


Project Info

 13 / 10 / 20


 CCX-M™

 50m²

 Longitudinal layers

 Tzaneen, South Africa

 Kingdom Civils

 CCX-M™ was installed on a trial basis to establish its effectiveness for remediation of an existing concrete lined canal



Completed CCX-M™ canal lining installation

Project Introduction

In October 2020, Concrete Canvas CCX-MAT™ (CCX-M™) was installed on a trial basis at a site in Tzaneen, South Africa.

The objective of the project was to provide a rapidly installable and non-erodible remediation solution for an existing concrete lined canal. The client, Pusela Irrigation Board (PIB) opted to trial CCX-M™ in order to determine its ease and speed of installation as well as to demonstrate and monitor material strength and durability.

The section of canal being lined in this trial was part of PIB's feeder canal to a local avocado farm. The existing concrete lined canals are approximately 50 years old and require regular remediation by crack sealing, panel replacement and joint reinstatement. As a result of the current condition, the canals leak with a significant amount of water loss in a very water-sensitive region.

The section of canal being lined measured 25m in length, with a parabolic profile measuring approximately 1.7m wide. CCX-M™ was installed by Kingdom Civils for PIB, with guidance and support provided by a representative from Concrete Canvas Ltd and Kaytech on site.

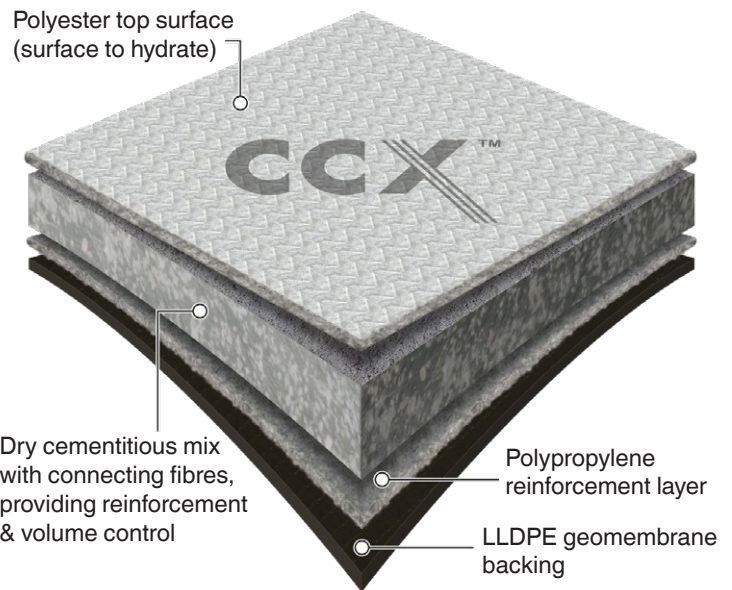
*Geosynthetic Cementitious Composite Mat

Specification of CCX-M™

The PIB currently use a number of different methods for remediation of damaged sections of canal. Conventional cast in situ concrete is used for re-lining or replacement of damaged panels whilst crack sealing with grout is typically used where cracks are small enough to attempt remediation. Where sections of canal are significantly damaged it has also been deemed more feasible to replace the canal with buried pipe.

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-M™ consists of two interconnected layers of geotextile that encapsulate a specially formulated dry concrete mix. A 0.3mm thick LLDPE geomembrane backing ensures the material has high impermeability whilst the composite geotextile reinforced concrete top cover provides a high degree of long-term durability.

CCX™ can be rapidly unrolled to line existing or new earth canals as well as remediating existing concrete canals. It is significantly faster, easier and more cost effective to install than conventional lining methods. As a result, CCX™ is the ideal solution for lining and remediation of irrigation canals, increasing their operational life and significantly reducing water seepage losses.

Installation of CCX-M™

The 1.95m wide CCX-M™ rolls were delivered to site by Hiab truck without any logistical complications due to the availability of an access road directly adjacent to the canal. The rolls were lifted from the truck using a spreader beam and unrolled longitudinally along the length of the chosen canal section.

A single overlap was formed at the end of the roll to demonstrate the proposed future mechanism for jointing. The overlap joint created was 100mm wide and thermally bonded using a hand-held hot air welder. This consisted of the LLDPE backing being bonded to the Polyester top surface of the underlying lap at a temperature of approximately 450°C and speed of 1.5m/min.

Once the overlaps had been bonded, the CCX-M™ was anchored to the concrete canal using shot-fired nails. In order to reinstate a high degree of impermeability at the position of these nails, an epoxy covering was applied measuring approximately 50mm in diameter. Shot-fired nails were also used to fix the CCX-M™ internally at 400mm spacing, 100mm from the top of the canal to the underlying concrete substrate. These nails were again covered with an epoxy.

Installation of CCX-M™ continued...

The CCX-M™ edges were terminated in a shallow anchor trench directly behind the top of the existing 50mm thick concrete. These edges were secured using 250mm long anchor pegs created and bent on site from 12mm thick high tensile steel straight bar. The shallow anchor trenches were backfilled with in situ material and compacted by hand.

The CCX-M™ was hydrated by hose pipe attached to a generator pump. Water was pumped from the main canal just upstream from the installation. CCX-M™ was hydrated 3 times at 15-minute intervals to saturation and then one last time prior to completion of the installation.



CCX-M™ rolls deployed from Hiab and spreader beam



Termination slot created to secure CCX-M™ edge



Shot-fired nails used to secure CCX-M™ edge within termination slot



Shot-fired nails and CCX edge covered with epoxy to restore impermeability



Creation of downstream termination slot in existing concrete



Fixing CCX-M™ to channel invert with nails and washers



Installation of shot-fired nails



All nails were covered with epoxy



CCX-M™ secured within shallow anchor trenches using custom pegs



Sandbags laid over CCX-M™ edges to prevent lifting during installation



Thermal welding of CCX-M™ joint



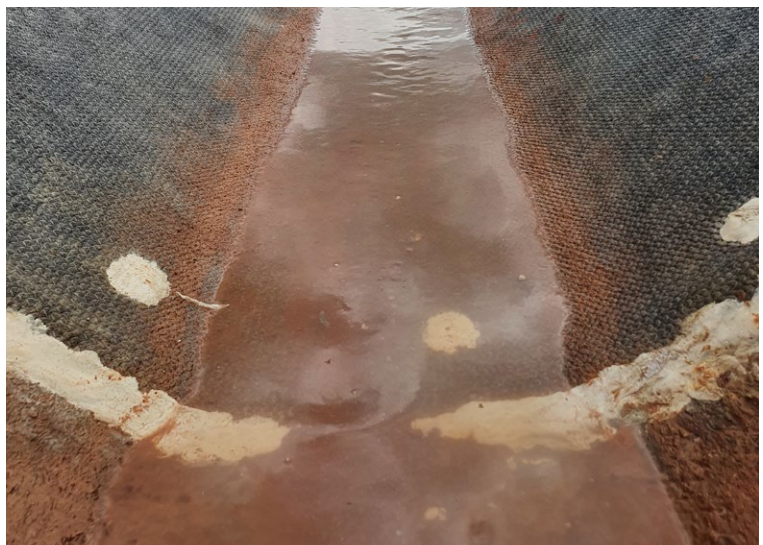
Hydration



Completed installation following hydration



Shot-fired nails were also inserted in overlap joint and sealed with epoxy



Termination of CCX-M™ installation into existing concrete channel

Project Outcome

A total of 50m² of CCX-MTM were installed in around three hours by a team of six in moderate heat and humidity conditions.

The trial was very successful and is currently under consideration by the PIB for use as a remediation solution for the full scope of their canal scheme.

The 50m length of canal lined with CCX-MTM is noticeably more efficient than the unlined sections. CCX-MTM provides a more durable, erosion resistant solution with considerably reduced permeability than those currently incorporated on the canal network and is fit for purpose for all future canal linings of similar terrestrial conditions.



Completed installation