


Project Info

 04 / 09 / 20


 CCX-M™ Custom Rolls

 6m²

 Transverse layers

 Abergavenny, Wales

 Concrete Canvas Ltd.

 CCX-M™ installed on a trial basis to establish its resistance to puncture from cattle traffic



Cattle loading pad in use 24 hours after installation

Project Introduction

In many canal lining applications, clients often ask us how our material performs under cattle loading conditions, specifically puncture performance, when cows or other heavy animals make their way to the edge to drink or wallow in the canal. In order to simulate this application, CCX-M™ was selected for creation of a pad over which approximately 400 dairy cattle pass in the morning and evening, going to and from milking.

The installed CCX-M™ could thereafter be monitored for puncture resistance 24 hours after installation as well as over the medium and long term. The overall purpose of the project was to establish whether CCX-M™ can withstand the puncture loading associated with cattle hooves.

In September 2020, Concrete Canvas CCX-M™ was installed on a trial basis for this application at a dairy farm in Abergavenny, Wales.

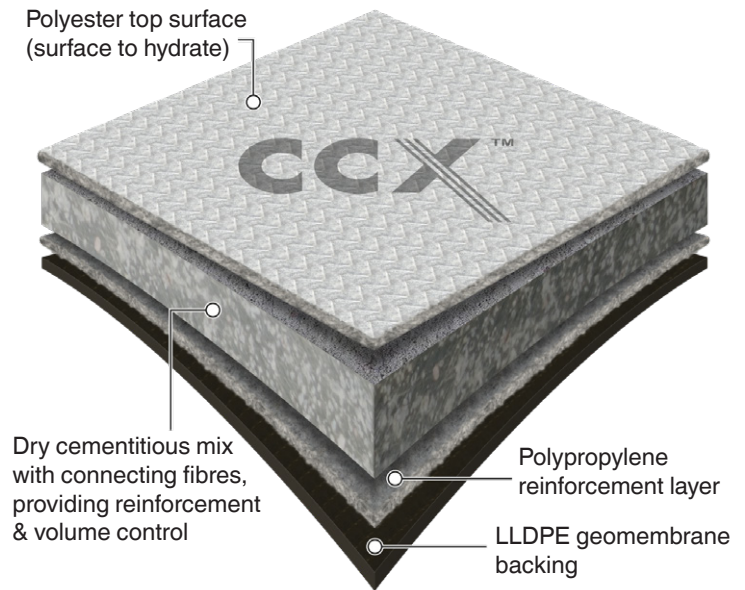
The pre-existing access to the dairy is covered with precast concrete railway sleepers approximately 2m long by 0.2m wide and 0.2m thick. These sleepers are laid side by side to effectively create a hard-wearing surface. The benefit of these sleepers is that they are easy to install but are very costly.

Introduction to CCX-M™

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™

Dairy farms are typically quite messy with waste and slurry generated by cattle. On the day of the installation, all waste material had to be cleared, the sleepers removed and the void left by the sleepers backfilled to create a well compacted pad.

In order to improve the stability of the substrate, it was first hand compacted at the level of the pad base. The void was then backfilled with a well-graded gravel which was then also hand compacted and covered with a low-grade geotextile layer. Finally, a layer of sand screed was installed and covered with a second layer of geotextile.

Once the ground preparation was completed, the CCX-M™ was laid by hand to form a transverse joint mid-way across the pad, perpendicular to the direction of cattle traffic. The outer edges of the CCX-M™ were then tucked over the sides and fixed with countersunk wedge anchors to the top of the sleepers. An overlap of approximately 250mm was created to determine how the exposed overlap edge performs under hoof. Adhesive sealant was applied to this overlap before it was mechanically fixed with a double row of screws at 100mm spacing in a staggered configuration.

CCX-M™ was hydrated by hand using a watering can. The surface was hydrated 3 times at approximately 15-minute intervals to ensure sufficient saturation.



Site prior to installation



Removal of sleepers



Realignment of outer sleepers and compacting substrate



Installation of geotextile separation layer



Gravel compacted



Sand screed layer



Second layer of geotextile



Installation of CCX-M™



Edges sealed and underlap hydrated prior to jointing



Overlap jointed and edges fixed to concrete sleepers below



Installation completed and hydrated



Loading pad in use

Project Outcome

A total of 6m² of CCX-MTM were installed in around three hours by a team of four in 20°C. Despite dry conditions on the day of the installation, rain was anticipated that night.

The pad was left to cure for 24 hours prior to opening it to cattle traffic. Monitoring of the pad under loading began immediately, with no evidence of any puncturing, cracking or other forms of degradation observed.

The project was deemed successful with puncture load resistance very much evident. There was also extremely little impact on the operating capacity of the dairy with cattle simply diverted around the installation site during the 24-hour curing period.

Assuming that the average dairy cow weighs 600kg and that the full weight of the cow is transferred to 2 hooves whilst walking, it can be deduced that each hoof applies a force of approximately 3kN over an area roughly 100mm in diameter.

Considering that there are 1600 individual cattle trips per day to and from the dairy and half of those cattle traverse the pad then a total of 1600 hoof loads are applied to the pad daily.

In the 4.5 months from installation to writing of this report, there was no damage caused to the CCX-MTM under an extrapolated load of 216,000 hooves. This is a considerable achievement and significantly demonstrates the strength and durability of CCX-MTM.



No evidence of scuffing, puncture or damage after 100 passes



CCX-MTM installation intact after 100 passes

Return Visit - Six Months After Completion

Six months after completion of the project, we returned to inspect the material. It was found to be performing as intended, with no signs of erosion or damage despite six months of cattle use, trafficking by tractors and snow and freeze-thaw weather events over the winter.



Tractor traffic has had no impact on the CCX material



There were no evident signs of damage or abrasion to the

“We have been looking for a new, more feasible lining option for our dairy farm level trial section of cow track and CCX has proved to meet all our needs. Not only did it provide negligible interruption to our operations but it has proven to be extremely robust under constant loading over the course of its first winter. There is no noticeable damage of the lining after almost 7 months and 400 000 cattle hooves to date and we would not hesitate to recommend it to our fellow agricultural community.”

Dairy Farm Owner