BLOW DOWN PIT LINING

Project Info

- 14 / 01 / 14
- CC8™ Bulk Rolls
- 875m²
- Vertical layers
- Middle East
- Undisclosed
- CC8 used to rapidly line a blow down pit to provide weathering protection and impermeability.

Completed, lined blow down pit

The objective of this trial was to line a blow down pit using Concrete Canvas® GCCM* (CC), a flexible, concrete impregnated fabric that hardens on hydration to form a thin, durable, water proof and fire resistant concrete layer. The trial installation was proposed to demonstrate the speed and ease of using 8mm thick CC (CC8™) to line a berm against traditional concreting. The primary function of the CC was to improve the berm impermeability and protect against weathering erosion.

The pit is located at a 250'000 acre oil field in the Middle East, operated by a large petroleum company. The viscosity of the oil reserve and the local geology on site is such that high pressure steam is required to aid the recovery of crude oil. Exhaust steam is piped into blow down pits where hydrocarbon contaminated water is condensed through pipe manifolds and allowed to collect in an excavated reservoir, referred to as a 'blow down pit'. The fluid is allowed to naturally evaporate and the contaminate material is periodically removed via dredging.

Conventional concrete lining of blow down pits involves using in-situ poured concrete and shuttering with re-bar reinforcement. This can typically take anywhere from 9 to 12 weeks, from breaking the ground to completion, depending on the size and accessibility of the site.

*Geosynthetic Cementitious Composite Mat

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Project site

Steam generators

Conventional poured concrete blow down pit

Steam condensing pipe manifold

The dimensions of blow down pits vary considerably, according to the capacity requirement and the number of attached steam generators. The dimensions of the pit to be lined in this instance were 37m in length, 25m wide and approximately 2.5m deep.

Details included concrete steps with handrails in the eastern and western berms, two concrete plinths in the northern berm for subsequent steam pipe mounting, a 1.5m deep sump pit in the north east inner corner of the pit and an 800mm square concrete pillar set into the northern berm.

The geology of the site was approximately 0.5m of overlaying sand, a further 0.5m of mixed sand and unconsolidated rock, and at least 35m of underlaying rock. Analysis of the rock demonstrated a high degree of impermeability and therefore there was no requirement to line the base of the pit.

An anchor trench was excavated around the outside perimeter of the berm with a depth of 200mm and a width of 300mm. A similar sized anchor trench was excavated in the inner perimeter at the foot of the berm. Both trenches were to be filled with poured concrete after CC installation as a means of anchoring the material into the substrate. The profile of the berms was made smooth by removing any protruding rocks prior to CC install.

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Excavated blow down pit prior to lining, with anchor trenches along inner and outer perimeters

Concrete plinth for mounting pipework

Concrete steps in western berm

Concrete pillar inset into northern berm

Concrete steps in eastern berm

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Unloading CC bulk rolls from the 40T flatbed delivery truck

Unloading bulk rolls via lifting straps

CC bulk roll on dispensing trolleys for cutting to batched lengths

Positioning the man portable batched rolls of CC on the berms

7 bulk rolls were delivered to site on a 40T flat bed truck. These were craned off the truck using loading straps. Typically, installations of this size would normally require unrolling bulk rolls of CC down the slope face on a spreader beam and cutting them to length in situ. Due to restricted access, the bulk rolls were batched to man-portable lengths and carried into position.

Three methods of joint sealing were demonstrated in this trial; thermal bonding, application of adhesive sealant and grouted joints, in order to assess the speed and logistical requirements of each method. The southern and western banks were thermally bonded whilst sealant was used on the northern and eastern banks. Localised areas were also sealed by grouting.

Overlapped layers of CC can be thermally bonded by positioning their PVC faces together in a ‘prayer’ type joint and applying the thermal welder. Once bonded, the overlap is hydrated and folded flat to create a strong mechanical joint. Some CC layers were joined by using a double bead of CT1 adhesive sealant between the PVC faces of overlapped CC layers in a prayer joint. This was achieved by folding back two adjacent layers of CC to expose the PVC faces, applying two continuous 6mm beads of CT1 from a cartridge gun and compressing the two layers together before hydrating and folding the overlap flush.

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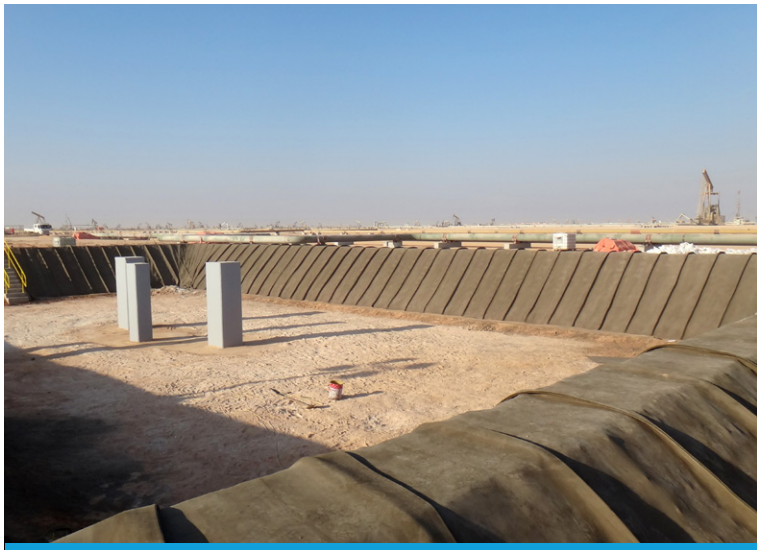
Thermal bonding on the berm face

Thermal bonding on the berm face



Completed thermally bonded banks

6mm continuous double beading on the PVC faces

Folding over and compressing

CT1 sealed corner detail prior to hydration and folding overlaps flush

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Cutting out the 100mm offset of plinth through laid up CC

CC edges tucked into anchor trench to expose plinth

Laying up sections of CC above and below the pillar

CC edges lapped, fixed and grouted to pillar face

CC fixed to stair edge with steel strips

Completed stair section with grouted edges

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250mm steel ground pegs were used to fix the CC joints in the correct orientation and to further secure the CC to the substrate at the crest.

Prior to hydration, all joints were folded over flush and compressed using scaffold boards weighted with sandbags. Hydration was completed using a 5000 gallon tank with attached petrol pump using a 4” hose. Hydration was started at dusk to avoid over drying during the high day time temperatures. Following an initial hydration, certain areas were subsequently rehydrated an hour later.

Following hydration, the inner perimeter anchor trench was back filled with concrete to capture the end sections of CC whilst providing an impermeable transition between the pit floor and CC lined berm.

Fixing CC to the substrate

Sandbag weighted joints and hydration

Completed hydration

Applying concrete backfill

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Overview of project

Despite installing in a remote location, the pit was successfully lined, sealed and hydrated in less than 5 days. Conventional concrete pouring methods can take 9-12 weeks depending on site access. With the correct equipment in place and with an experienced installation team, a similar sized project could be completed in 2-3 days.

Comments from the client:

"The speed of install at 3.5 days for the material was significantly faster, with less traffic movement, than using our traditional method of concrete which would have taken 3 weeks. It was cheaper than using traditional concrete... the simplicity of the install was significant. What was interesting was the way it was just rolled out and cut with a Stanley knife and was very simple to manoeuvre into position. [We only needed] one truck and one truck mixer for the base as opposed to fifteen truck mixers then the need for curing for 7 days. With CC once we had watered it we walked away and had no cracking. Brilliant. [We] already have other projects and will be using CC in bund walling for mega ponds and other blow down pits on site. The ability to shape it simply with no form work is a great advantage along with the water and go."

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