

Project Info



28 / 04 / 14



CC8™ Bulk Rolls



6,125m²



Transverse layers



Oil Distribution Site, UK



Moulding Contracts Limited



CC8™ used to line a butyl rubber lined tertiary containment lagoon to provide fire resistance, protection against puncture and a secondary impermeable layer.



Completed installation

In April 2014, Concrete Canvas® GPCM* (CC) was installed as a fire resistant and impermeable protective layer to a 0.75mm butyl rubber lined tertiary containment / firewater run off lagoon at an oil distribution terminal site in the UK.

6125m² of CC8™ material was installed directly onto the incumbent liner which had reached the end of its serviceable life and had been degraded through 15 years of weathering, puncture and UV damage. The project was completed successfully over a 9 week period by Moulding Contracts Limited which included additional civils works associated with the upgrade of existing penstock systems and outfall discharge.

CC had been specified over a number of alternative solutions including shotcreting and GCL's (Geosynthetic Clay Liners). The sensitive nature of the surrounding infrastructure and the restricted site access prohibited sprayed concrete solutions where rebound could cause issues.

It was determined that Concrete Canvas® GPCM would provide a more cost effective approach over GCL's as it did not require excavation of the lagoon and subsequent removal of the existing liner, nor the costs associated with infilling with granular material to form the sub-grade. The CC option provided the greatest freeboard (which was maintained during construction) and required the least preparatory work and off site disposal of waste materials.

*Geosynthetic Cementitious Composite Mat





Sensitive nearby infrastructure



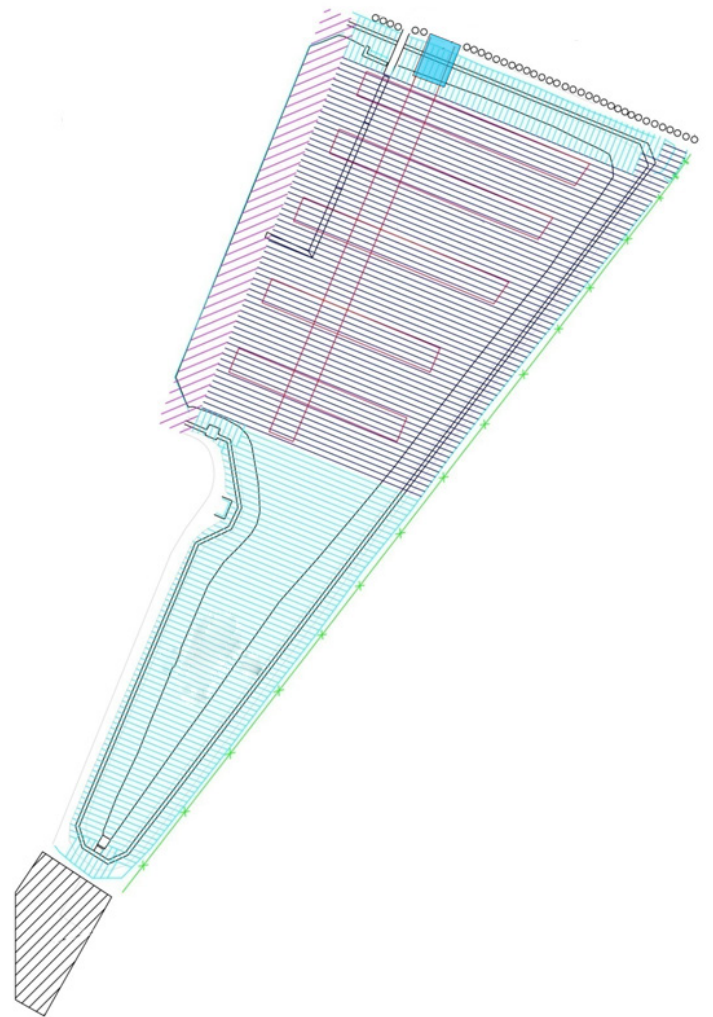
CC being laid directly onto the existing liner



Excavated anchor trench



Surface water before removal



Deployment Plan

The incumbent butyl liner was fixed along its perimeter by concrete flagstones or within anchor trenches. These were temporarily removed to release tension in the liner to reduce significant void space between the liner and substrate. Where required, cuts outside the lagoon were made into the liner to further release tension to provide intimate contact between the liner and substrate. Care was taken to ensure the integrity of the internal lining system was not compromised.

The section along the eastern bank of the lagoon adjacent to a fence perimeter had been backfilled covering the original lagoon lining up to the level of the flagstones. This was excavated, with the fill retained for backfilling following installation.

Due to differential settlement of the sub-grade a degree of surface lying water within the lagoon was noted. This was removed via pumps and squeegees prior to installation. This was undertaken to prevent premature hydration of the lead edges of the CC prior to welding and grouting.

A deployment plan was predetermined to ensure maximum efficiency by maintaining a 90° pattern and avoiding cross welds on batters. Furthermore the plan aimed to minimise the number of grouted seams and ensure welded seams were shingled in the direction of the designed fall within the lagoon.



20T excavator manoeuvring a bulk roll to the lagoon centre



Attaching the leading edge of the CC to the 5T excavator



Spooling the CC across the span of the lagoon



Cutting CC using a guarded rotary blade to protect the liner



Thermal bonding of prayer joint



Welded joints prior to hydration and sandbagging



Joints weighted down after hydration



Grouted joints where welding not possible

To locate the 1.5T bulk rolls to the centre of the lagoon whilst protecting the integrity of the butyl liner, it was required to provide temporary access tracks down the centre of the lagoon with a protective geotextile (HPS30) and 20mm ply boards. A 20T excavator could then position CC8™ bulk rolls from the storage area at the northern bank, to the centre point of the lagoon.

By attaching the leading edge of the bulk roll with mould grips to a smaller 5T rubber tracked Hitachi excavator, CC could then be spooled across the width of the lagoon, avoiding any need for physical handling of the CC lengths. It was required to deploy sections of CC manually beneath the service corridor on the western bank. This provided no significant issues as rolls were cut to man portable lengths to avoid excessive manual handling.

Once each CC layer had been spooled to span the width of the lagoon from the spine, it was cut to length using a powered rotary blade with safety shield. CC is conventionally cut to length using open bladed utility knives, but these were banned from use on site. The safety guard on the rotary blade also minimised risk of damage to the butyl liner beneath.

Adjacent layers of CC were positioned such that they formed a 'prayer' joint where the two rear PVC faces of the material were brought together before folding over and thermally bonding. Thermal bonding was completed using a Leister Twinny S model at a rate of approximately 2.5m/minute.

Once thermally bonded, the leading CC edge was teased out with mould grips to recover overlapped material by reverting the joints to the vertical. The joints were then subsequently folded flat and compressed with strips of 10mm ply board and surcharged with sand bags prior to hydration to minimise the profile and prevent perched water traps. The Twinny S welder was calibrated each day to take into account ambient temperatures and trial welds were tested to destruction to measure the effectiveness of the weld settings. An indication that a weld of maximum strength has been achieved is where de-lamination of the PVC backing from the CC occurs in a basic pull test.

Once a phase of deployment had been completed, the CC was hydrated via hose connected to the local fire main. Care was taken to protect the leading edge of CC from premature hydration via the hydration process or through natural precipitation, by rolling the edge back on itself, lifting from the floor of the lagoon and covering with tarpaulin.



Hydrant up stand wrapped in CC collar secured at top with band



5mm plate with Fischer stud anchors at 100mm centres



Grouted corner joints of concrete plinth



Corner detail



Narrow South end of the lagoon

At terminations between CC and the existing concrete infrastructure, the CC was lapped up the fixture by a minimum of 150mm before applying a continuous 5mm bead of CT1 sealant between the PVC face and the fixture. The leading edge was then secured in position with a clamping band around circular fixtures or 100mm x 5mm galvanised steel bar along flat edges. The fixings to the concrete headwalls and steps were Fischer stud anchors which maintained a minimum of 75mm wall anchorage. Once the full area of CC had been installed, the flag stones around the perimeter of the lagoon were replaced and the excavation along the eastern bank backfilled.

The project was completed over a 9 week period, with the CC installed at an average rate of between 250-300m² per day using a team of 6. The client was impressed with the speed and ease of install and are looking to specify CC on future projects within their extensive oil and gas network. The CC lining will greatly increase the operational life span of the lagoon whilst significantly upgrading its permeability and fire protection, improving the overall safety and compliance of the site.

“Although MCL tend to specialise in geotextile / geomembrane / GCL installations we found the ease of deployment and welding of the CC8 to be comparable with other products we have used in the past. The backup support we received from Concrete Canvas during the project was first class... A great project all-round.”

Benedict M Smith
Commercial Manager, Moulding Contracts Limited.



Completed installation



Edge finishing: replacement of flag stones and backfilling along palisade fence



Completed installation