.0 Equipment Required

- Sufficient CC or CCH to complete the project including allowance for edge fixings, overlaps (and trial welds for CCH)
- Suitable lifting equipment to dispense CC/CCH Bulk or CC Wide Rolls
- Safety mask and gloves
- Cutting equipment, snap off knife or disc cutter
- Metal or plastic fixing pins and lump hammer
- For jointing CC: Screwdriver, stainless steel screws and adhesive sealant or alternative approved method to join the CC layers. See the [CC Equipment List](#) for full details.
- For jointing CCH: Automated hot air welder, generator, test equipment and associated ancillary equipment, see the [CC Hydro User Guide: Thermal Welding](#) for full details.
- Water supply
- For ordering, offloading and storage information, see the [CC & CCH Logistics Guide](#) for full details.
- Dust hazard. Wear appropriate PPE. Consult [CC & CCH SDS](#)



Equipment required

3.0 Substrate Preparation

Remove vegetation and grade the bund to a uniform profile to suit the design dimensions.

Remove sharp or protruding rocks >25mm and fill large voids.

Consult the construction drawings to verify if special subgrade preparation measures such as minimum bearing capacity requirements, installation of a non-woven geotextile, or if subgrade drainage details are needed. For CC Hydro it is important to install on a suitable subgrade to protect the geomembrane from puncture. Typically, a 25mm sand layer or geotextile is used.

If the perimeter edge of the CC/CCH is terminating in a soil subgrade (i.e. it is not going to be connected to existing infrastructure), excavate anchor trenches at the toe of either side of the bund (or toe and crest if lining one side only). Anchor trench dimensions must be a minimum of 150mm x 150mm but may need to be increased to suit the designer's requirements to resist wind uplift.



Substrate Preparation

4.0 Deployment

CC must be placed to ensure direct contact with the surface to prevent void space.

Remove packaging (making sure to note the Roll ID) and unroll CC/CCH on the bund profile to suit specified layup (typically vertically), ensuring the fibrous top surface faces upwards, with the PVC membrane in contact with the ground. This is achieved by dispensing the roll by naturally unrolling along the ground rather than pulling material from the top. Avoid snagging the CC/CCH on the substrate. It is important to relax the material to relieve any tension generated in deployment. This can be achieved by lifting the CC/CCH layer by hand and repositioning. The installer can adjust the material to remove any wrinkles and ensure the CC/CCH conforms to the substrate when hand repositioning.



CCH Deployment

Personnel must not wear damaging shoes and avoid walking on the CC/CCH surface to prevent staining, particularly with wet footwear prior to hydration. On restricted access projects where installers have no option but to walk on CC/CCH, the surface can be protected by using timber boards or ladders to prevent boots from creating depressions in the material.

Tuck the edge of the CC/CCH into the anchor trench before cutting to length. When cutting unset CC, a 15-20mm allowance should be left from the cut edge due to potential loss of fill. For CCH, at least 100mm excess should be allowed on each end for air channel testing. If cutting with a disc cutter, it is recommended to wet the cut beforehand to minimise dust generation.

Ensure the perimeter side edge of the first layer of CC/CCH is either suitably terminated into existing infrastructure and fixed to prevent wind and water ingress (e.g. using stainless steel clamping bar and gasket), or tucked into an anchor trench.



CCH Edge Cutting

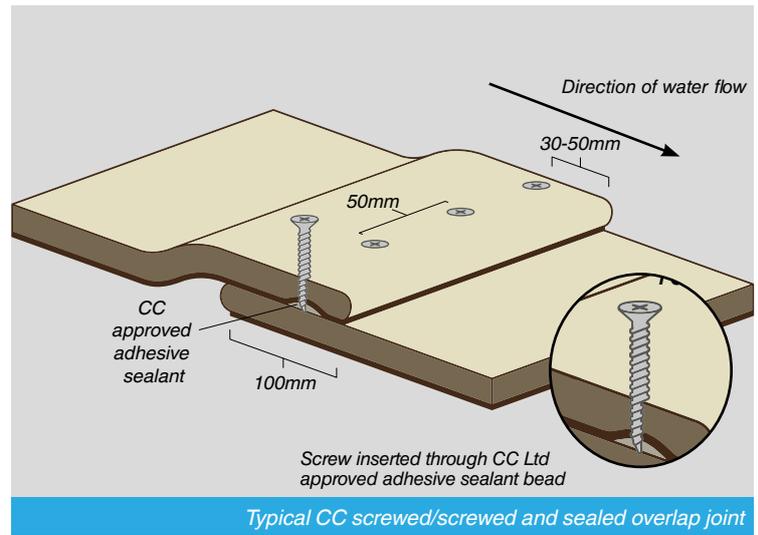
5.0 Jointing

Verify the specified joint method to be installed. For CC, ensure there is at least a 100mm overlap when positioning subsequent layers, and that the material layers are in intimate contact with each other.

5.1 For Concrete Canvas® Lined Structures:

5.1.1 For Screwed and Sealed joints:

- Fold back top layer and hydrate the material under the overlapped sections of the CC. This is important to ensure the joint cures to optimum strength. Once hydrated, the material remains workable for 1 to 2 hours
- Apply a CC approved sealant as an 8mm diameter continuous bead along the line of where the screws will be positioned (eg. for a 100mm overlap with screws 30mm from the edge of the top layer, the sealant bead needs to be 70mm from the edge of the bottom layer)
- Fold the top layer back into position and insert stainless screws at 50mm centres, 30-50mm from the edge of the top layer so that the screw is inserted through the adhesive bead.



5.1.2 For Thermal Bond joints:

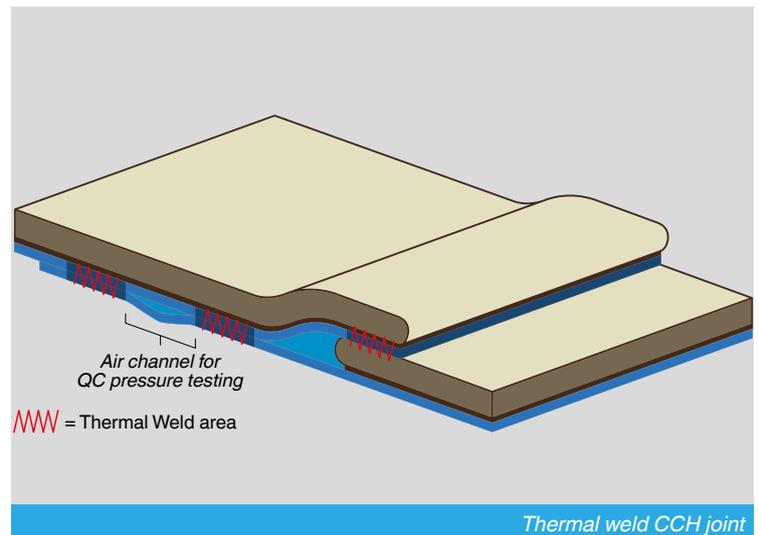
- Ensure CC remains dry and unhydrated before jointing
- Follow section 5.2.2 of the [CC Specification Guide: Containment Structures](#) for the correct procedure.

Ensure there is no rucking at the joint and both layers are in contact with each other.

5.2 For CC Hydro Lined Structures - Thermal Welding of Joints:

- Ensure CCH remains dry and unhydrated before jointing.
- Follow the [CCH User Guide: Thermal Welding](#) document.
- Conduct air channel testing at the test frequency specified by the designer.

Care shall be taken during installation to avoid damage occurring to the CC/CCH. Should the CC/CCH be damaged during installation and before hydration, the layer should be removed and replaced.

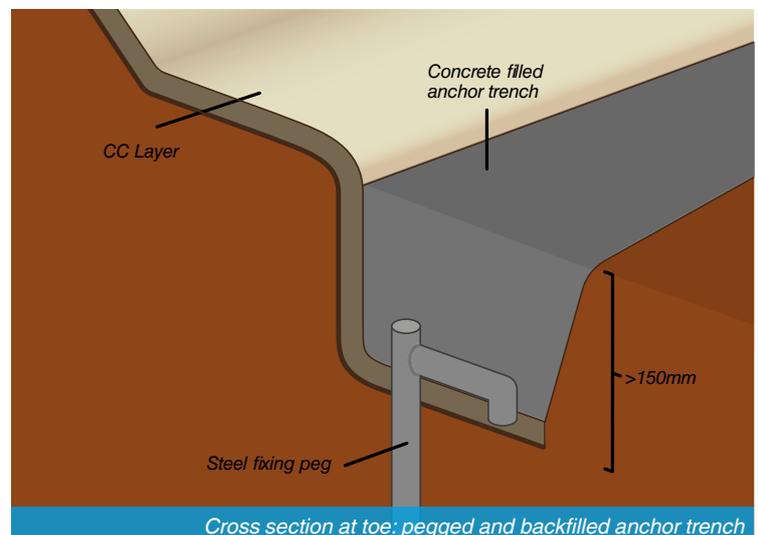


6.0 Perimeter Edge Fixing

It is essential that all exposed (i.e. unjointed) perimeter edges of the CC/CCH must be secured prior to hydration to prevent movement during curing and wrinkling during subsequent thermal expansion. Perimeter fixing is also needed to eliminate wind ingress and wind action which can result in uplift.

6.1 When fixing to Soil (i.e. using anchor trenches):

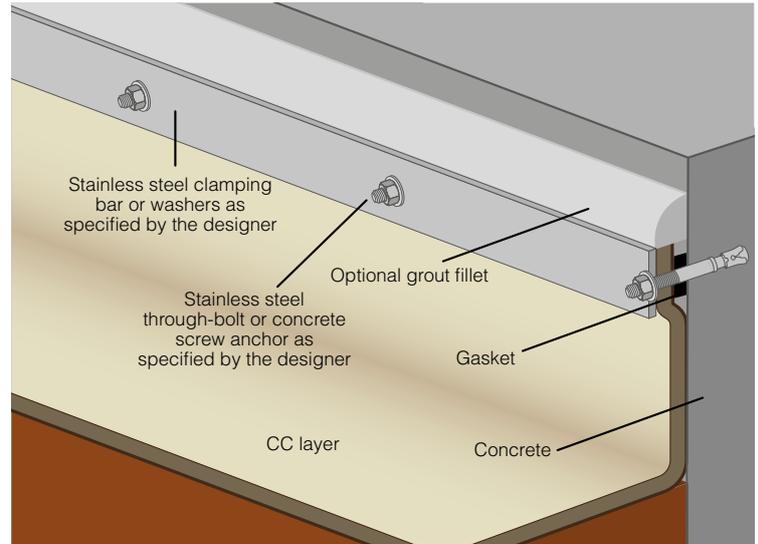
- Position the CC/CCH into the anchor trench so the material rests in contact with the subgrade.
- Check the designers requirements for pegging (as a liner may be present beneath the trench that must not be punctured). If pegs are specified, secure through each CC/CCH overlap.
- The CC/CCH should be hydrated before backfilling. The backfill may be soil or concrete, depending on the designers requirements to resist erosion and wind uplift. Consult the construction drawings.



6.2 When fixing to Concrete/Masonry/Rock:

- Consult the construction drawings for the mechanical fixing specifications and fixing spacings.
- Position the CC/CCH against the structure and drill a pilot hole through the material and the structure before inserting the mechanical fixing.
- Use appropriate sealant/gasket and washers/clamping bar as specified by the designer to ensure a watertight seal.

Ensure the perimeter side edge of the final layer of CC/CCH is either suitably terminated into existing infrastructure and fixed to prevent wind and water ingress (e.g. using stainless steel clamping bar and gasket), or tucked into an anchor trench.



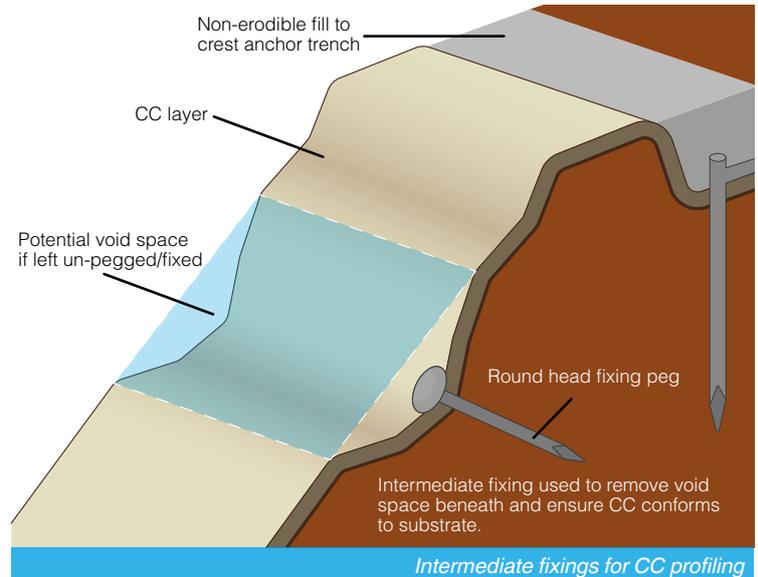
Edge fixing to concrete: clamping bar with neoprene gasket and grout fillet

7.0 Intermediate Fixings

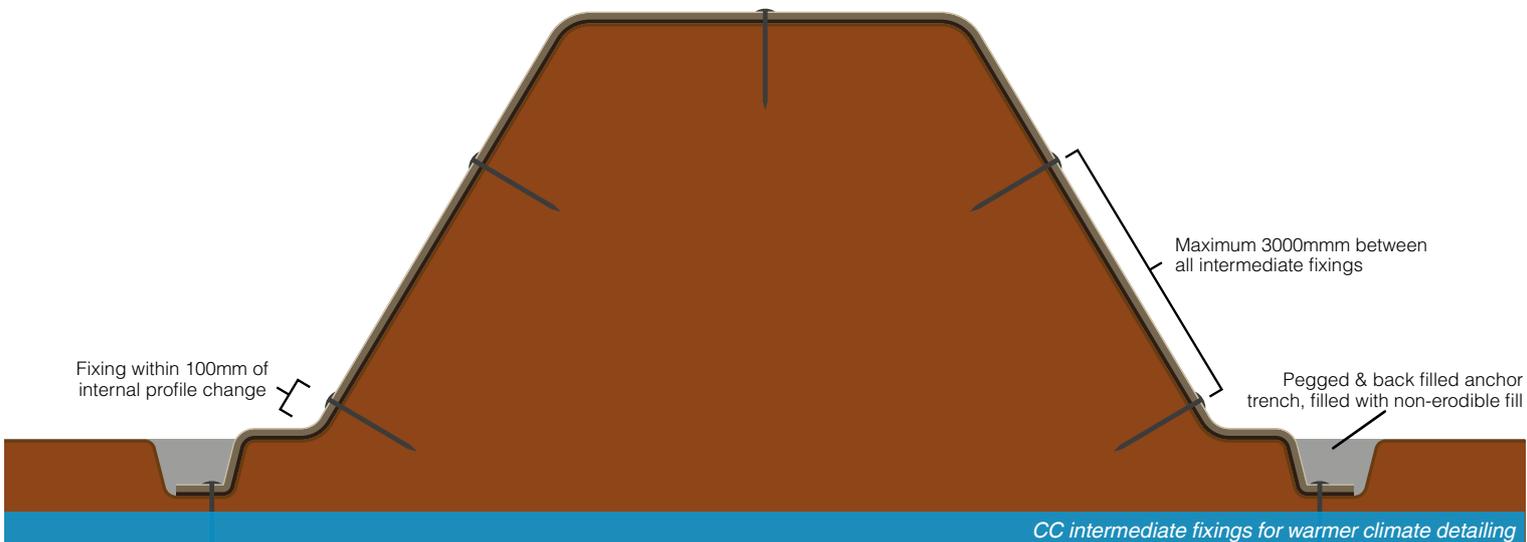
Additional intermediate fixings may be necessary to profile CC/CCH on uneven substrates to ensure it conforms to the underlying surface and remove voids, or to resist the following load conditions:

- Warmer Climate Detailing: e.g. where CC profile lengths exceed 3m
- Wind Loads: e.g. in exposed locations where CC slope lengths exceed 7m (20m for CCH)
- Large Structures/bund floors where CC/CCH panel lengths exceed 30m

The intermediate fixing type, performance requirements and installation locations should be specified by the designer to suit the anticipated load conditions. For CC, 'round head' fixing pegs are typically used for profiling and warmer climate detailing. When a greater head plate diameter or pull-out strength is required, for example when designing to resist wind uplift, larger intermediate fixings such as Earth Percussion Anchors may be specified. For CCH, any intermediate fixings should not penetrate the geomembrane backing layer unless the penetration can be adequately sealed. Typically, the CCH is captured in concrete backfilled anchor trenches, or when lining concrete substrates clamping bar, gasket and mechanical fixings are used. Consult the construction drawings.



Intermediate fixings for CC profiling



CC intermediate fixings for warmer climate detailing

8.0 Bespoke Detailing

Consult the construction drawings for bespoke detailing such as baffling, accommodating pipe penetrations securing around upstands and steps.

9.0 Hydration

If necessary, the Installer must place temporary ballast, such as sandbags, on top of the laid CC/CCH prior to hydration to prevent wind uplift and ensure that it lies flat to the substrate on undulating ground to prevent voids from forming underneath the material.

After fixing and jointing, the surface of the CC/CCH can be brushed clean to remove marks and debris before spraying with water to hydrate.

Spray the fibre surface multiple times until the CC/CCH is fully saturated. The wet CC/CCH will first darken and then become lighter as it absorbs the water.

Do not spray high pressure water directly onto the CC/CCH as this may wash a channel in the material.

CC/CCH can be hydrated using fresh water or salt water, it is not possible to over hydrate CC/CCH and it will hydrate and set underwater.

A minimum volume of water equal to 40% of the material weight is required. For example, CCT2™ requires 5 litres of water per square meter.

To check proper hydration, the CC/CCH should feel wet to the touch several minutes after hydration. Press your thumb into the CC/CCH and release. If water is present in the depression in the CC/CCH, it has been sufficiently hydrated. If no water is observed, then more water must be applied.

Specific hydration methods are required in drying conditions (installing in high air temperatures (>22°C), wind (>12km/h), strong direct sunlight or low humidity (<70%)) and in low temperature conditions. Please consult the CC User Guide: Hydration which is also attached on all CC/CCH Bulk rolls.

It is not recommended to rely on rainfall to provide hydration.

10.0 Setting

There is a working time of 1-2 hours after hydration.

Backfill anchor trenches with non-erodible fill as specified in the construction drawings.

CC/CCH hardens to strength in 24 hours and is then ready for use.

Allow the CC/CCH to cure for at least 48 hours before applying any post installation surface treatments such as jet washing or painting.

11.0 Installation Sequence

Planning of CC/CCH installations is necessary to ensure tools and materials (e.g. hydration water) is available when required.



CC termination to existing infrastructure



External corner detail with cover layer



Pipe penetration

Only install what can be fully jointed, fixed 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/CCH overnight with waterproof sheeting to enable jointing on return to work.

An example CC install sequence is described below:

- Morning - Deploy CC panels and secure along the perimeter edges.
- Early afternoon - Jointing of panels (e.g. hydrate under-lap, apply sealant, screw joints), install intermediate fixings.
- Late afternoon - Hydration (following drying/low temperature condition guidance as required).

Note for CCH, jointing and any required air channel testing should be carried out as each new panel is deployed.

12.0 Inspection, Maintenance and Repair

CC/CCH lined structures should be inspected 24 hours after hydration and at regular intervals thereafter. Consult the [CC User Guide: Inspection, Cleaning and Maintenance](#) for more details. For the majority of projects, CC and CCH do not require cleaning or maintenance. If damage is found during a periodic inspection, contact [Concrete Canvas Ltd](#) for repair advice.

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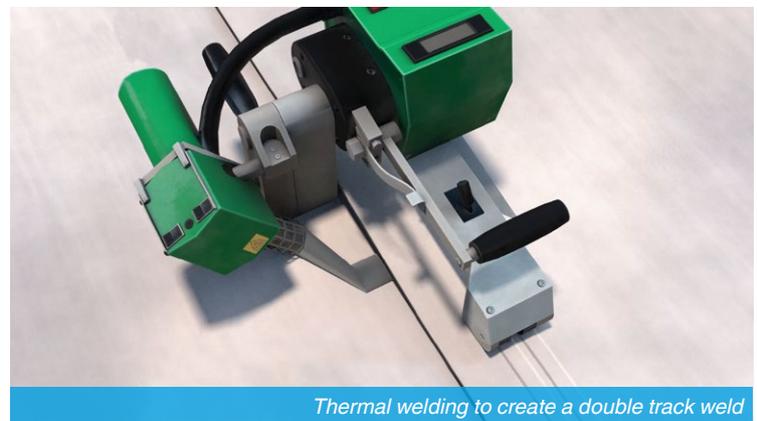
Patent and trade mark information concerning our products can be found at <https://www.concretcanvas.com/patent-trademark-info/>.



Hydration



Fill anchor trench with concrete or aggregate



Thermal welding to create a double track weld



Pressure testing for CQA purposes