

Project Info

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 CC8™ and CC13™ Bulk Rolls

 # 10,150m²

 Transverse layers

 Willow Creek mine, British Columbia, Canada

 Ledcor Group

 CC8™ and CC13™ used to line a carrier drain channel directing contaminated water from a mine to a settling pond



Completed lined channel and culvert

In February 2012, Concrete Canvas® GCCM* (CC) was used to line a carrier drain channel on the Willow Creek mine site in British Columbia, Canada.

Willow Creek is a large open pit mine located 45 kilometres west of the town of Chetwynd, in northeast British Columbia. The mine is a truck and shovel operation and is capable of producing both hard coking coal and low-volatile PCI coal for steelmaking.

The carrier drain channel was 10.5–12m wide, between 3–5m deep and approximately 650m long. The purpose of the carrier channel was to direct mining industrial waste from Willow Creek mine to a nearby settling pond.

The overall size, performance requirements of this particular application, as well as the cost potential meant that Ledcor were reluctant to use Shotcrete.

The client also specified that the lined channel had to be as water tight as possible, could handle freeze/thaw conditions, due to the cold winter temperatures in the area, and should be easy to repair. Following the recent success of a 52,000m² CC installation in the Alta Montaña III region of Chile, contractors Ledcor Group specified CC as a protective liner for the channel.

*Geosynthetic Cementitious Composite Mat

CC8™ and CC13™ were specified for the project and dispensed in bulk rolls from a spreader beam and plant equipment. The material was unrolled and cut to length on site, minimising waste as lengths were cut to match each section of the channel's profile. No perishable formwork or additional reinforcement was required.

CC layers were laid transversely across the width of the channel, with subsequent layers overlapping by 100mm and beaded with Sikaflex 1A adhesive sealant to create water tight joints. Overlaps were jointed using 25mm screws to ensure intimate contact with the substrate. Where possible, end edges were buried with loose shale and aggregate to prevent water ingress under the CC and provide a neat termination.

The channel was excavated from a blasted rock substrate, with some sections reinforced with concrete block work. CC layers were pinned into position at the top of the profile using 10" Ardox galvanised spikes. When fixing CC to the concrete block work, Hilti rock anchors were used.

The channel terminated in a 4m diameter corrugated steel and concrete block work culvert and sump which was also lined with CC to ensure minimum water loss. This was imperative as the water was contaminated from tailings and could not come into contact with any other water sources.



Large settling pond collecting effluent from nearby Willow Creek mine



Excavating sump and constructing culvert



CC bulk rolls dispensed using spreader beam and plant



CC deployed across channel width



Lining culvert with CC8™



Applying Sikaflex beading to joints



6" steel anchor nails with 1" hex head washers

Grout was chosen in areas that may be prone to heavier flows and related scouring, and used to seal edges of the material to ensure ingress would be avoided. In an effort to minimise the possibility of potential debris dams, grouting also eliminated the lip that was caused from the overlaps of CC layers.

The fibre reinforcement inherent in CC gives a durability and design life well above competitor geomembrane products, whilst the integral PVC backing ensures minimal water loss in the carrier channel. The CC will moss over in time, blending in with the surrounding environment but will prevent root growing vegetation, reducing the need for maintenance of the channel.

A swale was formed on the north ridge of the ditch at a nearby tree line to collect surface rainfall from an adjacent hillside, using the ability of CC to closely follow the profile of existing slopes and negotiate tight bends and curvatures.

CC has a working time of approximately two hours from hydration, meaning that work can continue in very wet conditions. This can reduce programme disruption typically caused by bad weather when using traditional concrete solutions. Plastic sheeting was used to protect the CC during setting when temperatures dropped to below -5°C.



Hydration of lower channel section



Hydration of top section of carrier channel



Swale was formed on the north ridge of the channel at a nearby tree line to collect surface rainfall from an adjacent hillside



Completed lined channel

A total of 10,150m² of CC material was installed by Leducor Group on schedule in under six weeks, on a remote site and in difficult weather conditions. Leducor were impressed with their first experience of installing CC, noting several advantages of using CC compared to traditional concreting methods: speed and ease of installation, minimal amount of training or specialist equipment required, ability to install CC in all weather conditions, minimal waste material compared to shotcreting. CC also provided substantial cost savings for the project.

“The end result is that there would have been an extra zero on the end of the price quote, if we had elected to use Shotcrete.”

Bud Fassnacht
Leducor Group,
Superintendent

“As an engineer, I liked the fact that CC was adaptable to changes in channel shape as we had segments of trapezoidal shape that had to transition to a rectangular shape. The drape characteristic allowed the CC to be placed on a pretty rough surface. Finally it seems that any future damages to the CC will be easily fixed by patching. This should result in very low maintenance costs.”

Michael Graham
Senior Geotechnical Engineer,
Norwest Corporation

5 years later the ditch is holding strong with minimal damage and minimal vegetation growth. The Willow Creek Mine is currently in shut down but is slated to possibly re-open in the later part of 2017

