

Dixie



CONTRACTOR



Concrete Forming & Placement

Fabric—Formed Concrete Revetments

New Technology Applied to Control Erosion

The construction industry has grown in complexity just as fast as it has grown in dollar volume — perhaps faster. And the increasing demands placed upon construction have been met with a wide array of advances in building technology.

One such development has been the increased use of fabrics. Although fabrics are now used in many different applications, one of the earliest uses was in erosion control.

“Fabric is a wonderful material for controlling erosion,” stated Bruce A. Lamberton, president of Construction Techniques, Inc. “It’s porous, so it allows passage of ground water to relieve hydrostatic uplift, but it’s not so porous as to permit the loss of those fine soil particles we’re trying to hold in place.

“If it would just stay in place on a shoreline,” he added, “and not wash away, abrade or tear so easily.” One of the oldest remedies for this problem has been to simply pile rocks — the riprap — on the fabric to hold it in place and protect it.

But just dumping rocks on a sheet of fabric can pose almost as many problems as it solves. Suitable rock isn’t always available, and transportation costs can sometimes be prohibitive. And the rough, loose stones render the



Above: Fabric being positioned along canal bank prior to the pumping of concrete. Below: Concrete being pumped into fabric form at a lake adjacent to a power plant.

shoreline or beachfront pretty much unuseable.

But a solution to these problems, first proposed by Dutch engineer Henri Hillen in 1968, has been improved and refined to the point where it now has many other applications and has become something of a separate, independent construction technique.

As Lamberton explained the development of the process, “Hillen joined two layers of fabric together at spaced centers. . . sewed closed the edges of this big fabric envelope, and pumped structural cement mortar into it, forming a cobblestone revetment. Textile engineers,” he continued, “quickly demonstrated that such a fabric envelope could be produced by weaving



two layers of fabric simultaneously, joining them together by interweaving the two layers at spaced intervals.”

Today, a variety of concrete revetment forming fabrics are available to meet the specific requirements of many differing applications.

The simplest type of fabric forming for concrete revetments is just two layers of cloth held together by evenly spaced threads of fixed length. When pumped full of concrete at the work site these forms result in a slab of relatively uniform cross sections. If relief of hydrostatic uplift is required plastic tubes, called “weep” tubes, can be pushed through the material at selected intervals prior to the insertion of concrete.

However, both these types of revetments have a drawback in that they are basically rigid slabs of concrete. These mats cannot provide the pronounced articulating capabilities of riprap over filter cloth — such as those properties required

A Fabriform concrete revetment installation in Savannah, Ga. Installation of concrete bags above revetment is for extra flood protection.





A section of the shoreline of West Point Lake in Georgia is protected from erosion with fabric concrete revetments.

in revetment exposed to underscour from wave or current action.

An articulating fabric formed revetment was developed to provide these characteristics which are needed in some instances. These so-called "articulating block revetments" consist of fabric formed concrete blocks linked together with galvanized steel cables or nylon ropes. The cables or ropes are threaded between the two fabric layers, passing through the mortar conduits between adjacent blocks.

Any of these types of concrete revetments, formed with fabric, can be installed with varying thicknesses of concrete. All that is required is that the spacers holding the two layers of fabric together be produced with the desired length.

But the fabric doesn't just act as the concrete's form — the material is also essential as reinforcement and, most importantly, as a filter to remove water from the grout as it is being pumped into place.

The concrete that is used with the fabric forms obviously must be very "pumpable." For this reason the mix of the material is very important. The cement content is usually very high and coarse aggregate, normally used to reduce the cement requirement, is not used. According to Construction Techniques'

Lamberton, "Water content of the grout as pumped is always far higher than that customary for conventional concrete."

In fact, Lambertson continued, "the grout which (is) pumped into our revetment form looks very much like a gray soup." Apparently "of little structural value to the trained eye of the concrete inspector," he added. But appearances can be deceiving, because the type of fabric used to produce the forms results in surprisingly strong revetments.

"The fabric must be highly water per-

meable," Lambert explained, "while being woven tightly enough to prevent loss of fine cement particles. The fabric acts like a filter as well as a form," he added, allowing the high levels of water to be pushed out while "retaining the solids in essentially unchanged proportions."

According to Lambertson, "the durability of fabric-cast mortar under extreme weathering conditions has proven to be excellent." He pointed out that the oldest major project using such revetments, placed in New York in 1968,

Concrete revetment forming fabrics installed in a City of Atlanta park.



shows the imprint of the fabric on the crowns of the mortar nodules, which are still in place.

A relatively new adaptation of the fabric forms has been developed to assist in repair and reconstruction work on bridge and dock pilings — which have been slowly eaten away by corrosion, erosion or other factors. Fabric sleeves have been developed which fit around the pilings, creating a form which can be pumped full of concrete.

This technique creates a strong protective layer around the original piling and, when used in conjunction with reinforcing materials, can actually form a new structural support member.



Above: Detoriated pilings can be given new life with nylon fabric forms for concrete. Right: Pilings being restored with Fabriform pile jackets. Mortar is injected through two hoses extending to bottom of jacket.

Fabric forms for concrete revetments

The solution to slope protection for new construction and "INFRASTRUCTURE" repairs ————— is —

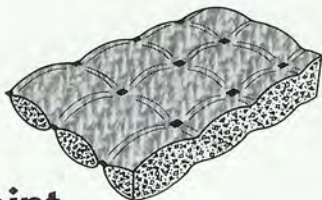
Fabriform®

CONTECH manufactures and markets three distinct styles of revetment fabric. Assembled fabric panels are filled in-place with concrete, underwater or in-the-dry. Each fabric style is expressly designed to protect against specific erosive conditions.

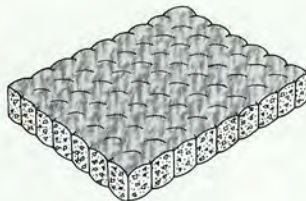
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Filterpoint

Integral woven filter points on either, 5", 8" or 10" centers provide maximum relief of hydrostatic uplift and attenuation of hydraulic energy.



2



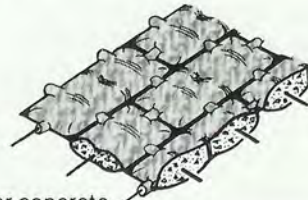
Unimat

Closely spaced tie cords between fabric layers, provide revetment thicknesses ranging from 3" to 8" for minimum hydraulic friction and maximum impermeability.

3

Articulating block (AB)

Cable reinforced, rectangular concrete blocks, weighing 75, 190, or 520 lbs. each, are cast in place on slopes subject to severe underscour or settlement.



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