Dominion Energy South Carolina, Inc.
400 Otarre Parkway
Cayce, SC 29033

May 18, 2022

Mr. Greg Cassidy
Project Manager
State Voluntary Cleanup Program
South Carolina Department of Health & Environmental Control
2600 Bull Street
Columbia, South Carolina, 29201

Re: Entact's Alternate Approach to Cofferdam Liner Material & Reinforcement
DESC – Congaree River Site
Columbia, South Carolina

Dear Mr. Cassidy:

As you are aware, DESC has selected Entact, LLC as the Remediation Contractor to implement the Stakeholder-Developed Modified Removal Action (SD-MRA) for the Congaree River Project located in Columbia, South Carolina. Contained within Entact's proposal was an alternate approach for providing the liner and reinforcement component of the stone-filled cofferdam. This correspondence provides details as they pertain to the alternate liner material and reinforcement component of the cofferdam construction.

It is important to note that this alternate approach for the liner and reinforcement remains consistent with other aspects of the USACE NWP-38 permit verification for this project and provides improved constructability of the cofferdam and reinforcement, which was a concern expressed by other potential contractors. The cofferdam(s) footprint, elevation, stone material of construction, and slopes **all remain unchanged**.

SUMMARY OF ALTERNATE COFFERDAM MATERIALS

	Liner Material	**Reinforcement**
Original Design	50-mil HDPE Liner	4" ACB Mats
	Or Approved Equivalent	
Alternate Design	XR5 Geomembrane	6" Unimat Fabric Formed Concrete

The following text provides additional details regarding the alternate cofferdam liner/reinforcement materials. Figures 6A and 6B from the design drawings in addition to two figures provided by Entact depicting the proposed alternatives are attached. Product specifications for the alternate materials are also attached.

ENTACT'S ALTERNATE APPROACH TO LINER MATERIAL & REINFORCEMENT

XR5 Geomembrane - In lieu of the 50-mil HDPE liner, Entact will install the 30 mil XR5 - 8130

geomembrane. This alternate approach will be implemented because the XR5 geomembrane:

- Has a strength advantage and higher puncture resistance;
- Has low hydraulic conductivity;
- Is far less stiff than HDPE liner; and
- Can be managed much more easily in marine applications.

The XR5 geomembrane is a synthetic reinforced geomembrane and provides high strength at minimum thickness. Based on product literature, the standard 30 mil thick XR5 strength significantly exceeds a 100 mil thick HDPE liner. Additionally, the XR5 reinforced geomembrane is flexible while the 50 mil HDPE is stiff. This flexibility as well as the ability to prefabricate panels, versus field seaming of the HDPE liner, makes field installation easier which provides a significant advantage for the anticipated conditions.

Fabriform Unimat - In lieu of the 4-inch articulated concrete block (ACB) mats depicted in the design drawings, a 6-inch thick Fabriform Unimat filled with concrete grout will be installed. The 6-inch Fabriform Unimats:

- Have greater thickness (6" vs. 4") and have a higher unit weight than the 4-inch ACBs;
- Can be placed using smaller equipment, manual labor and dive crews and subsequently grouted from the top of the cofferdam;
- Are continuous, making them practically impervious, as compared to the open-faced ACBs;
- Are pre-fabricated per an approved panel layout diagram; and
- Have been successfully used by DESC in other applications.

Overview of installation and removal process - The Fabriform Unimat will be laid in panels over the geotextile/XR5 geomembrane. The panels will be stitched and/or zippered to connect the mats. Articulated sections of the mats will be used at the base of the outboard and inboard sides of the cofferdam to allow the sections to conform to the river bottom. A dive crew will assist in positioning and securing the mats beneath the water at the base of the cofferdam. Each mat will be filled with concrete grout via a flexible pipeline connected to the grout pump, as supplied by ready-mix concrete trucks. Grout filling of each mat will be controlled by the grout stops present within each mat to prevent overfilling. Once the Fabriform Unimats have cured, 6 inches of gravel road base aggregate will be placed on the top of the cofferdams to allow equipment access during sediment removal.

Installation on the inboard side of the cofferdam is planned after the outboard side is complete. Geotextile will be secured to the top and bottom of the XR5 geomembrane using grommets prior to deployment. The geotextile/XR5 geomembrane will be placed at the top of the cofferdam and weighted with sandbags prior to unrolling down the outboard slope to the base of the river. The sections will be overlapped and secured, and a dive crew will assist with

placement of the panels at the base of the cofferdam until the Fabriform Unimat sections are placed. Geotextile/geomembrane placement will advance ahead of Fabriform Unimat placement.

At the conclusion of sediment removal activities at each area, the cofferdams will be removed. The Fabriform Unimat and geotextile/XR5 geomembrane will be cut into sections for removal by a CAT 336 hydraulic excavator with thumb attachment or similar equipment. Any stone that is commingled with the Fabriform Unimat and geotextile/geomembrane will be transported for off-site disposal and/or recycling and not reused for the second cofferdam.

ENGINEER'S REVIEW AND CONCURRENCE OF ENTACT'S ALTERNATE APPROACH

These alternate design materials have been reviewed by WSP, the cofferdam engineering firm, and *"In summary, the proposed approach appears to be appropriate and in line with the intent of the design presented in the permit drawings".*

Should you have any questions, please contact Paul Biery at (803) 217-5016 or me at (803) 217-9367.

Sincerely,

T. N. Effinger

Thomas N. Effinger. P.E.
Director, Environmental Services

Figures:
Permit Drawings: Sheet 6A, Sheet 6B
Entact Drawings: Figure 3, Figure 4

Attachments:
A XR5 Geomembrane Product Information
B Fabrifrom Unimat Product Information

cc: A. Cappellino - USACE
P. Biery, D. Slade -DESC
R. Contrael – ACE
W. Zeli – Apex
M. Blanchard - Entact

FIGURES

Permit Drawings: Sheet 6A, Sheet 6B

Entact Drawings: Figure 3, Figure 4

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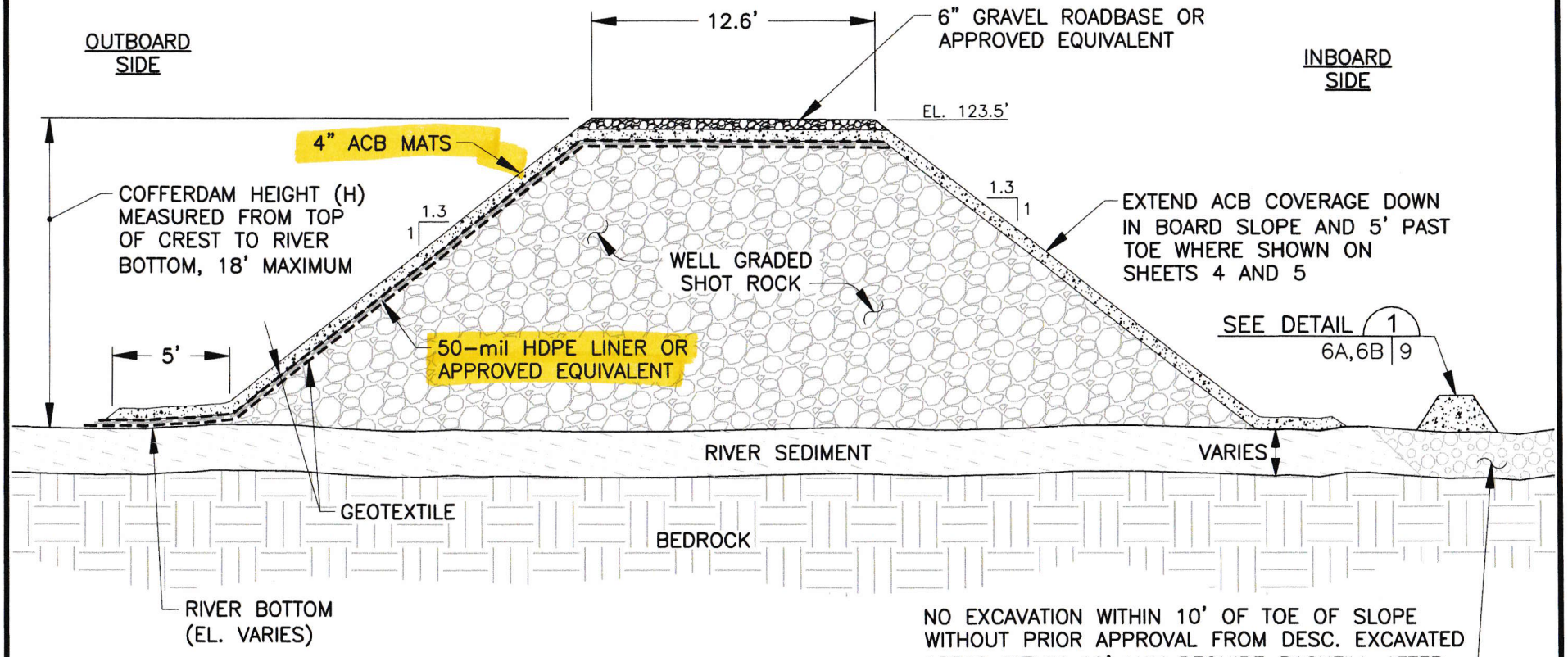

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

A

WSP USA Inc.
11 STANWIX STREET
SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 6A

COFFERDAM SECTION IN AREA 1 AND PARTIAL AREA 2

CONGAREE RIVER
COLUMBIA, SOUTH CAROLINA

PREPARED FOR
DOMINION ENERGY SOUTH CAROLINA, INC.
COLUMBIA, SOUTH CAROLINA

Drawn By: RAZ 05272020
Checked: TE 07142020
Approved: JPO 07242020
DWG No.: 314P1788.001-A06b

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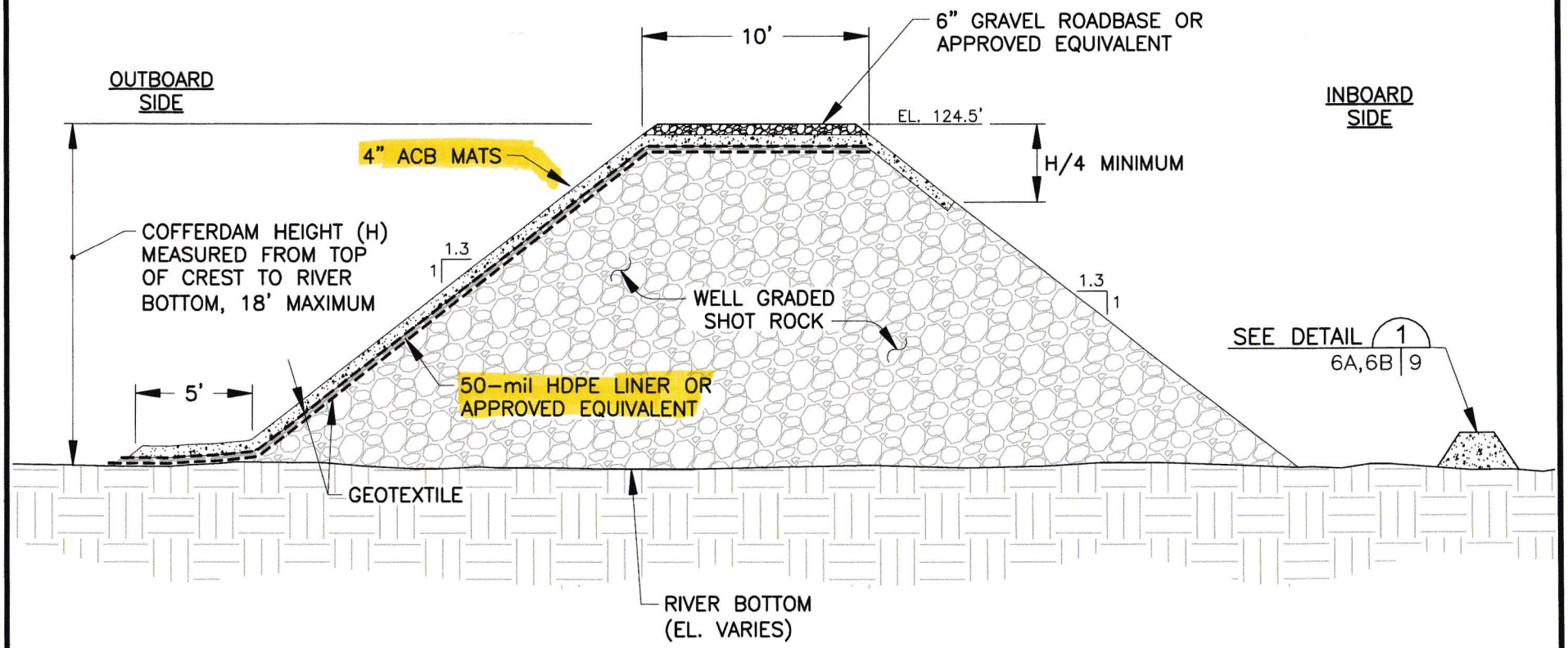

SECTION D 5 | 6A

LEGEND:

SEE DETAIL 1 | ? | ?

- 1: DETAIL NO.
- ?: SHEET WHERE DETAIL IS CALLED OUT
- ?: SHEET WHERE DETAIL IS SHOWN

0 6 12

SCALE, FEET

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

A

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11 STANWIX STREET
SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

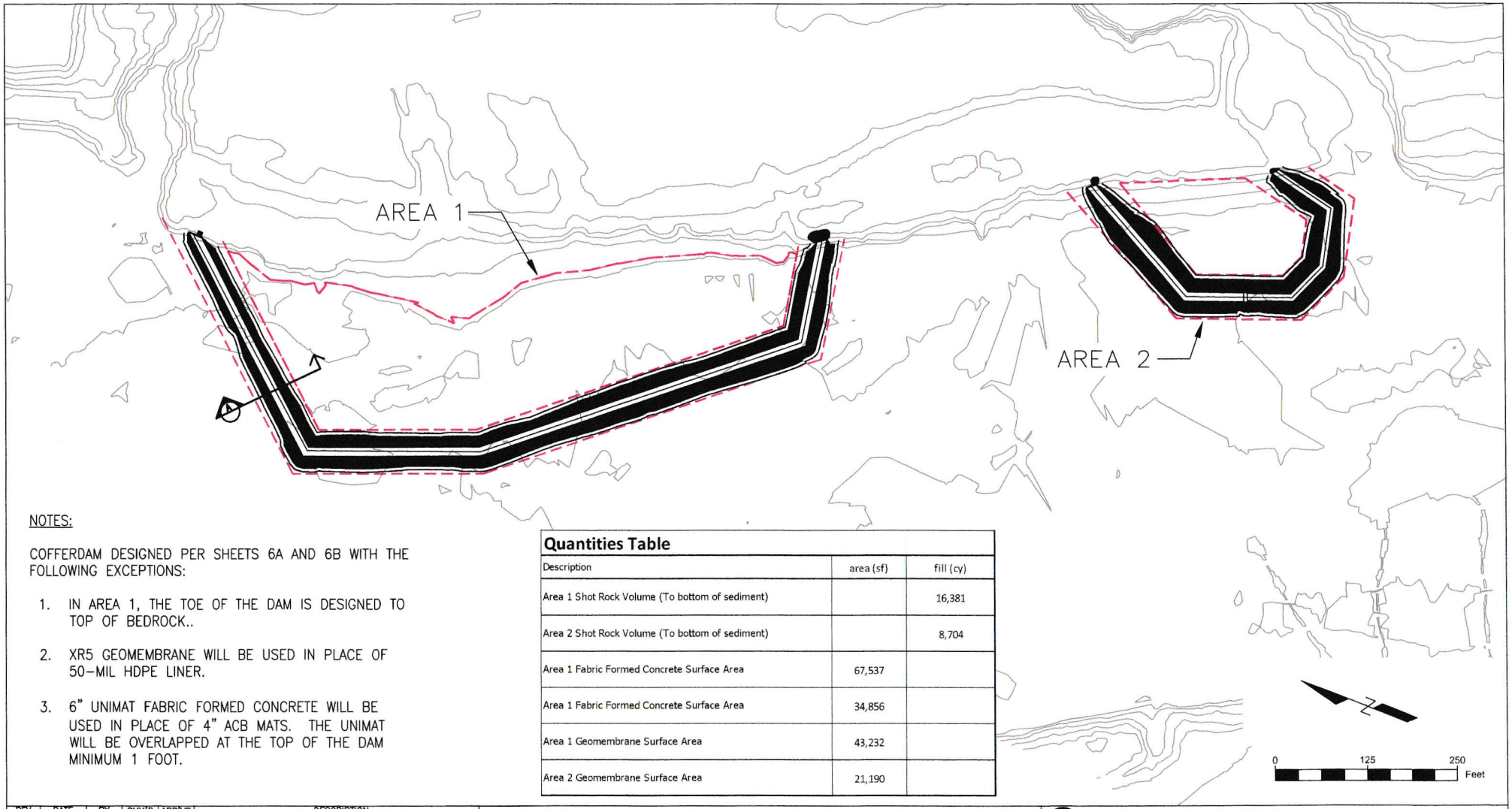
SHEET 6B

TYPICAL COFFERDAM SECTION IN AREA 2

CONGAREE RIVER
COLUMBIA, SOUTH CAROLINA

PREPARED FOR
DOMINION ENERGY SOUTH CAROLINA, INC.
COLUMBIA, SOUTH CAROLINA

Drawn By:	RAZ 10/02/2019
Checked:	TE 07/14/2020
Approved:	JPO 07/22/2020
DWG No.:	314P1788.001-A06a



NOTES:

COFFERDAM DESIGNED PER SHEETS 6A AND 6B WITH THE FOLLOWING EXCEPTIONS:

1. IN AREA 1, THE TOE OF THE DAM IS DESIGNED TO TOP OF BEDROCK..
2. XR5 GEOMEMBRANE WILL BE USED IN PLACE OF 50-MIL HDPE LINER.
3. 6" UNIMAT FABRIC FORMED CONCRETE WILL BE USED IN PLACE OF 4" ACB MATS. THE UNIMAT WILL BE OVERLAPPED AT THE TOP OF THE DAM MINIMUM 1 FOOT.

Quantities Table

Description	area (sf)	fill (cy)
Area 1 Shot Rock Volume (To bottom of sediment)		16,381
Area 2 Shot Rock Volume (To bottom of sediment)		8,704
Area 1 Fabric Formed Concrete Surface Area	67,537	
Area 1 Fabric Formed Concrete Surface Area	34,856	
Area 1 Geomembrane Surface Area	43,232	
Area 2 Geomembrane Surface Area	21,190	

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION

ENTACT

DRAWING NAME: FIGURE 3
COFFERDAM CONSTRUCTION – PLAN VIEW

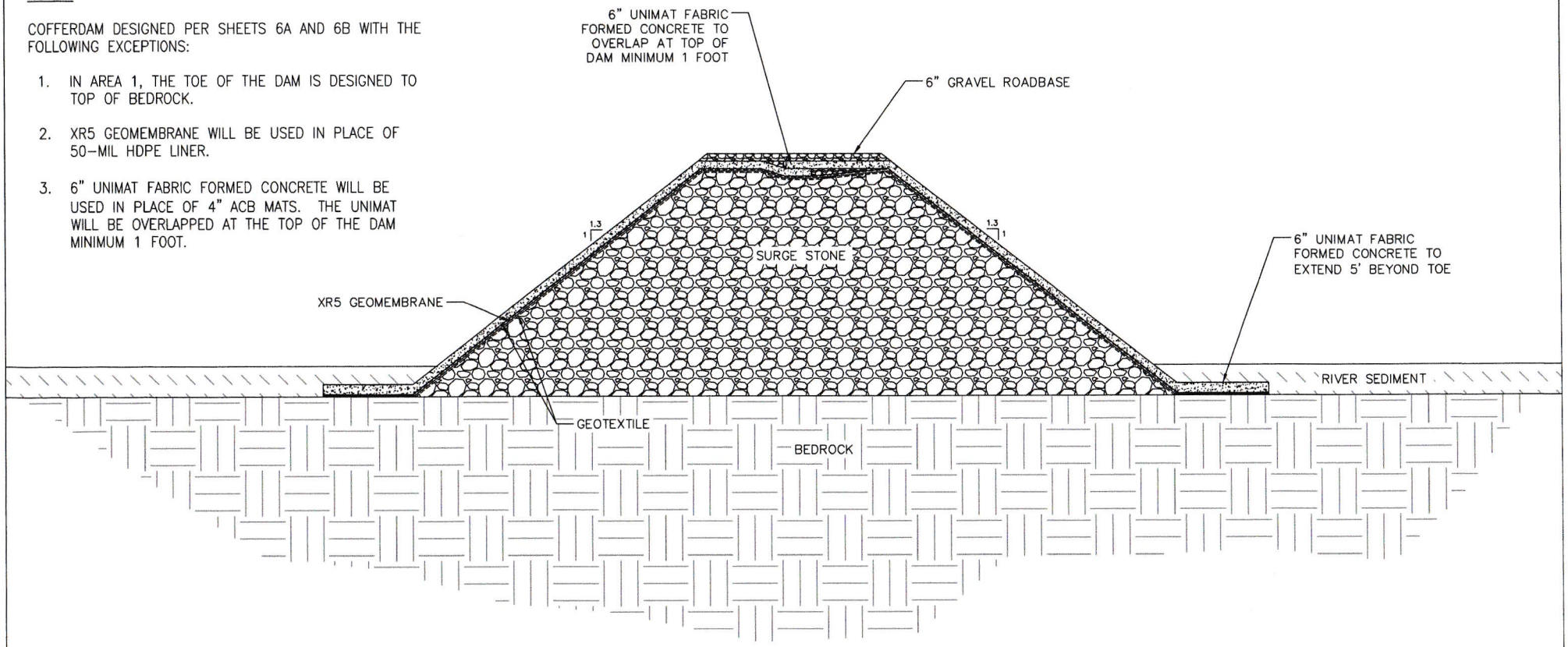
PROJECT NAME & LOCATION: CONGAREE RIVER SEDIMENTS
COLUMBIA, SOUTH CAROLINA

DRAWN BY	J. HOUGH	APPROVED BY	M. BLANCHARD	REV	0
DATE	3/4/22	DATE	3/4/22	PROJECT NO.	

NOTES:

COFFERDAM DESIGNED PER SHEETS 6A AND 6B WITH THE FOLLOWING EXCEPTIONS:

1. IN AREA 1, THE TOE OF THE DAM IS DESIGNED TO TOP OF BEDROCK.
2. XR5 GEOMEMBRANE WILL BE USED IN PLACE OF 50-MIL HDPE LINER.
3. 6" UNIMAT FABRIC FORMED CONCRETE WILL BE USED IN PLACE OF 4" ACB MATS. THE UNIMAT WILL BE OVERLAPPED AT THE TOP OF THE DAM MINIMUM 1 FOOT.



SECTION A

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION

ENTACT

DRAWING NAME	FIGURE 4 COFFERDAM CONSTRUCTION – PROFILE VIEW				
PROJECT NAME & LOCATION	CONGAREE RIVER SEDIMENTS COLUMBIA, SOUTH CAROLINA				
DRAWN BY	J. HOUGH	APPROVED BY	M. BLANCHARD	REV	0
DATE	3/4/22	DATE	3/4/22	PROJECT NO.	

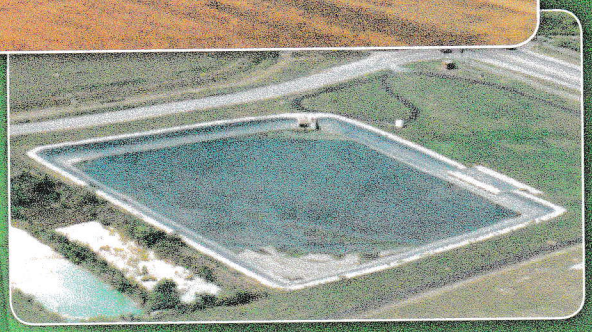
ATTACHMENT A

XR5 – Product Information

XR-5®
By Seaman Corporation

OUTLAST. OUTPERFORM. OUTSTANDING.

For over 30 years, XR-5® has been used by engineers who have needed the strongest geomembrane for use in the world's harshest conditions. Backed by over 60 years of coated fabric technology, Seaman Corporation's XR-5 is the highest-strength and most chemically resistant fabric on the market. XR-5 was developed to contain and protect against acids, oils, methane. Across the world, XR-5 is being used for pond liners, secondary containment, floating covers, wastewater baffles and potable water containment.



The XR-5® By Seaman Corporation Difference vs. HDPE, CSPE and Polypropylene

- Superior UV-Resistance
- Low Thermal Expansion & Contraction
- Superior Chemical Resistance
- Superior Tensile Strength
- 10-Year Weathering Warranty

Seaman Corporation is a global leader in the development of a broad range of innovative, high-performance fabrics. With a 60-year track record, Seaman Corporation has developed innovative fabric solutions for the roofing, military, architectural and marine industries.

Seaman Corporation • 800-927-8578 • 1000 Venture Blvd. • Wooster, OH 44691 • www.xr-5.com XR-5®

Property	Test Method	8130 XR-5®	8138 XR-5®
Base Fabric Type Base Fabric Weight	ASTM D 751	Polyester 6.5 oz/yd² nominal (220 g/m² nominal)	Polyester 6.5 oz/yd² nominal (220 g/m² nominal)
Thickness	ASTM D 751	30.0 mils nominal (0.76 mm min.)	40.0 mils nominal (1 mm min.)
Weight	ASTM D 751	30.0 ± 2.0 oz/yd² (1017 ± 2 g/sq. m)	38.0 ± 2.0 oz/yd² (1288 ± 2 g/sq. m)
Tear Strength	ASTM D 751 Trap Tear	40/55 lb. min. (175/245 N min.)	40/55 lb. min. (175/245 N min.)
Breaking Yield Strength	ASTM D 751 Grab Tensile	550/550 lb. min. (2,448/2,448 N min.)	550/550 lb. min. (2,448/2,448 N min.)
Low Temperature Resistance	ASTM D 2136 4hrs-1/8in Mandrel	Pass @ -30° F (Pass @ -34° C)	Pass @ -30° F (Pass @ -34° C)
Dimensional Stability	ASTM D 1204 212°F/100° C-1 hr.	0.5% max. each direction	0.5% max. each direction
Hydrostatic Resistance	ASTM D 751 Method A	800 psi min. (5.51 MPa min.)	800 psi min. (5.51 MPa min.)
Blocking Resistance	ASTM D 751 180° F/82° C	#2 Rating max.	#2 Rating max.
Adhesion-Ply	ASTM D 413 Type A	15 lb./in. min. or film tearing bond (13 daN/5 cm min. or FTB)	15 lb./in. min. or film tearing bond (13 daN/5 cm min. or FTB)
Adhesion- Heat Welded Seam	ASTM D 751 Dielectric Weld	40 lb./2in. min. (17.5 daN/5 cm min.)	40 lb./2in. min. (17.5 daN/5 cm min.)
Dead Load Seam Strength	ASTM D 751 4-Hour Test	Pass 240 lb./in. @ 70° F (Pass 1,068 N/2.54 cm @ 21° C) Pass 120 lb./in. @ 160° F (Pass 534 N/2.54 cm @ 70° C)	Pass 240 lb./in. @ 70° F (Pass 1,068 N/2.54 cm @ 21° C) Pass 120 lb./in. @ 160° F (Pass 534 N/2.54 cm @ 70° C)
Bonded Seam Strength	ASTM D 751 Procedure A, Grab Test Method	550 lb. min. (2,450 N min.)	550 lb. min. (2,450 N min.)
Abrasion Resistance	ASTM D 3389 H-18 Wheel 1 kg Load	2,000 cycles min. before fabric exposure, 50 mg/100 cycles max. weight loss	2,000 cycles min. before fabric exposure, 50 mg/100 cycles max. weight loss
Weathering Resistance	ASTM G 153	8,000 hours min. with no appreciable change or stiffening or cracking of coating	8,000 hours min. with no appreciable change or stiffening or cracking of coating
Water Absorption	ASTM D 471, Section 12 7 Days	0.025 kg/m² max. @ 70° F/21° C 0.14 kg/m² max @ 212° F/100° C	0.025 kg/m² max. @ 70° F/21° C 0.14 kg/m² max @ 212° F/100° C
Wicking	ASTM D 751	1/8in max. (0.3 cm max.)	1/8in max. (0.3 cm max.)
Bursting Strength	ASTM D 751 Ball Tip	750 lb. min. (3,330 N min.)	750 lb. min. (3,330 N min.)
Puncture Resistance	ASTM D 4833	275 lb. min. (1,200 N min.)	275 lb. min. (1,200 N min.)
Coefficient of Thermal Expansion/Contraction	ASTM D 696	8 x 10^{-6} in/in/° F max. (1.4 x 10^{-5} cm/cm/° C max.)	8 x 10^{-6} in/in/° F max. (1.4 x 10^{-5} cm/cm/° C max.)
Puncture Resistance	FTMS 101C Method 2031	350 lb. approx. (1550N approx.)	350 lb. approx. (1550N approx.)
Environmental/Chemical Resistance Properties	ASTM D 741 7-day Total Immersion with Exposed Edges	See Chemical Resistance Table	See Chemical Resistance Table

ATTACHMENT B

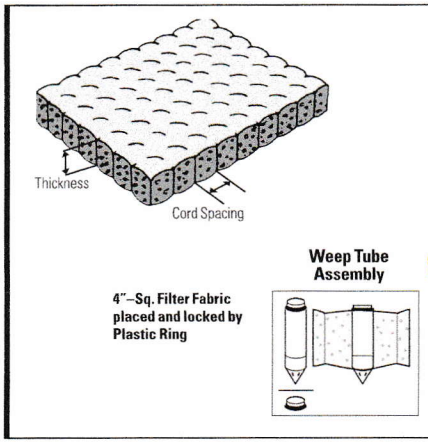
Fabriform Unimat Product Information

Fabric Forms for Concrete: Erosion Control Revetments

The FABRIFORM® Process utilizes a double-layer 100% nylon fabric form especially woven for optimum strength, stability, adhesion and filtering characteristics and a highly fluid fine aggregate concrete (grout) to provide an economical hard armor solution for erosion control. Fabriform revetments can be cast under water as well as in-the-dry.

Fabriform® Unimat Technical Data

DESIGNS BASED ON OVER 40 YEARS OF EXPERIENCE



Designation Style	CAST-IN-PLACE							
	Cord Spacing	Average Thickness*		Coverage Per		Dry Weight**	
		in.	mm	Y^3 Mortar	M^3 Mortar	lb / ft^2	kg / m^2
3" UMNN	3" x 3.5"	3	75	100 ft^2	12.14 m^2	34	166
4" UMNN	3" x 3.5"	4	100	75 ft^2	9.11 m^2	45	220
6" UMNN	3" x 6"	6	150	50 ft^2	6.07 m^2	68	330
8" UMNN	4.5" x 6"	8	200	38 ft^2	4.55 m^2	90	440
10" UMNN	4.5" x 7.5"	10	250	31 ft^2	3.78 m^2	112	550
12" UMNN	4.5" x 9"	12	300	25 ft^2	3.00 m^2	135	660

* Nominal

** Dry Weight based on a specific weight of 2.1 or 135 lb/cf. Unit Weight may vary with material proportions and source.

Uniform Cross Section (Unimat) revetment fabric is a form for casting in place fine aggregate concrete (grout) revetments. Characterized by a slightly dimpled surface, these rigid revetments exhibit a relatively low coefficient of hydraulic friction. Permeability is equivalent to that of high quality concrete paving. The criterion for selection of Unimat revetment thickness is the same as that employed in determining the thickness of conventional concrete paving.

Unimat revetment fabrics are woven of 100% high tenacity multi-filament nylon of which at least 50% by weight consists of textured fibers for optimum filtering characteristics and adhesion to the grout. These fibers have an excellent long-term performance record. Nylon yarns also provide a relatively high resistance to ultraviolet light and alkali degradation.

The Unimat revetment fabric is shop-assembled in predetermined panel sizes to fit site topography. The panels are convenient to handle and are joined together side-by-side at the job site by means of sewing or zipper closures attached to both the upper and lower layers of fabric.

The panels will contract when they are injected with grout. Allowance must be made for this contraction when preparing shop drawings of panel assemblies. Contraction will vary with site conditions. For budgetary estimates, a minimum contraction allowance should be made for approximately 8% additional fabric to cover the cast-in-place area.

NOTE:

Information contained in this publication is offered in good faith as a guide to placement of Fabriform® erosion control revetments. It is based on experience obtained under a variety of conditions. However, information contained herein will not apply to every job and dimensions and quantities shown are approximate only and will vary as a result of site conditions and installation procedures. The user is cautioned to obtain from others such professional and technical services as may, in his own judgment, be necessary or desirable to insure effective and economical installations.

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CONSTRUCTION TECHNIQUES, INC.

P.O. Box 42067

15887 Snow Road, Suite 100 • Cleveland, Ohio 44142

TEL 216.267.7310 FAX 216.267.9310

WEB www.fabriform1.com EMAIL fabriform@fabriform1.com

I. GENERAL

A. Scope of Work

The work shall consist of furnishing all labor, materials, and equipment for installing fabric-formed concrete revetment as indicated in the contract drawings and specified herein.

B. Description

The work shall consist of installing an unreinforced concrete revetment as indicated in the contract drawings, by positioning a specially woven dual wall 100% nylon fabric form on the slope or surface to be protected and injecting it with fine aggregate concrete (grout). The surfaces to be protected shall be prepared and graded to such an extent that they are normally stable in the absence of erosive forces.

C. Qualification of Contractor

The Contractor shall furnish records of past successful experience in performing this type of work. The Contractor shall save the Owner harmless from liability of any kind arising from the use of any patented or unpatented invention in the performance of this work.

II. MATERIALS

A. Fiber and Fabric Specifications

Fiber and fabric materials shall meet the minimum requirements, as listed and reported by an independent testing agency, shown below:

PROPERTY	TEST METHOD	UNIT	VALUE
PHYSICAL			
Composition			NYLON
Weight (both layers)	ASTM D-5261	oz/yd (g/m)	13 (440)
Thickness	ASTM D-5199	mils (mm)	30 (0.76)
MECHANICAL			
Grab Tensile Strength	ASTM D-4632	lbf (N)	WARP 400 (1780) FILL 400 (1780)
Grab Tensile Elongation	ASTM D-4632	%	WARP 30 FILL 30
Wide Width Strip Tensile Strength	ASTM D-4595	lbf/in (kN/m)	WARP 300 (52.5) FILL 300 (52.5)
Elongation At Break	ASTM D-4595	%	WARP 15 FILL 15
CBR Puncture Strenth	ASTM D-6241	lbs	1600
Trapezoidal Tear Strength	ASTM D-4533	lbf (N)	WARP 175 (775) FILL 175 (775)
HYDRAULIC			
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Standard (mm)	30 (0.587)
Flow Rate	ASTM D-4491	gal/min/sf (l/min/m)	100 (4072) Max

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TEL 216.267.7310 FAX 216.267.9310
WEB www.fabriform1.com EMAIL fabriform@fabriform1.com

B. Fabric Design

Fabric-forming material shall consist of double-layer, open-selvage fabric joined in a mat configuration. Fabric shall be woven of 100% high tenacity continuous multifilament nylon of which at least 50% by weight shall be textured fiber. Polyester, staple and partially orientated yarn shall not be allowed.

Unimat Fabric, designated as _____UMNN on the drawings, shall be woven in such a manner with nylon spacer cords to provide points of attachment on specific centers. *(See Note 1 below)* The spacer cords shall serve to control the thickness of the revetment without bursting the fabric during fine aggregate injection.

Thickness of the finished revetment shall be measured as described in Section III.D of these specifications.

Note 1: Designer will indicate here the fabric designation required from choice of fabric styles below. Fabric style designates the nominal thickness of the cast-in-place revetment:

3" UMNN, 4" UMNN, 6" UMNN, 8" UMNN, 10" UMNN, 12" UMNN

C. Fabric Porosity

Fabric porosity is essential for the successful execution of this work. At the direction of the Engineer, the Contractor shall demonstrate the suitability of fabric design by injecting the proposed grout into 5½" (140 mm) diameter sleeves. The sleeves shall be constructed of a single layer of the same basic fabric material. Test cylinders, 12"(300 mm) long, shall be cut from each specimen and tested in accordance with ASTM C-39. This test will be run once at the start of the project unless otherwise directed by the engineer. (See Item F below)

D. Relief of Hydrostatic Uplift

Where groundwater conditions require provision for relief of hydrostatic uplift, 7/8" (22mm) I.D. weep tube assemblies shall be inserted through the fabric. These weep tube assemblies shall be held in place during grout injection by means of a snap on collar attached to the lower end of the weep tube assembly. If the revetment has not been placed over a geotextile filter cloth, the lower end of the weep tube assembly shall be cover with a piece of filter cloth. The weep tube assemblies shall be located as called for on the plans.

E. Fabric Assembly

The Unimat fabric can be factory sewn into predetermined custom sized panels. The fabric rolls are first cut into the lengths specified on the shop drawings. These fabric pieces are then joined together, top layer to top layer and bottom layer to bottom layer. This will allow for the finished revetment to have the full mat thickness between the top and bottom seam. A single seam in which all four layers of fabric are joined at one point will not be permitted. All factory seams shall face downwards and shall be made using a double-needled machine utilizing the Standard Type 401 stitch. If required, bulkheads (grout stops) may be installed parallel to and in between individual mill widths at predetermined intervals to regulate the flow of fine aggregate concrete. Grout stops shall be designed as to produce full mat thickness along the full length of the grout stop.

F. Fine Aggregate Concrete (Grout)

Fine aggregate concrete (grout) shall consist of a mixture of portland cement, fine aggregate and water so proportioned and mixed as to provide a readily flowable grout. Admixtures and/or a pozzolan may be used with the approval of the Engineer. Use of super plasticizers require special precautions; silica fume is not recommended. The hardened fine aggregate concrete shall exhibit a compressive strength of 2,500 psi (17 MPa) at 28 days when specimens are made and tested according to the provisions of ASTM C-31 and C-39. The average compressive strength of fabric cast test cylinders, as described in Paragraph C above, shall be at least 20% higher at 7 days than that of companion test cylinders made in accordance with ASTM C-31, and not less than 3,000 psi (21 MPa) at 28 days.

III. INSTALLATION

A. Fabric Storage

Immediately following receipt of fabric on the job site, fabric shall be inspected and stored in a clean dry area where it will not be subject to mechanical damage or exposure to moisture or direct sunlight. Fabric allowed to become wet and then dried before installation may be subject to shrinkage.

B. Site Preparation

The surface to be protected shall be constructed to the line and dimensions as show on the contract drawings. The area shall be free of all obstruction and organic material such as rocks and roots. Areas below grade shall be brought to grade using engineered fill or a drainage stone as specified by the Engineer.

C. Fabric Placement

The Unimat fabric panels shall be positioned, as specified by the Engineer, at its approximate design location. The factory assembled panels shall be joined in the field by means of sewing or zipper closures. Adjacent panels shall be joined top layer to top layer and bottom layer to bottom layer. The contractor must make the appropriate allowance for approximately 4% contraction of the fabric in each direction which will occur as a result of grout injection. If joining of panels as described above is impractical, adjacent panels may be overlapped a minimum of 3 feet (900 mm), subject to Engineer's approval. In no case will simple butt joints between panels be allowed. However, a modified butt joint where an underlayment of similar fabric is sewn to one panel and overlapped a minimum of 2 feet (600mm) by the adjacent panel is allowed subject to Engineer's approval.

D. Fine Aggregate Concrete Injection

Following placement of the Unimat fabric panels, fine aggregate concrete (grout) shall be injected between the upper and lower layers of fabric through small slits cut in the upper layer of fabric. The injection pipe shall be wrapped tightly at the point of injection with a strip of burlap during pumping. After pumping, the burlap shall be pushed into the slit as the injection pipe is withdrawn in order to minimize spillage of grout on the revetment surface. The burlap seal shall be removed prior to the final set of the fine aggregate concrete and the injection area hand finished. The sequence of grout injection shall be such as to insure complete filling of the revetment-forming fabric to the thickness specified by the fabric manufacturer.

Foot traffic will not be permitted on the freshly pumped mat when such traffic will cause permanent indentations in the mat surface. Walk boards shall be used where necessary.

Excessive grout which has been inadvertently spilled on the mat surface shall be cleaned up with a broom and shovel. Use of a water hose to remove spilled grout from the surface of a freshly pumped mat will not be permitted.

During grout injection, the mat thickness may be measured by inserting a short piece of stiff wire through the mat at several locations from the crest to the toe of the slope. Any mat measuring less than 90% of the average of all thickness measurements shall be re-injected until desired average thickness has been attained.

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