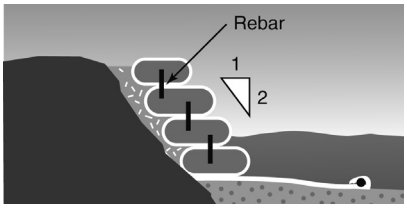
Fabric Forms for Concrete: Erosion Control Bags

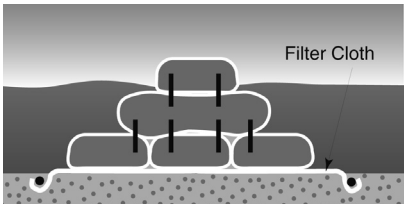
The FABRIFORM® Process utilizes a 100% nylon fabric form, especially woven for optimum strength, stability, adhesion, and filtering characteristics, combined with a highly fluid fine aggregate concrete (grout) to provide an economical hard armor solution for scour and erosion control. Fabriform Concrete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

Fabriform® Concrete Bags Specifications

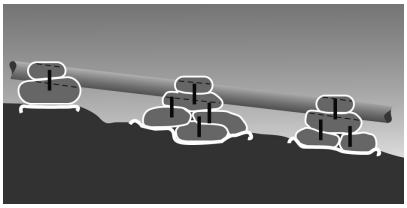
DESIGNS BASED ON OVER 40 YEARS OF EXPERIENCE



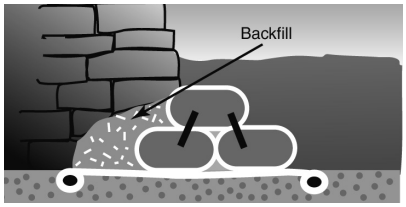
SHORELINE PROTECTION



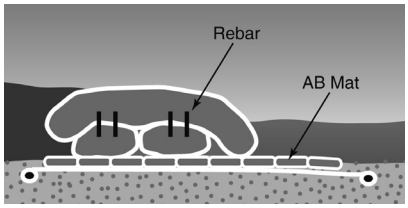
GROINS



PIPELINE SADDLES



STRUCTURAL REPAIRS



BREAKWATERS

Fabriform Concrete Bags are used to create large, cast-in-place concrete blocks that provide superior shore protection with significantly reduced labor and equipment requirements. They allow for customized design to ensure the most stable repair of waterfront areas such as scoured bridge piers, dam spillways, bulk-heads, dikes, jetties, flood walls, breakwaters, and other sub-aqueous structures.

Fabriform Concrete Bags are woven from high-tenacity, multifilament, 100% nylon fiber to create a water-permeable material that serves as both a filter and a form. A fine-aggregate concrete mixture is pumped into the bags through self-closing inlet valves. Excess mix water is forced through the fabric as a result of pump pressure, causing rapid stiffening and case hardening of the outer area of the cast-in-place block. Reinforcing dowels can be inserted into the completed block to interlock with the next layer. The result is a strong, stable concrete block installation that will provide proven protection.

IMPORTANT: When used as waterfront protection over erodible soil, a layer of filter cloth beneath and behind the blocks is required to prevent toe scour and undermining or consolidation of the underlying soil. Fabriform revetments are an effective supporting platform under the blocks on soft soil.

In construction of breakwater and groins, the top layer of blocks must be oriented *perpendicular* to the predominant direction of wave action or "nose-on" to the waves.

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 bags as indicated in the contract drawings and specified herein.

B. Description

The work shall consist of installing concrete bags, as indicated in the contract drawings, by positioning a specially woven, dual wall, 100% nylon fabric bag on the area to be protected and injecting it with fine aggregate concrete (grout).

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	ASTM D-5261	oz/yd (g/m)	8 (270)	
Thickness	ASTM D-5199	mils (mm)	30 (0.76)	
MECHANICAL				
Grab Tensile Strength	ASTM D-4632	lbf (N)	WARP FILL	600 (2,670) 600 (2,670)
Grab Tensile Elongation	ASTM D-4632	%	WARP FILL	25 25
Wide Width Strip Tensile Strength	ASTM D-4595	lbf/in (kN/m)	WARP FILL	400 (70) 400 (70)
Elongation At Break	ASTM D-4595	%	WARP FILL	15 15
Trapezoidal Tear Strength	ASTM D-4533	lbf (N)	WARP FILL	200 (890) 200 (890)
CBR Puncture Strength Puncture Resistance	ASTM D-6241	lbs	2,200	
HYDRAULIC				
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Standard	60 (max)	
Flow Rate	ASTM D-4491	gal/min/sf	35 (max)	

B. Fabric Design

Fabric bag material shall consist of single-layer, open-selvage fabric joined in a bag 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.

C. Fabric Assembly

The 100% nylon fabric is factory sewn into predetermined custom sized bags with a tolerance of plus or minus 3 inches (75mm). Self-sealing inlets are factory-installed with size and location determined by contractor. Two self-sealing inlets shall be provided for bags 20 feet (6 m) or longer. Seams shall be folded and double-needle stitched.

D. 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 and/or 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 bags shall be inspected and stored in a clean, dry area where they 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 roots and sharp rocks.

C. Concrete Bag Placement and Injection

The fabric bags shall be positioned over a geotextile filter fabric, as specified by the Engineer, at their approximate design location. The contractor must make the appropriate allowance for contraction of the fabric bag in each direction which will occur as a result of grout injection. The bags shall be positioned and filled in such a way they abut tightly. Joints between bags in successive tiers shall be staggered.

Fine aggregate concrete (grout) shall be injected between the upper and lower layers of fabric through special self-sealing inlet valves provided by the manufacturer in the upper layer of fabric. The injection pipe shall be held tightly at the point of injection. The sequence of grout injection shall be such as to insure complete filling of the concrete bag to the thickness required while minimizing excess grout loss.

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

If reinforcing steel connectors (rebars) between blocks are required, the rebars are first inserted through the fabric and then into the bag containing fresh concrete. The succeeding layer of bags is threaded over these rebars and filled with concrete in a staggered pattern.

IV. ORDERING INFORMATION

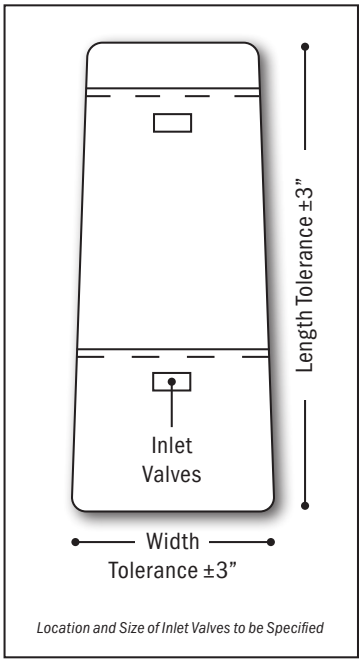
A. All Fabriform concrete bags are assembled to order. Shipment can usually start within one week from receipt of order.

B. Specify bag size by length, width and height. Manufacturing tolerance is plus or minus 3" (75mm) in length and width.

C. Specify location of inlet valves and outside diameter of injection hose to be used.

D. Bags may be shop assembled to irregular, non-rectangular shapes on request. Bulk fabric is available for job site assembly of special bags.

E. In estimating freight costs, it is conservative to use:
Weight – 14 lbs. per hundred square feet of bag area (7 kg/10m^2)
Cube – 40 cu. ft. per 6,000 square feet of bag area (0.2m^3/100m^2).



Location and Size of Inlet Valves to be Specified

V. EFFECTIVE pH OF SURROUNDING WATER

Laboratory tests have demonstrated that cement lost through fabric will average about a ¼% of cement content with a maximum of ½%, equivalent to about 3,000 gm of cement per cubic meter of mortar pumped. Tests have likewise demonstrated that the addition of 50 grams of cement to a cubic meter of water will raise the pH value about 1.0, well within the normal range of pH variation in potable water – typically 7.0 - 9.5. From these facts, it may be demonstrated the raise in pH will be limited to no more than 1.0.

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