CONCRETE CANVAS®
Concrete on a Roll

1909.EN.BR
MADE IN UK

CONCRETE CANVAS®

Concrete on a Roll

REMEDIATION

CASE STUDIES

The Queen's Awards for Enterprise: International Trade 2019

Board of Trade Winner 2018

Winner Technical Innovation Award

Innovation Award ICE Wales Cymru Awards 2017

British Board of Agrément Certified

ACS Registrars Ltd ISO 9001 Accreditation

Certified CPD Provider

Corporate Member

Proud Supporter of Exporting is Great

RAIL ROAD MINING PETROCHEM AGRO PUBLIC WORKS UTILITIES DEFENCE DESIGN SHELTER

www.concretecanvas.com

CONCRETE CANVAS®

REMEDIATION

Project Info

- 01 / 08 / 17
- CC8™ Bulk Rolls
- 2,000m²
- Transverse layers
- Muck Burn Flume, Dumfries & Galloway, Scotland, UK
- Cubby Construction Ltd on behalf of Scottish Power
- CC8™ was used to remediate a dilapidated concrete flume forming part of a hydro-electric system.

Completed installation at Muck Burn Flume

In August 2017, Concrete Canvas® GCCM* (CC) was used to remediate a dilapidated concrete flume forming part of a hydro-electric system in Dumfries & Galloway, Scotland.

The flume, known as the Muck Burn Flume, is a concrete culvert/aqueduct which was constructed in circa 1935 as part of the Galloway Hydro Scheme. The flume forms part of the Muck Burn Dam civil assets located near Loch Doon, which links to Drumjohn power station. The flume was created to divert flow from the muck burn to Loch Doon to prevent water build up behind the Muck Dam.

The flume structure principally comprises of an unreinforced concrete channel cast insitu. The flume is approximately 360m in length, and the base varies from 1.1m to 1.6m wide and the sides measure 1.6m, with the existing concrete 150mm thick.

A civil general inspection undertaken in June 2014 noted that the condition of the flume was poor in significant areas, and some localised repairs were carried out in 2015. The deterioration to the structure is consistent with erosion and frost damage. Rather than using conventional concreting techniques, CC was proposed to significantly mitigate the need for costly periodic repairs.

*Geosynthetic Cementitious Composite Mat

CONCRETE CANVAS®
+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

Water flow in original concrete flume

Algae, moss & vegetation growth within the flume channel

360m dilapidated concrete slabbed flume prior to installation

Vegetation & algae removed and water diverted out of the flume

Following the success of the CC remediation installation at the Bowburn Flume for Scottish Power in Scotland in October 2013, CC was specified for the Muck Burn Flume. Scottish Power commissioned works to design and construct remedial works to the flume and in August 2017, 2000m² of CC was installed by Cubby Construction with design consultancy provided by A. L. Daines and Partners.

CC5™ had been specified at the previous Bowburn Flume installation, however, due to an increased level of silt and debris generated at Muck Burn, it was decided that the CC8™ would be the most appropriate material for this installation.

Prior to installation, the flume was pressure washed to remove vegetation and minor repairs were carried out using a semi-dry grout mix to fill any voids in the concrete to ensure intimate contact between the CC and the concrete substrate. The water flow was then diverted into a nearby channel by building an earthen dam and using sandbags. Bulk rolls of CC8™ were then delivered to site in staggered deliveries to reduce onsite storage and accomodate the speed of the installation crew. The bulk rolls were then mounted on a spreader beam, which was hung from a Komatsu PC210LC-7 Hydraulic Excavator.

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CONCRETE CANVAS®

REMEDIATION

First layers of CC being laid into anchor trench & overlaps marked

CC dispensed with a spreader beam & cut to length

Installing 34mm Hilti nails with 25mm washers

Inlet ditches lined with CC to direct bank runoff into flume

CC able to accomodate sharp bends

CC lined channel with corner & inlet channel detail

CONCRETE CANVAS®

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CC layers overlapped in the direction of water flow providing natural weep paths

Flume inlet with an anchor trench running across the width of the channel

Remediated flume lined with CC8™ transverse layers

Original Bowburn Flume 4 years after installation requires minimal maintenance

The CC was then rolled across the width of the flume before being cut to specific profile length with an angle grinder. Each length of CC was laid transversely, with adjacent layers overlapped by 100mm in the direction of water flow, and fixed in place using 34mm Hilti nails with 25mm diameter washers shot fired at centres not exceeding 600mm. Cubby Construction were extremely diligent in preparation and ensured the 100mm overlaps and 600mm Hilti spacing intervals were clearly marked in chalk prior to fastening to ensure the correct interval spacing.

In order to prevent any build-up of hydrostatic pressure between the original concrete slabs and the CC, the joints were left unsealed and free draining. These free draining joints create natural weep paths to allow water ingress into the flume. The end sections of CC were cut with an angle grinder post-set to provide a neat termination and any inlet areas with direct bank water runoff were either lined with CC or buried into an anchor trench. The CC material was hydrated after each day's work using a hose with spray nozzle attachment and a 6000L water carrier.

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

Completed Installation

2000m² of CC8™ were installed in less than 3 weeks by 5 people, despite challenging weather conditions. The CC was able to easily accommodate sharp bends, junctions and inlet channels, along with interior and exterior pipe protrusions. CC also has a very low wash out rate and low alkali reserve meaning that it was not required to treat the run off from installation. The client was pleased with the speed and ease of installation, along with the long term erosion protection the CC material provides which will significantly reduce the costs for future maintenance repairs for the flume.

"Cubby Construction Ltd previously installed Concrete Canvas for Scottish Power at the nearby Bowburn Flume in 2013, so our installation crew were familiar with the material prior to installation. Despite the remote location and inclement weather conditions, we installed 2,000sqm of material in less than 3 weeks. The CC material had the ability to accommodate sharp bends and inlet channels, which helped with the speed of installation. The material could also be installed in wet weather, which helped reduce any down time on site and the project was successfully completed on time for the client."

Mike Rippon
Commercial Manager,
Cubby Construction Ltd.

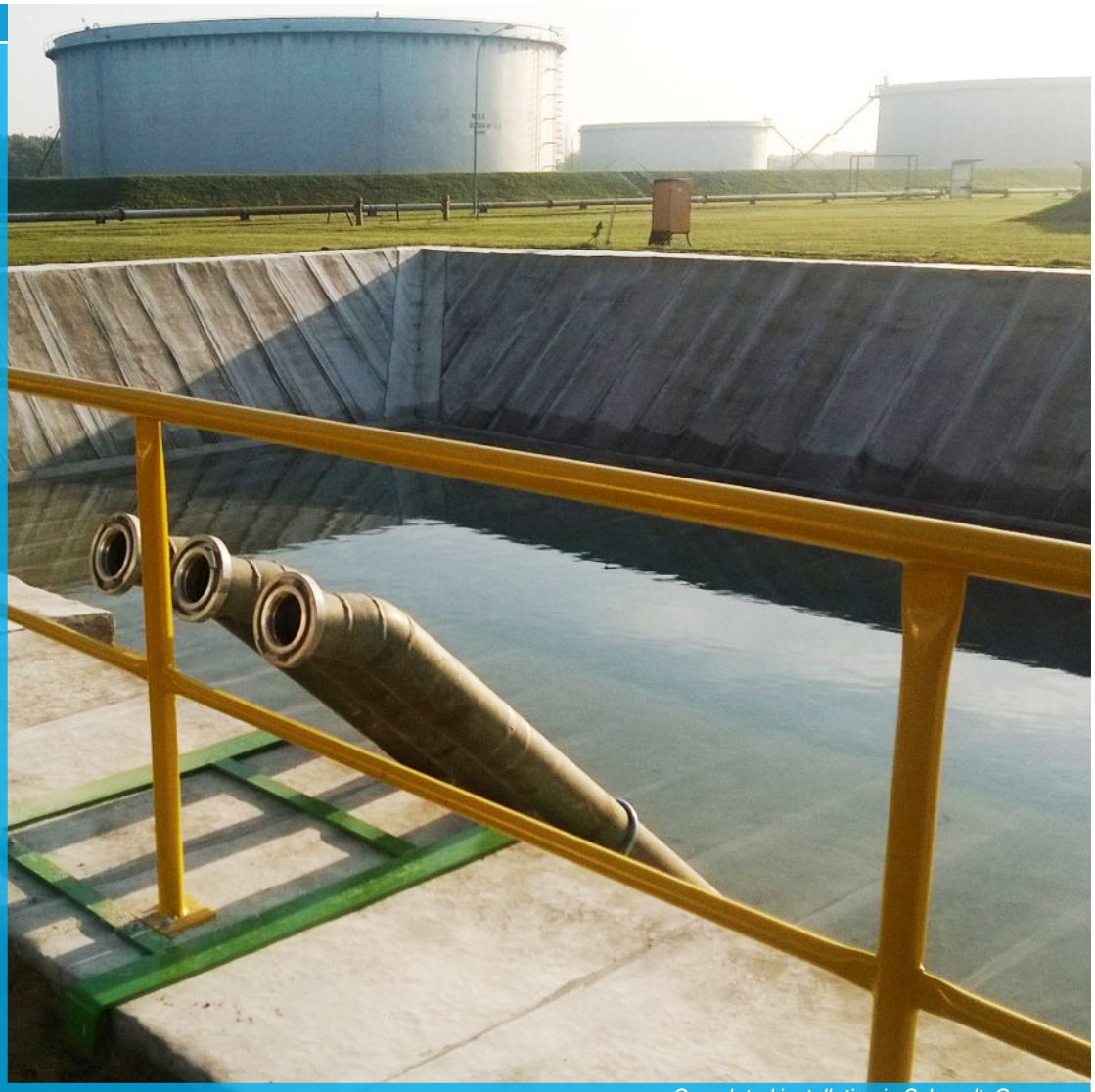
+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CONCRETE CANVAS®

REMEDIATION

Project Info

- 11 / 08 / 14
- CC5™ Bulk Rolls
- 900m²
- Transverse & Vertical layers
- PCK Refinery, Schwedt, Germany
- Undisclosed
- CC5™ used to improve the impermeability of an extinguishing basin.



Completed installation in Schewdt, Germany

In August 2014, Concrete Canvas® GCCM* (CC) was used to line an extinguishing lake in Schwedt, Germany, to improve impermeability. The original poured concrete structure had cracked and spalled, resulting in excessive water loss. Removing the basin and re-building it using poured concrete and form work was considered, however this would have been more time-consuming, taking the basin out of operation for an extended period. The works were carried out by an approved contractor for PCK (a joint venture between BP, Rosneft, Shell, Eni and Total).

The failing concrete was cleaned and mortar applied to any larger cracks to eliminate voids under the CC. An anchor trench was created on the shoulder of the basin to prevent water ingress and provide a neat termination. Bulk rolls of CC5™ were delivered to site and mounted onto a spreader beam hung from a Zoom Boom. The two shorter sections of the basin were completed first. The CC was unrolled on the flat, batched to profile length and positioned basin by hand with alternating perpendicular overlaps created at the corners. This allowed the CC to be laid transversely across the width of the basin for the remaining two sections, starting at each end and ending at a drainage sump in the middle. For each section, the leading edge of CC was fixed to the concrete substrate using 40mm wedge anchors at 2m intervals, each subsequent layer was then overlapped by 100mm and sealed. Once the installation was completed, the CC was hydrated.

900m² of CC5™ were installed by 5 people in 4 days with some inclement weather. The client was very impressed with the result, specifying CC for a bund lining trial as well as a 6000m² extinguishing basin.

*Geosynthetic Cementitious Composite Mat

CONCRETE CANVAS®
+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CONCRETE CANVAS®

REMEDIATION

Site before works

Batching on the flat and a corner detail

Sealing under the overlap

The start of section 3

Hydration

The finished project

CONCRETE CANVAS®

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CONCRETE CANVAS®

REMEDIATION

Project Info

- 02 / 05 / 17
- CC8™ Batched Rolls
- 2,250m²
- Longitudinal layers
- İkizdere, Rize, Turkey
- Arsan Yapi Ltd.Sti.
- CC8™ was used to line and protect the interior of a damaged water diversion pipe at a hydroelectric plant in Turkey.

A completed section of the water diversion pipe at the İkizdere hydroelectric plant in Turkey

In May 2017, Concrete Canvas® GCCM* (CC) was used to line and protect the interior of a damaged pipe in İkizdere, Rize, Turkey. The pipe functions as a water diversion pipeline from the İkizdere hydroelectric plant, owned by Zorlu Energy Group. The pipeline, originally constructed using concrete, had badly deteriorated and was in need of remediation.

Batched rolls of CC8™ were specified due to the inaccessibility of the site, which ruled out traditional solutions. CC would also provide better abrasion resistance, prolonging the useful life of the product and the life of the pipeline itself. Due to access issues, the CC had to be delivered to site using a cable car system. The works were carried out by Arsan Yapi Ltd.Sti. for Zorlu Energy.

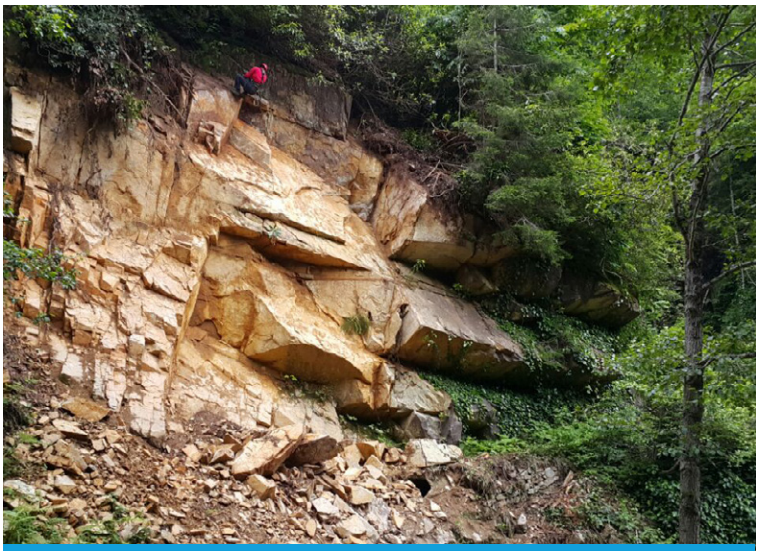
Prior to installation, the concrete was cleaned, vegetation removed and cracks and holes were repaired using high performance mortar. The material was passed into the pipeline in manageable sections through access holes along the top of the pipe. There was limited space to work, with an inner circumference of 900mm. The material was laid longitudinally and fixed using screws at 200mm intervals and along overlaps. Where material met the pipe wall, CT1 sealant and grout mortar was applied to prevent ingress. Once the installation was complete, a hose was fed into the pipeline and the CC material was hydrated.

A total of 2,250m² of CC8™ were installed in 90 days by 7 people in very cramped, challenging conditions, and on a site with very limited access. An average of around 100-150m²/day were installed once preparatory works were completed.

*Geosynthetic Cementitious Composite Mat

CONCRETE CANVAS®
+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

The outside of the pipeline was overgrown with vegetation



The site backed onto steep cliffs on either side

The inside of the pipe had to be cleared of rocks and debris prior to works

Repair works were carried out with mortar prior to installation

The CC was laid longitudinally and fixed with screws

Mortar and sealant was used to prevent ingress at the edges of the CC

CONCRETE CANVAS®

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CONCRETE CANVAS®

REMEDIATION

Project Info

- 12 / 12 / 16
- CC5™ and CC8™ Bulk Rolls
- 270m²
- Longitudinal layers
- Yanbu Refinery (SAUDI ARAMCO)
- FOQSCO
- CC5™ and CC8™ were used for the rememediation of an exisiting water channel at a roadside in Yanbu

Completed installation

In December 2016, Concrete Canvas® GCCM* (CC) was used to remediate a channel at the Yanbu Refinery, owned by Saudi Aramco. The channel, previously lined with curved concrete blocks, had cracked in several places, becoming a risk for weed protrusion, further erosion and damage. Fixing the cracks with, and laying fresh conventional concrete had been considered, but as the site was privately owned there was limited access and time on site. As CC would significantly reduce the time and cost of the job, this was chosen instead. The entire 90m long by 2.5m wide channel was fitted with CC. The works were carried out by FOQSCO for Saudia Aramco.

The cracks and gaps between existing concrete blocks were repaired and filled, and anchor trenches were excavated ahead of the installation. The CC was laid longitudinally using a spreader beam and crane, and cut using basic hand tools. The CC8™ was laid longitudinally down the middle of the channel, with CC5™ laid on either side. Overlapping layers of CC were sealed using a hot air gun, and CC was secured along the edges into the anchor trenches, using ground pegs. Once laid and fixed, the anchor trenches were backfilled with marlstone. Due to very dry weather conditions, the CC was hydrated for one hour, and re-hyrated following a period of two hours. This was repeated the following day.

A total of 270m² of CC5™ and CC8™ were installed over a period of 17 hours, spread over two days, in very dry, hot weather conditions. The project was very successful, and the client is keen to use CC for installations in other areas of the site in the future.

*Geosynthetic Cementitious Composite Mat

CONCRETE CANVAS®
+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

Channel prior to installation

Trenches were dug during ground preparations

CC5 was laid down the middle, with CC8 laid either side

CC was sealed with a hot air gun before fixings were applied

CC was hydrated using a fire hose

Overview of completed installation

CONCRETE CANVAS®

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CC HYDRO™
Concrete Impregnated Containment

BRIDGE REMEDIATION

Project Info

- 06 / 06 / 17
- CCH8™ Bulk Rolls
- 1,100m²
- Longitudinal layers
- Old Elvet Bridge, Durham, UK
- Sean Carr Lining Technology & Durham County Council
- CCH8™ was used to remediate the Old Elvert Bridge in Durham, UK and provide a waterproofing layer to the bridge decking to prevent leakage.

A view of the bridge from across the river

In June 2017, CC Hydro™ (CCH) GCCB* was used to provide a waterproof layer to bridge decking on the Old Elvet Bridge in Durham, UK. The Old Elvet Bridge is a Grade I listed mediaeval masonry arch bridge across the River Wear, linking the peninsula in central Durham and the Elvet area of the city. Building of the bridge began in AD 1160, and construction of the arches is believed to have continued into the 13th century, although exactly how many there are is still debated to this day.

An inspection identified that the arch barrels were saturated in localised areas with water staining to most of the arches indicating any waterproofing was not adequate and probably not present at all. If this issue was not addressed the deterioration of the masonry would continue. As a result Durham County Council (DCC) who maintain the bridge required a solution for repairing the bridge deck and preventing water ingress. A number of repair methods were put forward to Historic England but these were rejected as they wouldn't give any consent to any invasive waterproofing due to the preservation needs of the scheduled ancient monument. CC Hydro was introduced to DCC during a proposal presentation in February and was then put forward by the Council to HEas a waterproofing layer solution. The proposal was approved and works commenced in June, and were carried out by DCC and Sean Carr Lining Technologies (SCLT).

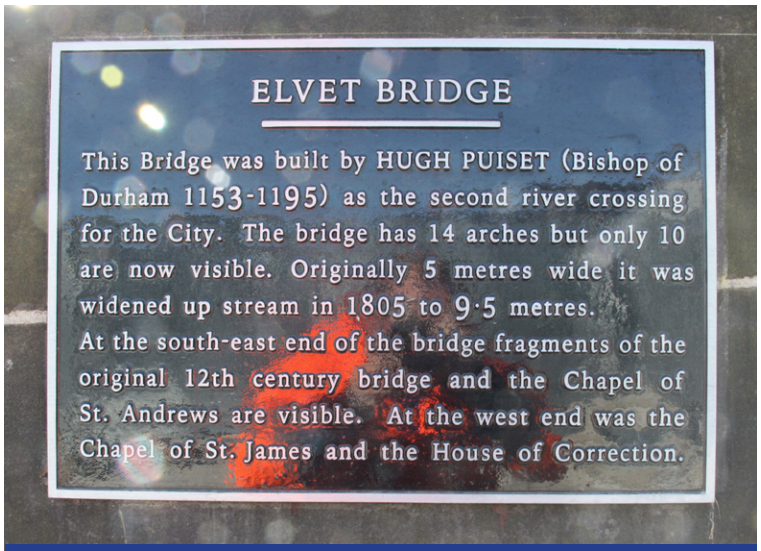
Due to the Council's requirement for minimal disruption on the bridge, allowing it to remain open to the public as it is one of the main streets through Durham, the scheme had to be carried out in several stages. As CCH was used for this scheme, this also meant that the work had to be carried out in dry weather to prevent the PVC membrane being laid on damp substrate.

*Geosynthetic Cementitious Composite Barrier

CONCRETE CANVAS®
+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

CCHYDRO™
Concrete Impregnated Containment

BRIDGE REMEDIATION



Commemorative plaque found on the bridge

*The bridge is one of the main footpaths in the city***

The substrate was flattened before installation

The CCH bulk rolls were dispensed from a spreader beam

CCH joints were welded with Leister Twinny Ts and Triacs

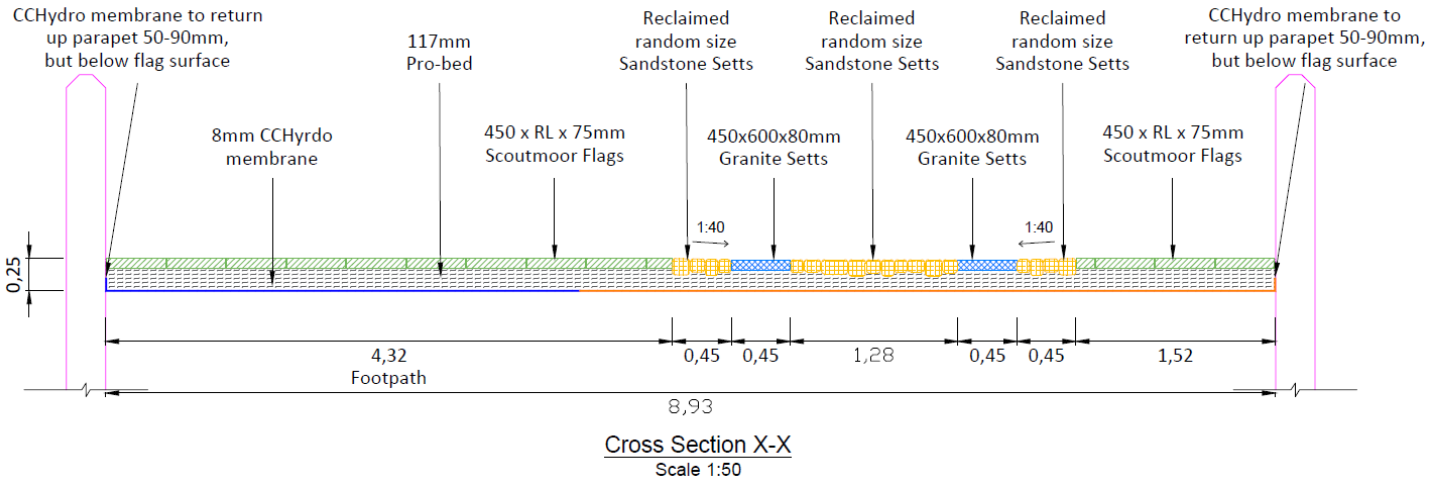
Hydration was given once each section was complete

***By The original uploader was DWaterson at English Wikipedia [CC BY-SA 2.5 (https://creativecommons.org/licenses/by-sa/2.5)], via Wikimedia Commons*

CONCRETE CANVAS®
+44 (0) 345 680 1908
info@concretecanvas.com
www.concretecanvas.com

Completed section re-covered with CCH edge exposed for welding

CCH layer underneath re-layed substrate and flagstones



Cross Section Proposal Drawing

In preparation for the installation, the top flag stones were removed along with some of the substrate and the ground compacted using a whacker plate in order to provide a smooth surface for the CCH to be laid on. Bulk rolls of CCH8™ were then delivered to DCC's warehouse and then delivered to the site when required. The bulk rolls were then mounted onto a spreader beam and unrolled longitudinally along the length of the bridge. Adjacent layers of CCH were laid and then thermally welded using a Leister Twinny T or Leister Triac and roller. Once laid and thermally welded, each section was hydrated and re-covered using the removed substrate, leaving the leading edge of the CCH uncovered to weld to the adjacent layer of the next section.

Following the installation of the CCH across all sections of the bridge, the flag stones were re-laid on top of the water-proof CCH layer.

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com

Completed section of works

In total, 1,100m^2 of CCH8™ were installed in 4 phases over the summer months by a team consisting of DCC and SCLT staff, section by section and only in dry weather conditions to ensure a successful installation. The installation was completed successfully, with minimal disruption to the day-to-day public use of the bridge and without the need of any invasive solutions, allowing Durham County Council to preserve the ancient, Grade I listed monument.

CONCRETE CANVAS®

+44 (0) 345 680 1908 info@concretecanvas.com www.concretecanvas.com