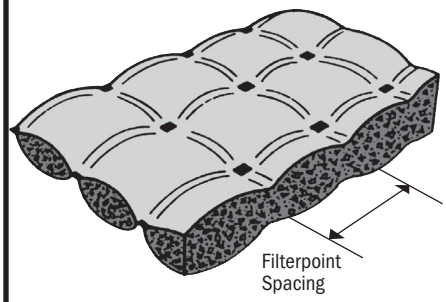
The FABRIFORM® Process utilizes a double-layer, 100% nylon fabric form, especially woven for optimum strength, stability, adhesion, and filtering characteristics, combined with a highly fluid fine aggregate concrete (grout) to provide an economical hard armor solution for erosion control. Fabriform revetments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

Fabriform® Filterpoint Technical Data

DESIGNS BASED ON OVER 40 YEARS OF EXPERIENCE



Designation Style	CAST-IN-PLACE							
	Filterpoint Spacing		Average Thickness*		Coverage Per		Dry Weight**	
	in.	mm	in.	mm	Y^3 Mortar	M^3 Mortar	lb / ft^2	kg / m^2
6" FPNN	6	152	3.0	76	100 ft^2	12.14 m^2	34	166
8" FPNN	8	200	4.0	100	75 ft^2	9.11 m^2	45	220
10" FPNN	10	250	6.0	150	50 ft^2	6.07 m^2	68	330
12" FPNN	12	300	8.0	200	38 ft^2	4.55 m^2	90	440

* Nominal

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

Filterpoint (FP) revetment fabric is a form for casting in place fine aggregate concrete (grout) revetments. Characterized by a deeply cobbled surface, these rigid revetments exhibit a relatively high coefficient of hydraulic friction which is well suited to attenuation of hydraulic energy. The woven filter points permit escape of ground water to relieve hydrostatic uplift.

Filterpoint revetment fabrics are woven of 100% high-tenacity, multifilament 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 in the critical areas where the two layers of fabric are joined together to form the filter points. Nylon yarns also provide a relatively high resistance to ultraviolet light and alkali degradation.

The Filterpoint 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 21% 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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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	15	
Thickness	ASTM D-5199	mils	40	
MECHANICAL				
Grab Tensile Strength	ASTM D-4632	lbf	WARP FILL	500 350
Grab Tensile Elongation	ASTM D-4632	%	WARP FILL	30 30
Wide Width Strip Tensile Strength	ASTM D-4595	lbf/in	WARP FILL	350 275
Elongation At Break	ASTM D-4595	%	WARP FILL	15 20
CBR Puncture Strenth	ASTM D-6241	lbs	1800	
Trapezoidal Tear Strength	ASTM D-4533	lbf	WARP FILL	200 170
HYDRAULIC				
SINGLE LAYER FABRIC				
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Standard	30	
Flow Rate	ASTM D-4491	gal/min/sf	90	
FILTERPOINT				
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Standard	170	
Flow Rate	ASTM D-4491	gal/min/sf	13.5	

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.

Filterpoint Fabric, designated as _____FPNN on the drawings, shall be woven in such a manner as to provide interwoven points of attachment on spaced centers. *(See Note 1 below)* These points of attachment shall serve to control the thickness of the revetment and also act as "Filter Points" to provide relief of hydrostatic uplift pressure beneath the revetment. The filter points shall be woven in a basket or other open weave to allow improved permittivity.

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 approximate spacing of filter points cast in place in the completed revetment:

6" FPNN, 8" FPNN, 10" FPNN, 12" FPNN

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 E below)

D. Fabric Assembly

The FP fabric can be factory sewn into predetermined custom sized panels. The FP 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. Completed FP panels shall be inspected to verify that the proper filter point spacing is maintained throughout the panel.

E. 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 requires 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 will be subject to shrinkage.

B. Site Preparation

The surface to be protected shall be constructed to the line and dimensions as shown 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. Anchor and flank trench installation will be in accordance with project plans and specifications.

C. Fabric Placement

The FP fabric panels shall be positioned over a geotextile filter fabric, as specified by the Engineer, at their 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 10% 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 (Grout) Injection

Following placement of FP fabric panels over the geotextile filter cloth, 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. First pump the upper edge of the mat which as been placed in the anchor trench followed by injection into the lower edge, working back up the slope. Avoid overpressuring of the fabric. 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 ensure 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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