CCX™
Innovation on a Roll

CANAL LINING

Project Info

- 22 / 10 / 22
- CCX-MAT (CCX-M™) Bulk Rolls
- 16,000m²
- Transverse layers
- Pest County, nearby M31 highway and Gödöllő city, Hungary
- KM Építő Ltd
- CCX-M™ used to provide erosion control to a newly constructed water run-off channel.

Completed section of channel 7 months after installation

In October 2022, Concrete Canvas® CCX-M™ (CCX-MAT™) GCCM* was installed to provide erosion protection to a newly constructed water run-off channel off the M31 near Budapest, Hungary. The M31 and Kis-rakos river basin district has a catchment area of over 800 hectares. Rainwater within the area was previously collected and discharged to nearby areas via natural gulley's and riprap lined channels. Over time the system became obsolete and, together with intensive rain in recent years, had caused significant erosion and damage in adjacent areas, resulting in residential properties, agricultural land and even the neighbouring airport being affected.

To mitigate the issues, a trapezoidal outfall channel was designed to collect runoff and drain it to the Kis-rakos river. The complete work included the water management of the interceptor Kis-Rákos river, reprofiling or building then lining channel sections, building energy dissipating devices, stilling basins, an oil-interceptor structure, culverts, headwalls, outlets.

The channel lining was specified as CC8™/CCT2™ a few years prior to execution of the project. However, with the advent of CCX™, a GCCM certified for utilisation in type II applications, a new solution from Concrete Canvas Ltd could be proposed that met all the performance requirements of the design and tender specification. These benefits were enhanced by the wider width of CCX™ compared with CCT™ and its greater rate of productivity resulting in a more cost-effective and more feasible completed lining solution.

*Geosynthetic Cementitious Composite Mat

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New profile cut to specification

CCX-M™ laid transversely across the channel

CCX-M™ cut to length using hand tools

Layers of CCX-M™ overlapped and secured using screws 100mm apart

CCX-M™ secured with J-pegs within anchor trenches

CCX-M™ hydrated using a water bowser and hose

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CCX-M™ insulated from cold weather conditions using plastic sheeting

CCX-M™ fully cured

CCX-M™ is a Type II GCCM as defined in ASTM D8364 - Standard Specification for GCCMs. CCX-M™ is suitable for lining hydraulic structures with both soil and solid subgrades and was chosen for this project to suit the abrasion and loading requirements.

Due to the shallow gradients, the ground preparation was required to a high specification, especially at the invert. A customised ditch bucket was used to excavate the channel to the exact dimensions specified. Anchor trenches were then excavated along the shoulders of the channel. To create a uniform surface, vegetation was removed and any voids filled. Terminations upstream, downstream and transitions to intermittent structures were created by excavating a minimum 300mm wide by 300mm deep transverse anchor trench.

Bulk Rolls of CCX-M™ were then delivered to site and mounted on a spreader beam attached to an excavator. Once attached, the material was lifted into place and unrolled transversely across the width of the channel and cut to the required length using hand tools. The subsequent layers of CCX-M™ were overlapped by 100mm in the direction of water flow. In bends, trapezoidal pie pieces were cut to optimise material utilisation, with the cut edges placed beneath the overlaps.

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Completed section of channel

The overlapped layers were fixed with stainless steel screws at 100mm spacings along the blue fixing marker lines. To prevent material wastage and optimising each roll of CCX-M™, offcuts were used. Horizontal overlaps created by off-cuts were made 200mm wide and fixed with a double row of screws at 100mm spacings in a zigzag formation. To prevent the material from being undermined, the trailing edges were encapsulated in pre-cut anchor trenches located at the shoulders of the channel. J-pegs were used to peg the material within the anchor trenches then later backfilled with excavated substrate. CCX-M™ was secured within transverse trenches located at the upstream, downstream and transitions using J-pegs and then backfilled with poured concrete.

The invert of the channel at the M31 junction was fitted with baffles to reduce the energy of stormwater flow exiting the culvert and tie-ins. These baffles were created by pavers, grouted around the perimeter to create a suitable shape and overlain with two layers of CCX-M™. The CCX-M™ overlay was fixed around the perimeter of the baffles with a double row of screws in a zigzag configuration.

A $2m^3$ bowser pumped water via a hose pipe and spray nozzle attachment to hydrate the CCX-M™. Hydration was done a minimum of 2 times to saturation at 30-minute intervals. As the installation was carried out at the onset of winter - with overnight temperatures sometimes dropping below freezing - concerns were raised over the potential for retardation of curing. To prevent the curing process from being interrupted, CCX-M™ was covered with a plastic sheet directly after hydration. This acted as an insulator and minimised the impact of freezing. The plastic sheeting was left in place for a minimum of 24-hours and ballasted in place to mitigate the risk of wind uplift.

In total, the installation was completed over a period of approximately 4 months. Installation did not take place from mid-December 2022 to mid- February 2023 due to weather conditions on site. Due to the construction programme and earthworks required, CCX-M™ installation only took place 2 days per week and 8 hours per day. An average of 7 rolls ($665m^2$) of CCX-M™ was laid per day.

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Baffles and gabions lined with CCX-M ™

Channel terminating at Kis Rákos dissipation area

Section of channel showing profile change

Completed section of channel including the use of CCX-M™ offcuts

CCX-M™ cut into pie pieces to optimise material utilisation

Completed 90° bend section with pie pieces

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CCX-M™ lined sediment traps

Section of sediment traps during winter

CCX-M™ terminated onto culvert headwall

CCX-M™ terminated onto culvert headwall

Baffles covered in CCX-M™

Baffles and gabions covered in CCX-M™

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7 Months after completion

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