An Introduction To Geosynthetic Cementitious Composite Mats (Concrete Cloth)

David Keaffaber, P.E.
Midwest Region Manager
Backed by a world-class organization

Founded in 1865

Privately held

More than 30,000 products

~7,000 associates

Manufacturing in 6 countries

Operations throughout Americas, Europe and Asia
A flexible cement-impregnated fabric that hardens when hydrated to form a thin, durable concrete layer.

Concrete Cloth consists of:

- **Dry concrete mix**
- **Reinforcing fiber matrix**
- **Fabric top surface**
- **PVC bottom coating**
Concrete Cloth is a Simple-to-Use Geocomposite Protection Material

- Install like a geotextile
- Hydrate using water
- Cures into a hard, fiber-reinforced concrete layer within 24 hours

Concrete Cloth can be used:

- Where a durable hard armor protective surface is required.
- Where conventional concrete or riprap is difficult or impossible to install.
- Where efficient use of labor and time is desired
Milliken Concrete Cloth GCCM Applications

- Ditch and Channel Lining
- Berm & Containment Protection
- Culvert Lining
- Slope Protection
Three Thicknesses Available

- CC5 (5mm)
- CC8 (8mm)
- CC13 (13mm)

<table>
<thead>
<tr>
<th>CC</th>
<th>Thickness in(mm)</th>
<th>Roll Width ft(ft)</th>
<th>Weight Unset lb/sf(kg/sm)</th>
<th>Batch Roll Length ft(m)</th>
<th>Batch Roll Area sf(sqm)</th>
<th>Batch Roll Weight Unset lbs(kg)</th>
<th>Bulk Roll Length ft(m)</th>
<th>Bulk Roll Size sf(sqm)</th>
<th>Bulk Roll Weight Unset lbs(kg)</th>
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</thead>
<tbody>
<tr>
<td>CC5</td>
<td>0.2 (5)</td>
<td>3.5 (1.1)</td>
<td>1.4 (7)</td>
<td>30 (9.1)</td>
<td>105 (10)</td>
<td>147 (68)</td>
<td>615 (187)</td>
<td>2152 (200)</td>
<td>3013 (1404)</td>
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<tr>
<td>CC8</td>
<td>0.3 (8)</td>
<td>3.6 (1.1)</td>
<td>2.5 (12)</td>
<td>15 (4.6)</td>
<td>54 (5)</td>
<td>135 (60)</td>
<td>373 (114)</td>
<td>1346 (125)</td>
<td>3358 (1499)</td>
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<tr>
<td>CC13</td>
<td>0.5 (13)</td>
<td>3.6 (1.1)</td>
<td>3.9 (19)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>239 (73)</td>
<td>862 (80)</td>
<td>3354 (1521)</td>
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</table>
Concrete Cloth GCCM comes in two roll varieties:

- **Portable Batched Rolls**
- **Bulk Roll**
Concrete Cloth
Case Studies
Ohio State Rte 579
Toledo, OH

Slope Stabilization & Erosion Control Under Bridge
Completed September 2015
Concrete Cloth Case Study: Toledo, OH

Project Details:

Customer: Ohio Department of Transportation

Issue: Flood flows causing erosion of the foundation slope below. This area was also exposed to runoff from bridge drainage.

Installation dimensions: Slope protection
- 20 feet x 30 feet
- Total 600 ft² Installed (CC8)

Alternate Option:
- State considered lining slope with riprap but access limited
- Vegetative slope was impractical and required continuous maintenance
Concrete Cloth Case Study: Toledo, OH

Initial slope conditions with erosion near columns
Concrete Cloth Case Study: Toledo, OH

Surface restoration prior to Concrete Cloth GCCM installation
Concrete Cloth Case Study: Toledo, OH

Close-up view of competed installation
Concrete Cloth Case Study: Toledo, OH

Completed installation on opposite bank
Michigan Route M-20
New Era, MI

CMP Culvert Invert Lining
Completed September 2017
Concrete Cloth Case Study: New Era, MI

**Project Details:**

**Customer:** Michigan DOT

**Issue:** One 11’ x 7’ CMP arch culvert with deteriorating invert in need of invert protection to extend service life.

**Installation dimensions:**
- 72 feet long (CC8)

**Alternate Option:**
- Reinforced poured in place invert
- Concrete Cloth substituted through change order
Concrete Cloth Case Study: New Era, MI

Aging CMP culvert was showing signs of significant deterioration in the bottom invert. Culvert above the invert appeared to be structurally intact.
Concrete Cloth Case Study: New Era, MI

The Concrete Cloth was cut and laid in a shingled fashion perpendicular to the direction of the flow.
Concrete Cloth Case Study: New Era, MI

Along the edges, screws are used to attached the Concrete Cloth to the pipe.
Concrete Cloth Case Study: New Era, MI

Completed invert protection performed by Oceana Road Commission crew under authority of the Michigan DOT Grand Region.
CMP Protection
Greenville, AL

Culvert Invert Lining

Completed February 2013
Concrete Cloth Case Study: Greenville, AL

Project Details:

Customer: Greenville Alabama

Issue:
• Two 72 inch diameter corrugated metal (CMP) culverts in Greenville, AL, had sections at the invert that had rusted through.

Installation dimensions:
• 60 feet long

Alternate Options:
• Dig and replace was not an option
• The city did not have the money for a full rehabilitation at the time of the project.
After ensuring that the invert was still structurally intact, the Concrete Cloth was cut and laid in a shingled fashion in direction of the flow. Along the edges, screws are used to attach the Concrete Cloth to the pipe.
Flow was released to allow the water to act as the hydration method. Concrete Cloth cannot be overhydrated.
Concrete Cloth Case Study: Greenville, AL

After the Concrete Cloth had cured overnight, the top edge of the installation was sealed with tar to limit high water infiltration.
I-85 Business & US 176 Interchange
Spartanburg, SC

Flume & Drainage Ditch
Completed May 2013
Concrete Cloth Case Study: Spartanburg, SC

Project Details:

Customer: South Carolina Department of Transpiration

Issue: Existing flumes were damaged and Concrete Cloth allowed SCDOT to avoid the use of forms and required no lane closures or special traffic control.

Installation dimensions:

- Total 3000 ft²
- CC5

Installation Time: 4 hrs
Original flumes were damaged and required frequent maintenance. The flumes were re-graded and sumps were created to slow water velocity.
Anchor trenches were dug and Concrete Cloth was rolled out. The finished installations were then hydrated and the trenches covered.
Concrete Cloth Case Study: Spartanburg, SC

The same flume and culvert outlet 2 years after installation.
I-74 Roadway Channel Stabilization
Moline, IL

Drainage Channel

Completed October 2017
Concrete Cloth Case Study: Moline, IL

**Project Details:**

**Customer:** Illinois Department of Transportation, District 2

**Issue:** District 2 Engineers were charged with repairing and stabilizing an eroding and failing concrete paved drainage channel located in the I-74 right of way near Moline, Illinois. Limited access made conventional repair methods unfeasible.

**Installation dimensions:**
- Total 22,187 ft²
- CC8

**Installation Time:** 3 weeks
Concrete Cloth Case Study: Moline, IL

Original paved drainage channel had collapsed from undermining resulting in severe erosion of entire waterway area.
Concrete Cloth Case Study: Moline, IL

Channel was cleared and regraded prior to placement of stabilization system involving sheet pile check dams.
Steel sheet piling was placed to create a series of check dams to contain and mitigate future erosive runoff discharges.
Completed channel stabilization with CC8 Concrete Cloth fabric. Concrete Cloth lining will protect earthen subgrade from future erosion and suppress woody vegetative growth.
Billings Drive
Superior, WI

Roadside Ditch Scour Protection
Completed June 2015
Concrete Cloth Case Study: Superior, WI

**Project Details:**

**Customer:** City of Superior Department of Public Works

**Issue:** Eroding roadside ditch along Billings Drive.

**Installation dimensions:**
- Total 2700 ft²
- CC5
Exposed and eroding roadside ditch.
Concrete Cloth Case Study: Superior, WI

Before and After Installation
Concrete Cloth Case Study: Superior, WI

Completed Installation

![Completed Installation Image 1]

![Completed Installation Image 2]
Lansing Levee Protection
Lansing, IL

Slope Protection
Completed December 2016
Concrete Cloth Case Study: Lansing, IL

Project Details:

Customer: Village of Lansing, IL

Issue:
Levee along Little Calumet River was found non compliant with US Army Corps of Engineers (USACE) Levee Safety Program

Installation dimensions:
• 16,000 ft² (CC8)
• With percussion anchors

Consultant:
• Robinson Engineering
Concrete Cloth Case Study: Lansing, IL

Existing levee with woody vegetation prior to reconstruction
Cleared Vegetation
Concrete Cloth Case Study: Lansing, IL

Installation of Concrete Cloth along levee
Concrete Cloth Case Study: Lansing, IL

Concrete Cloth panels with percussion anchors
Concrete Cloth Case Study: Lansing, IL

Rip-Rap installed over Concrete Cloth for completed project
Concrete Cloth Case Study: Lansing, IL

Protected levee slope
Culvert Rehabilitation
Using Concrete Cloth

John Strange, Noble County
Overview

• Culvert Selection
• Why use Concrete Cloth GCCM
• Installation
• Field Supplies
• Cost Breakdown
Culvert Selection
Why use Concrete Cloth?

- Extend culvert life
- Cost Comparison
Installation
Installation
Installation
Installation
Installation
Hydration
Installation Complete
Installation Recommendations
Thank You