

## Project Info



November 2019



CC5™ Bulk Rolls



1,400m<sup>2</sup>



Transverse and Vertical layers



Marula Mine, South Africa



Adferiad



CC was used to remediate an existing dam embankment at the Marula Mine in South Africa.



Right justified picture caption

## Project Introduction

In November 2019, Concrete Canvas® (CC) GCCM\* was specified as a remediation solution for an existing dam at the Marula Mine in South Africa.

The existing dam was previously constructed using a concrete filled geocell, which had become damaged over time. As the individual geocells had been filled with concrete independently, there was no continuity in the lining. This had led to significant cracking between the geocells themselves as the liner was unable to sustain differential settlement of the dam embankments.

The cracking at the crest of the embankment had resulted in a significant gap between the geocells. These cracks provide a leak path, resulting in further settlement of the embankment, but also a trip hazard for those requiring access for inspection and maintenance of the dam. It was determined that a quick and cost-effective remedial solution was required for refurbishment of the lined dam perimeter and crest.

\*Geosynthetic Cementitious Composite Mat



## Specification of Concrete Canvas® GCCM

Removal and replacement of the existing concrete filled geocell system, as well as casting of in situ concrete slabs were considered as solutions for the refurbishment project. However, neither of these options have the capacity to sustain future differential settlement capacity. The incorporation of these solutions would also make working in close proximity to the water in the dam very difficult, and would require a significant drop in water level in order to ensure a safe working environment. As a result, both of these options were discounted.

Ultimately, CC5™ was selected due to its ability to accommodate differential settlement of up to 50mm per linear metre. Its speed and ease of installation and also its ability to be installed very close to the water's edge without compromising the safety of the installation team or having to wait for water levels to drop also made it the most feasible option.

The works were carried out by Adferiad for Lebalelo Water Users Association with consultancy services provided by Ilifa Africa Engineers.

## Project Challenges

The environmental conditions on this site are typically hot to very hot. As a result, the potential for thermal expansion and contraction of the CC5™ relative to the underlying concrete also had to be taken into consideration to ensure that the CC did pull out from the edge fixings. For this reason, CC was terminated under a 150mm wide stainless steel cover plate at the toe, allowing for a maximum slip of 50mm of the CC5™ beneath.

## Installation of Concrete Canvas® GCCM

Prior to installation, all sharp and raised edges of the underlying concrete filled geocell had to be ground down with an angle grinder to prevent puncture of CC's PVC rear surface. Large cracks were filled with cement-stabilised gravel and compacted flush with the existing surface. At the crest of the existing lining, a slot approximately 50mm wide was cut and the internal material removed. This gap was then filled with more compressible cement-stabilised gravel to allow movement of the substrate at either side of the crest.

Once ground preparation had been completed, lengths of CC5™ were laid in a longitudinal layup on the straights of the dam sides and transversely on the corners of the dam for ease of installation.

Subsequent layers were overlapped by a minimum of 100mm and these overlaps were thermally bonded using a Leister Triac hot air welder. The overlaps were then fixed to the underlying concrete with stainless steel wedge anchors at 200mm centres, positioned 50mm from the overlap edge.

On the internal face termination, CC5™ was positioned below the stainless steel plate to allow for slip caused by thermal expansion and contraction. On the external face, the CC was terminated in a shallow anchor trench and secured to the substrate using ground pegs positioned at 2m intervals and then backfilled with non-erodible gravel.

The CC was hydrated to saturation three times at 30-45 minute intervals following installation, and a final hydration was then given the end of each day.





*Dam embankment prior to works*



*Significant cracking was found at a number of points around the dam*



*Geocell section showing significant damage where concrete has broken up*



*Dam prior to works*



*Large cracks were filled with cement-stabilised gravel*



*Transverse and vertical layups used to accommodate the shape of the dam*





*Upper edge of CC lengths captured in anchor trench*



*Stainless steel wedge anchors used to fix CC to concrete below*



*Stainless steel plate allowing expansion and contraction beneath*

## Project Summary

The installation was carried out in just five days, with a team of six installers working at a rate of almost 300m<sup>2</sup> per day. A total of 1,400m<sup>2</sup> of CC5™ were installed over the course of the project. The project has been deemed a success and will be considered by the client and their representative for further projects.