

# Geosynthetic Cementitious Composite Mat (GCCM)

Installed as a Shroud Over Wire Baskets for  
Protection and Containment

Richard Goodrum  
rgoodrum@cs-nri.com



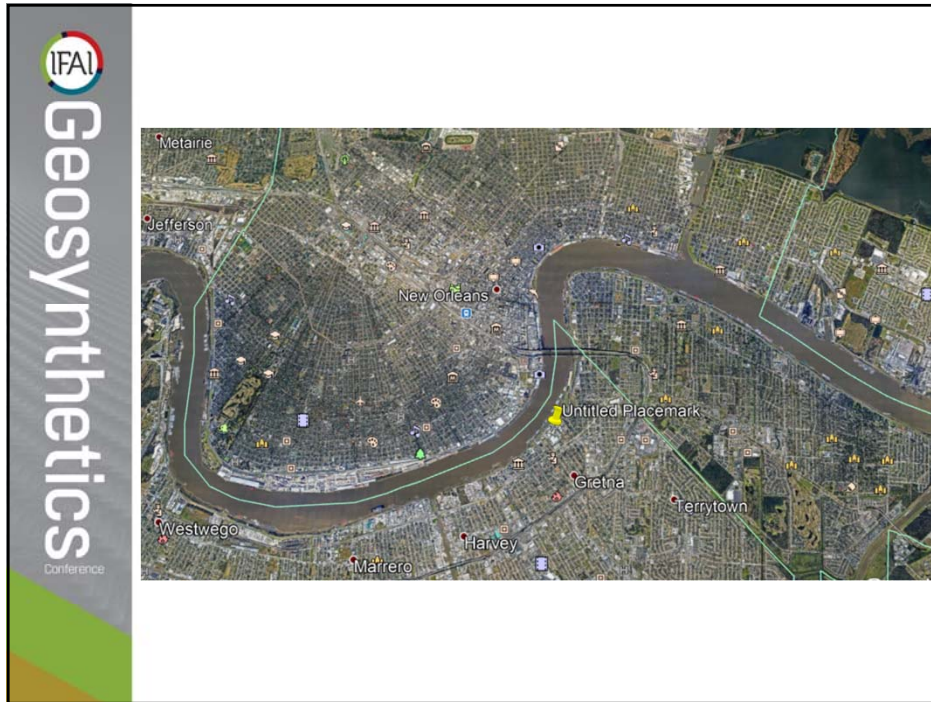
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## GCCM Installed as a Shroud

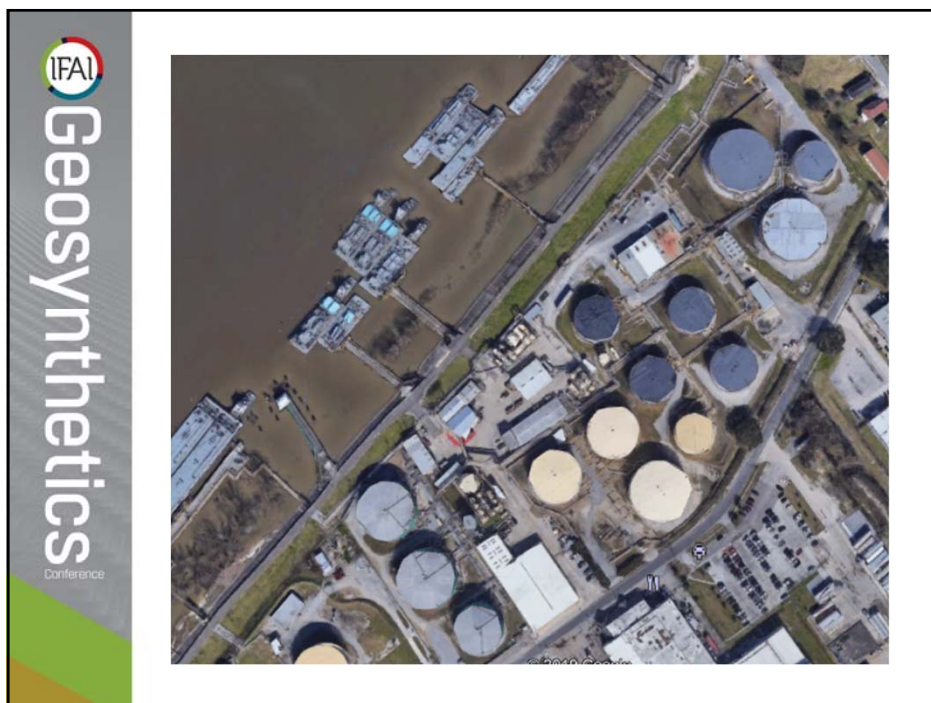
### OUTLINE

- Project Description / Location
- Project dilemma / Problem
- GCCM as a solution
- The how-to slides

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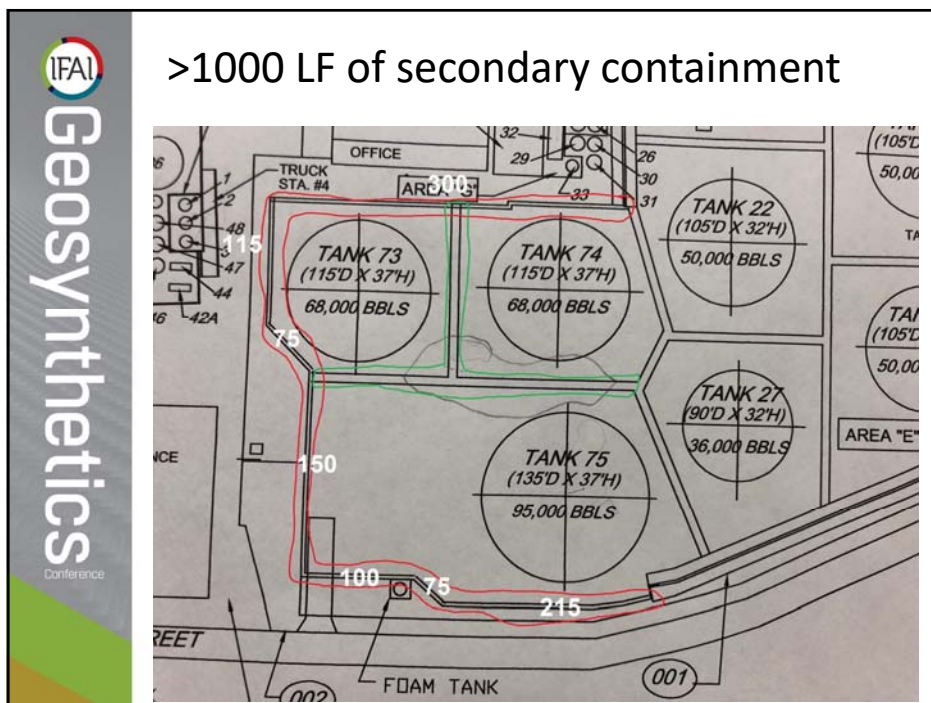
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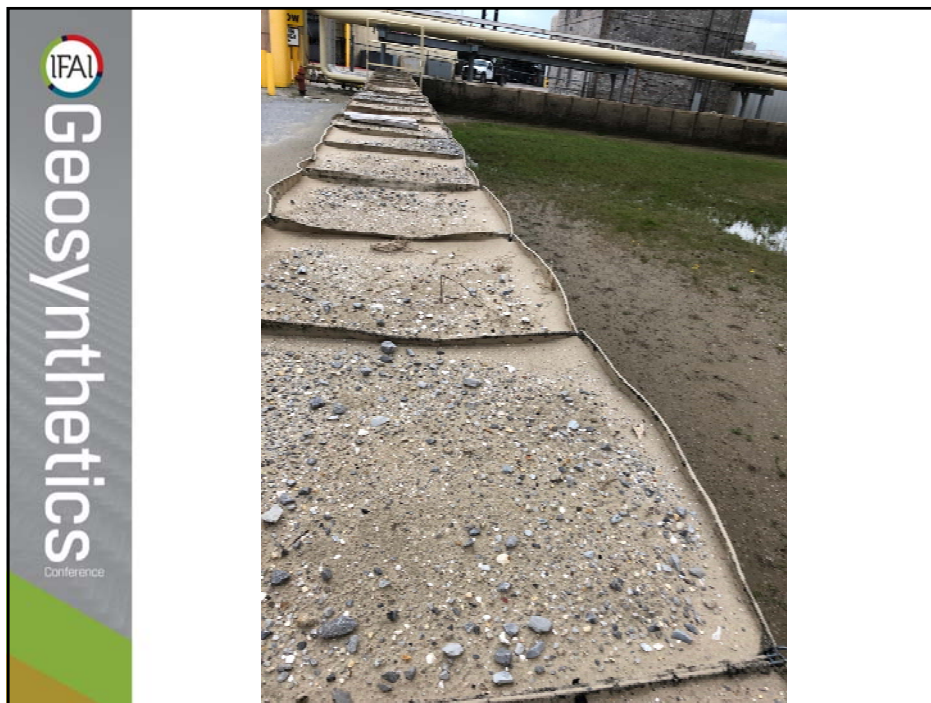
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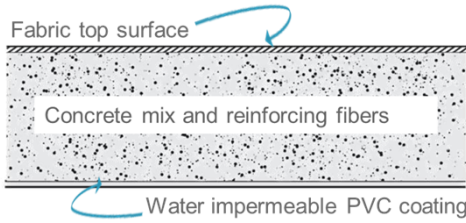


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## What is a GCCM?

**GCCM Section View**



**ASTM D8058** defines GCCM as 'a factory-assembled geosynthetic composite consisting of a cementitious layer contained within a layer or layers of geosynthetic materials that becomes hardened when hydrated'.

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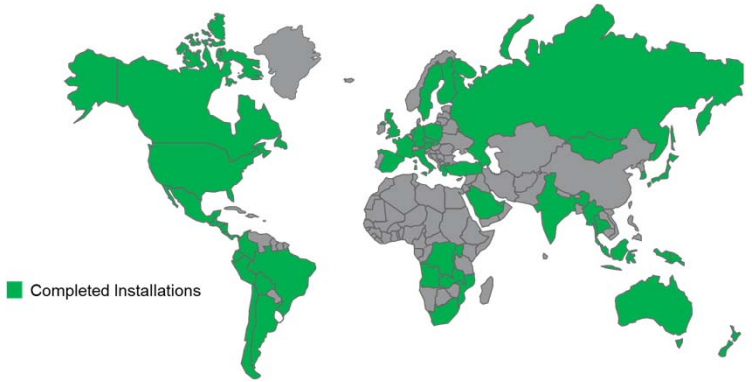
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## Acceptance/Standardization

Installations in nearly 50 countries around the world with over 10 years proven performance



■ Completed Installations

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## Acceptance/Standardization

### GCCM Global & US Standards



**ASTM International Technical Committee D35 on Geosynthetics Scope**

The Committee of these methods, specifications, guides, practices, terminology and the dissemination of knowledge standards will geosynthetics. This scope shall include but not be limited to applications for geosynthetic applications and include erosion control and soil stabilization and reinforcement, as well as both use before and after primary of geosynthetic applications in any related systems.

The dissemination of these methods, specifications, guides, practices and terminology for geosynthetics by geosynthetic shall be considered by the Committee by establishment of formal subcommittee approval by the Committee subcommittee.

The work of this Committee will be coordinated with Committee D15 on Textiles and Composites (Fibers, Texts and Nonwovens) and other ASTM Committees or organizations having related interests.

**Technical Subcommittees**

- D35.01 Research and Progress
- D35.02 Evidence Practices
- D35.03 Terminology and Practice
- D35.04 Geosynthetic Clay Layers
- D35.05 Geosynthetic Erosion Control
- D35.06 Geosynthetic Specifications
- D35.07 Installation
- D35.08 Removal and Termination
- D35.09 Research
- D35.10 IAI to ISO/TC20 on Geosynthetics

**Key Documents**

- 1995M04 ASTM Standard Test Methods for Determination of Compressibility of Open-cell Light, Medium and Heavy-Duty Non-Air-Tight Aggregates
- 1995M04 ASTM Standard Test Methods for In-Situ Permeability of Geosynthetic and Related Products
- 2002M02 Standard Test Methods for Assessing the Integrity of Geosynthetic Liners in Landfills Using Penetration Resistance Methods
- 1997M01 ASTM Standard Specification for High-Density Polyethylene Geotextiles

Learn more about Committee D35  
[www.astm.org/COMMITD35](http://www.astm.org/COMMITD35)






**Quick Facts**

**Standard 1995**  
 Member of Member D35  
 Member of Subcommittee D35.04  
 Member of Subcommittee D35.05  
 Member of Subcommittee D35.06  
 Member of Subcommittee D35.07  
 Member of Subcommittee D35.08  
 Member of Subcommittee D35.09  
 Member of Subcommittee D35.10

**Staff Manager**  
 Elizabeth A. Smith  
 ASTM International  
 100 Bar Harbor Drive  
 West Conshohocken, PA 19380  
 USA  
 tel: +1 610 670 8100  
 www.astm.org

**Environmental Durability (minimum 50 year expected life)**

<b>Freeze-Thaw</b> testing (ASTM C1183) ±20°C	200 Cycles
<b>Freeze-Thaw</b> testing (BS EN 12467:2004) ±50°C	100 Cycles
<b>Soak-Dry</b> testing (BS EN 12467:2004)	50 Cycles
<b>Head-Rate</b> testing (BS EN 12467:2004)	50 Cycles
<b>Water Impermeability</b> (BS EN 12467:2004)	Passed**

**Root Resistance** (CEN ENTS 14416:2005)
 Passed |

**Chemical Resistance** (BS EN 14416)

- Acid (pH 1.0) (56 day immersion at 50°C)	Passed
- Alkaline (pH 13.0) (56 day immersion at 50°C)	Passed
- Hydrocarbon (56 day immersion at 50°C)	Passed
- Sulfate Resistance (28 day immersion at pH 7.2)	Passed

**Hydraulic Performance**

<b>Permeable Shear &amp; Velocity CCE***</b> (ASTM D-6460)	
- Shear (%)	575
- Velocity (m/s)	8.62

**Abrasion Resistance** (ASTM C-1303)  
 Approx. 7.5x greater than 17MPa GPC (mm/1000 cycles)

**Manning's Value** (ASTM D6460) n = 0.011

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Geosynthetics



## Acceptance/Standardization

### GCCM Global & US Standards

 Designation: D8035/D8035M - 16 <b>Standard Practice for Sample Preparation for GCCM<sup>1</sup></b>	   	<p><b>Environmental Durability (minimum 50 year expected life)</b></p> <table border="0" style="width: 100%; font-size: 0.8em;"> <tr> <td>Freeze-Thaw testing (ASTM C1185) &lt;math&gt;+20^{\circ}\text{C}&lt;/math&gt;</td> <td style="text-align: right;">200 Cycles</td> </tr> <tr> <td>Freeze-Thaw testing (BS EN 12467:2004) &lt;math&gt;+50^{\circ}\text{C}&lt;/math&gt;</td> <td style="text-align: right;">100 Cycles</td> </tr> <tr> <td>Soak-Dry testing (BS EN 12467:2004)</td> <td style="text-align: right;">50 Cycles</td> </tr> <tr> <td>Heat-Rain testing (BS EN 12467:2004)</td> <td style="text-align: right;">50 Cycles</td> </tr> <tr> <td>Water impermeability (BS EN 12467:2004)</td> <td style="text-align: right;">Passed**</td> </tr> <tr> <td>Roof Resistance (ISO CEN/TS 14416:2005)</td> <td style="text-align: right;">Passed</td> </tr> </table> <p><b>Chemical Resistance</b> (BS EN 14114)</p> <table border="0" style="width: 100%; font-size: 0.8em;"> <tr> <td>- Acid (pH 1.0) (56 day immersion at 50°C)</td> <td style="text-align: right;">Passed</td> </tr> <tr> <td>- Alkaline (pH 13.0) (56 day immersion at 50°C)</td> <td style="text-align: right;">Passed</td> </tr> <tr> <td>- Hydrocarbon (56 day immersion at 50°C)</td> <td style="text-align: right;">Passed</td> </tr> <tr> <td>- Sulfate Resistance (28 day immersion at pH 7.2)</td> <td style="text-align: right;">Passed</td> </tr> </table> <p><b>Hydraulic Performance</b></p> <table border="0" style="width: 100%; font-size: 0.8em;"> <tr> <td><b>Permissible Shear &amp; Velocity <math>C_{s/V}^{***}</math></b> (ASTM D-5400)</td> <td style="text-align: right;">575</td> </tr> <tr> <td>- Shear (Pa)</td> <td style="text-align: right;">8.62</td> </tr> <tr> <td>- Velocity (m/s)</td> <td></td> </tr> <tr> <td><b>Abrasion Resistance</b> (ASTM C-1303)</td> <td style="text-align: right;">0.15</td> </tr> <tr> <td>Approx 7.5x greater than 17MPa OPC (mm/1000 cycles)</td> <td></td> </tr> <tr> <td><b>Manning's Value</b> (ASTM D6450)</td> <td style="text-align: right;">n = 0.011</td> </tr> </table>	Freeze-Thaw testing (ASTM C1185) <math>+20^{\circ}\text{C}</math>	200 Cycles	Freeze-Thaw testing (BS EN 12467:2004) <math>+50^{\circ}\text{C}</math>	100 Cycles	Soak-Dry testing (BS EN 12467:2004)	50 Cycles	Heat-Rain testing (BS EN 12467:2004)	50 Cycles	Water impermeability (BS EN 12467:2004)	Passed**	Roof Resistance (ISO CEN/TS 14416:2005)	Passed	- Acid (pH 1.0) (56 day immersion at 50°C)	Passed	- Alkaline (pH 13.0) (56 day immersion at 50°C)	Passed	- Hydrocarbon (56 day immersion at 50°C)	Passed	- Sulfate Resistance (28 day immersion at pH 7.2)	Passed	<b>Permissible Shear &amp; Velocity <math>C_{s/V}^{***}</math></b> (ASTM D-5400)	575	- Shear (Pa)	8.62	- Velocity (m/s)		<b>Abrasion Resistance</b> (ASTM C-1303)	0.15	Approx 7.5x greater than 17MPa OPC (mm/1000 cycles)		<b>Manning's Value</b> (ASTM D6450)	n = 0.011
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 Designation: D4439 - 17 <b>Standard Terminology for Geosynthetics<sup>1</sup></b>																																		
 Designation: D8058 - 17 <b>Standard Test Method for Determining the Flexural Strength of a Geosynthetic Cementitious Composite Mat (GCCM) Using the Three-Point Bending Test<sup>1</sup></b>																																		
 Designation: D8173 - 18 <b>Standard Guide for Site Preparation, Layout, Installation, and Hydration of Geosynthetic Cementitious Composite Mats<sup>1</sup></b> <p style="font-size: 0.7em; margin-top: 5px;">This standard is based under the first designation (D8173) the number immediately following the designation indicates the year of original approval or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last revision, a superscripted number to indicate an editorial change since the last revision or approval.</p> <p style="font-size: 0.7em; margin-top: 5px;"><b>1. Scope</b></p> <p style="font-size: 0.7em; margin-top: 5px;">1.1 This guide covers directions for the installation of a geosynthetic cementitious composite mat (GCCM) under field conditions typically present in erosion control, hydrologic, slope-strengthening and protection, and protection applications.</p> <p style="font-size: 0.7em; margin-top: 5px;">1.2 The values in SI units are to be regarded as the standard. Values in each system are in parentheses for information.</p> <p style="font-size: 0.7em; margin-top: 5px;">1.3 This guide contains general guidelines. It is not intended to replace project-specific installation requirements. In the event of a conflict between the two, the requirements of the project specifications will supersede the requirements of this guide.</p> <p style="font-size: 0.7em; margin-top: 5px;">2.2 Further information is available on the various GCCM from their manufacturers. Individual GCCM manufacturer's recommendations may be more detailed with regards to specific applications or details than the information found in this standard, and should be consulted prior to installing any installation.</p> <p style="font-size: 0.7em; margin-top: 5px;"><b>3. Terminology</b></p> <p style="font-size: 0.7em; margin-top: 5px;">3.1.1 <b>Definition:</b></p> <p style="font-size: 0.7em; margin-top: 5px;">3.1.1.1 <b>Bottom Layer App. —</b> in a GCCM installation, a section of the bottom layer that extends beyond the top layer.</p> <p style="font-size: 0.7em; margin-top: 5px;">3.1.2 <b>Top zone —</b> in a GCCM installation, a combination of</p>																																		

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## GCCM Applications

### Channel Lining



### Slope Protection



### Culvert Lining



### Concrete Remediation





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### Prepping wire baskets...

- Remove vegetation where problematic
- Refill & recompact to top of basket
- Rake/screed top for smooth finish



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### Prepping wire baskets



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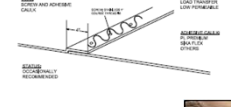
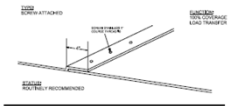
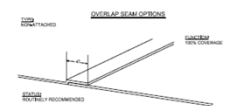
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### Standard install techniques...

**Ground Anchors**

**Waterproof Caulk/Adhesive**



**Screws/washers**



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### Standard install techniques...



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## Some special techniques...

**SECTION VIEW**

**FRONT ELEVATION VIEW**

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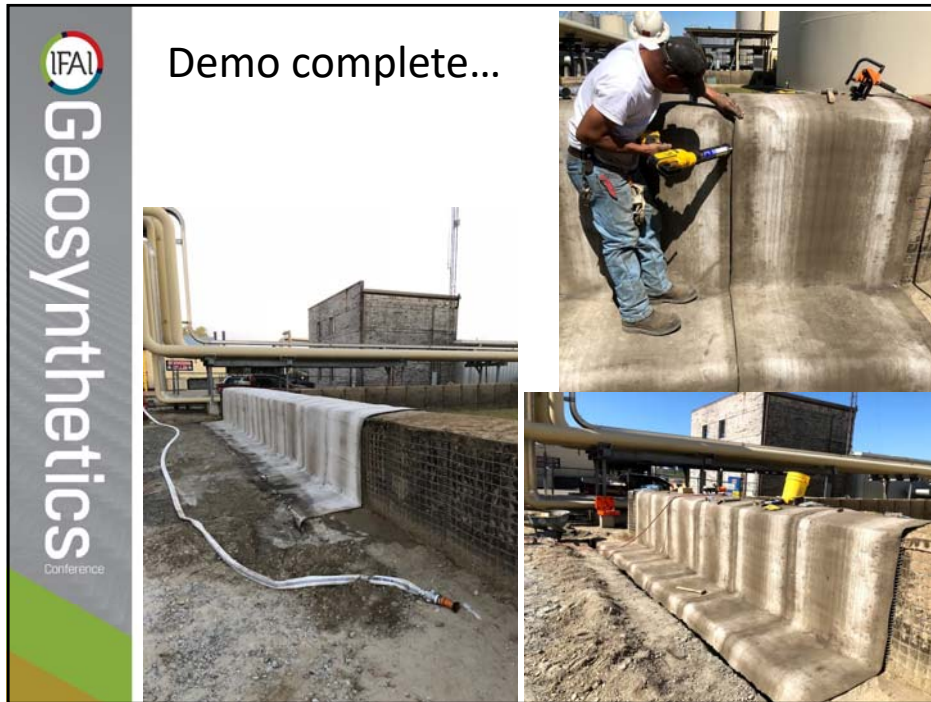
### FASTENER INDEX

RINGS SHOWN ACTUAL SIZE

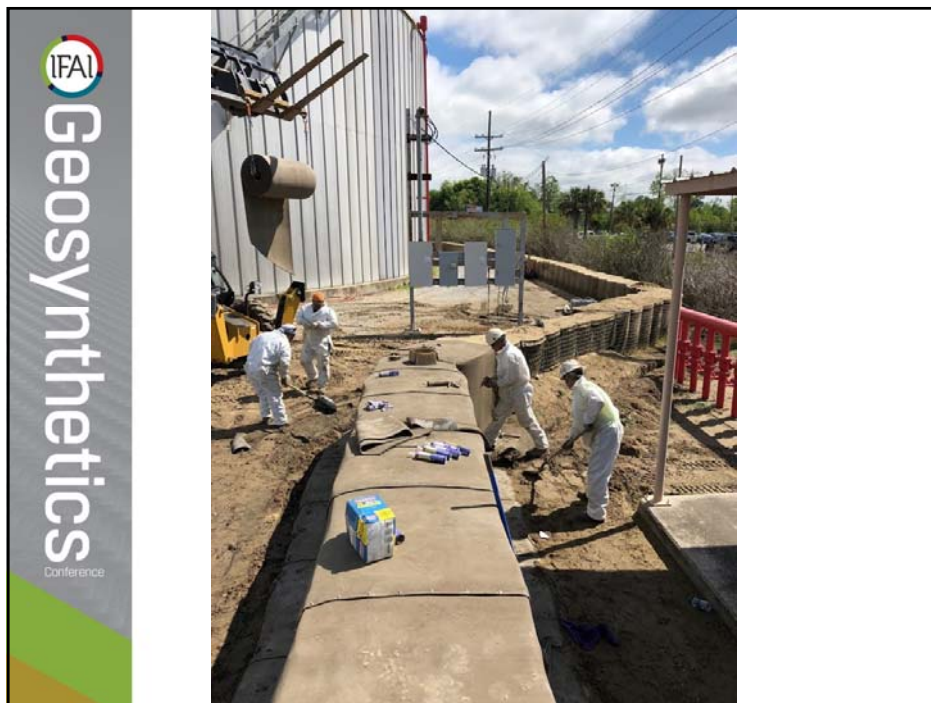
Ring Series and Closure	GF460	GF461	GF462	GF463	GF464	GF465	GF466	GF467	GF468	GF469	GF470
TOOLS	SC73402	SC73403	SC73404	SC73405	SC73406	SC73407	SC73408	SC73409	SC73410	SC73411	SC73412
RING TYPE	C-RING	C-RING	C-RING	C-RING	C-RING	D-RING	D-RING	C-RING	D-RING	C-RING	C-RING
WIRE SIZE	10 GA	10 GA	10 GA	10 GA	10 GA	10 GA	10 GA	10 GA	9 GA	14 GA	11 GA
RING SIZE	3"	12"	12"	3"	3"	3"	3"	3"	1.5"	1.5"	1.02"
CLOSURE SIZE (E.G. 3/16")	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"
STANDARD RING AVAILABLE	GALVANIZED ALUMINUM	GALVANIZED ALUMINUM	GALVANIZED ALUMINUM	GALVANIZED ALUMINUM	GALVANIZED ALUMINUM	BASIC STEEL ALUMINUM	GALVANIZED ALUMINUM	GALVANIZED ALUMINUM	GALVANIZED ALUMINUM	ALUMINUM	GALVANIZED ALUMINUM
POINTS OFFSET	BLUNT	BLUNT	BLUNT	BLUNT	BLUNT	BLUNT	BLUNT	BLUNT	BLUNT	BLUNT	BLUNT

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