



CONCRETE CANVAS APPLICATIONS

Malnar Leo, Matjašić Bruno, Kereš Boris

Monterra d.o.o., Croatia

Abstract

This presentation reviews few different applications of Concrete Canvas and Concrete Canvas Hydro material. Concrete Canvas is a flexible, concrete filled fabric which provides a thin durable concrete layer when hydrated or fully waterproof layer in it's Hydro variant. It's possible to apply concrete Canvas in many different ways, some of them are slope protection, weed suppression, canal lining, lagoon lining and erosion control. We are going to present our application of material at 3 different projects: securing waterproofness of area around gas tanks in luka Ploče, preventing fire outbreaks along railway in Slovenia and water drainage at hardly accessible locations in Serbia. Each project had it's problems where we found Concrete Canvas suitable replacement for conventional concrete solutions. In that way we delivered Investor faster and high quality solution which in the end resulted in lower expanses. We will show comparison between Concrete Canvas and standard methods that are usually used.

Keywords: concrete canvas, concrete canvas Hydro, slope protection

1 Introduction

Concrete Canvas is modern concrete alternative for erosion control applications, providing erosion control, abrasion resistance and weed suppression. Also it provides excellent impermeability. Since today material is used all over the world for a range of applications. Some most used applications are: Channel lining, slope protection, bund lining, concrete repair, weed control, culvert lining, lagoon lining, gabion protection, etc.

1.1 Material parameters

Regarding the application there are two types of material that can be chosen from, Concrete Canvas and Concrete Canvas Hydro.

Concrete Canvas

Concrete Canvas consists of a 3-dimensional fibre matrix containing a specially formulated dry cementitious mix. Underneath 3D fibre matrix, a PVC backing that ensures complete waterproofness can be found. Material gets it's compressive strength after hydration with water. Fibres inside material reinforce the cementitious mix preventing crack propagation and providing a safe plastic failure mode. As a result Concrete Canvas provides good alternative to traditional concrete. Material comes in 3 typical values. It can be 5mm, 8mm or 13mm thick. 24 hour Compressive strength of cementitious mix gets up to 50MPa while 28 day Compressive strength totals 80MPa. Concrete Canvas is Freeze-Thaw, weather, chemical, root, fire and abrasion resistant.

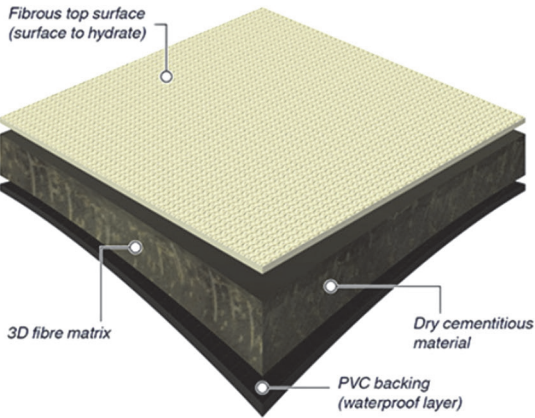


Figure 1 Concrete Canvas layers

1.1.1 Concrete Canvas Hydro

Concrete Canvas Hydro combines the concrete filled geotextile technology of Concrete Canvas with a highly impermeable, chemically resistant geomembrane liner as addition to regular PVC backing. The geomembrane liner allows joints to be thermally welded with a double or triple weld with a high-visibility welding strip that allows joints to be pressure tested easily on site. Material consists of fibrous top surface, dry cementitious material, 3D fibre matrix and PVC backing same as Concrete Canvas. Concrete Canvas Hydro has been independently tested to BS-EN-1377 to have a hydraulic conductivity better than 1×10^{-12} m/s. Also material has shown to have excellent resistance to a wide range of chemical reagents, including hydrocarbons, digestates and acidic leachates that makes it suitable for using within the Petrochemical and Oil and Gas industries.

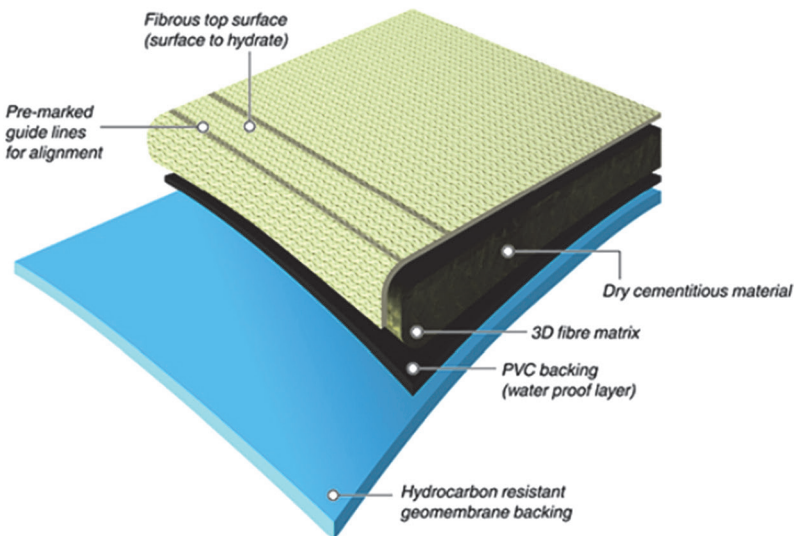


Figure 2 Concrete Canvas Hydro layers

2 Concrete Canvas projects finished by Monterra d.o.o. in Croatia, Slovenia and Serbia

2.1 Oil and Gas terminals in Luka Ploče (NTF), Croatia

During 2019 and 2020 Concrete Canvas Hydro was used to provide secondary containment to a total of approximately 10.000 m² concrete tanks in Luka Ploče operated by NTF (Naftni terminali Federacije).

There are 12 tanks of various sizes within the site that are used to store different petrochemical products: gasoline, jet fuel, gas oil, biodiesel and diesel. As part of ongoing improvements NTF had to improve secondary containment around 3 of its storage tanks.

As a solution to a problem Monterra together with project designers gave Investor better, faster and after cost comparison cheaper solution than conventional concrete solutions.

2.1.1 Preparation of the substrate

Prior Concrete Canvas Hydro installation, base material inside concrete tanks had to be replaced. Replacing base material resulted in soil strength higher than 45Mpa while parameters of the former material showed strength lower than 20Mpa. After replacing base material with gravel, thin layer of fine sand and geotextile was made on top so Concrete Canvas Hydro can lay perfectly on the ground.

2.1.2 Deployment of the Concrete Canvas Hydro

Supplied in bulk rolls of up to 150m², Concrete Canvas Hydro is deployed via excavator across tanks before being cut to length using basic hand tools.

2.1.3 Thermal welding and pressure testing of the joints

Welded in accordance to guidelines, CCH incorporates a high-visibility welding strip, allowing the joint to be thermally bonded with triple-track air channel.

2.1.4 Hydration

Following the welding and testing of the joints, Concrete Canvas Hydro was hydrated. CC Hydro cannot be over hydrated so procedure was repeated.



Figure 3 Step by step Concrete Canvas Hydro installation



Figure 4 Concrete Canvas Hydro after 28 days

2.2 Slope protection against fire along railway Kopar - Divača

During October 2017 Concrete Canvas was used to provide fire protection on slopes along railway Kopar – Divača. Before Concrete Canvas installation on this part of the railway there was risk of fire caused by sparkles during train traffic. Investor started project using classical shotcrete method which made contractor dig a lot of small canals underneath rail for using hoses, there was constantly needed for moving equipment along the railway and sometimes railway traffic had to be completely stopped. After numerous problems Investor agreed to Concrete Canvas 8mm.

2.2.1 Preparation of the substrate

Prior Concrete Canvas installation, all unstable/sharp rocks and larger vegetation was removed from the surface. On top part of the slope a small canal (dimensions were 15cm in width and 10cm in depth) was made so we could anchor top part of Concrete Canvas and stop it from twisting while it hardens. At the end of application canal was covered with soil.

2.2.2 Deployment of the Concrete Canvas

Before installation Concrete Canvas bulk rolls were cut to premeasured lengths. On site 4 workers covered 300m² of slopes along railway in 2 days.

2.2.3 Connecting Concrete Canvas

Layers of Concrete Canvas were overlapped by 100mm and connected with screws.

2.2.4 Hydration

Following connecting of the joints, Concrete Canvas was hydrated with a water tank and hose (spray nozzle attached).



Figure 5 Slope before fire protection (left), slope after fire protection (right)

2.3 Slope protection – drainage channel lining, Serbia

During 2018-2020 in Serbia, Concrete Canvas was used to provide drainage and erosion control of perimeter canals on few projects. During huge slope stabilization on highway trough Momin Kamen because of difficult conditions and big heights, material was used as replacement of conventional methods like stone cladding or concrete channels.

2.3.1 Preparation of the substrate

Prior Concrete Canvas installation, all unstable/sharp rocks and larger vegetation was removed from the surface. On both edges of slope a small canal (dimensions were 15cm in width and 10cm in depth) was made so we could anchor top part of Concrete Canvas and stop it from twisting while it hardens. If substrate is rock, there was no need of making this step.

2.3.2 Deployment of the Concrete Canvas

Before installation Concrete Canvas bulk rolls were cut to premeasured lengths. Material was then deployed on the installation point by loader machine or crane.

2.3.3 Connecting Concrete Canvas

Layers of Concrete Canvas were overlapped by 100mm and connected with screws.

2.3.4 Hydration

Following connecting of the joints, Concrete Canvas was hydrated with a water tank and hose (spray nozzle attached).



Figure 6 Perimeter canals

3 Conclusion

Concrete Canvas in many ways provides replacement for conventional concrete solutions. It is faster, more reliable solution that saves time, money and usually avoids traffic disruption and big mechanization. All that above makes it a material that should be considered while designing modern road and railway structures, slope protection, weed suppression, canal lining or maybe oil tanks sanitation.

References

- [1] Concrete Canvas website: <https://www.concretcanvas.com/downloads/?types=product-brochures-acc,technical-certification-acc#toggle-id-499>