

## ITEM 555.2511--09 - CONCRETE GROUT FILLED FABRIC BAGS

### DESCRIPTION

This work shall consist of furnishing and installing custom fitted fabric tubes or bags and pumping concrete grout into these fabric tubes or bags at the specified locations and in accordance with the lines, grades, design and dimensions shown on the contract drawings and as specified herein, and as directed by the Engineer.

### MATERIALS

**Fabric Forms:** The fabric forms shall be composed of synthetic yarns formed into a woven fabric. Yarns used in the manufacture of the fabric shall be composed of at least 85% by weight of polyamide. Forms shall be woven with a minimum of 50% textured yarns (by weight) to improve adhesion to fine aggregate concrete and to improve filtration. They shall be formed into a network such that the yarns retain dimensional stability relative to each other, including selvages. Each layer of fabric shall conform to the physical, mechanical and hydraulic requirements shown below. The fabric forms shall be free of defects or flaws which significantly affect their physical, mechanical, or hydraulic properties.

Fabric form material shall consist of two layers of woven fabric sewn together. When filled with fine aggregate concrete they shall form a concrete armor unit with finished average unit dimensions as shown on the plans or as directed by the Engineer.

#### **Specification property requirements – fabric forms<sup>1, 2</sup>:**

<b>Property</b>	<b>Test Method</b>	<b>Units</b>	<b>Values</b>
<b>Physical:</b>			
Composed of Yarns -Machine -Cross			Polyamide (Nylon) Polyamide (Nylon)
Mass Per Unit Area (double-layer)	ASTM D 5261	g/m <sup>2</sup>	470
Thickness	ASTM D 5199	mm	0.7
Mill Width		m	1.93
<b>Mechanical:</b>			
Wide-Width Strip Tensile Strength -Machine -Cross	ASTM D 4595	kN/m kN/m	33.2 24.5
Elongation at Break -Machine -Cross	ASTM D 4595	% %	20 30
Trapezoidal Tear Strength -Machine -Cross	ASTM D 4533	N N	800 510
<b>Hydraulic:</b>			
Apparent Opening Size (AOS)	ASTM D 4751	mm	0.250
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup>	2035

#### **Notes:**

1. Conformance of fabric forms to specification property requirements shall be based on ASTM D 4759, "Practice for Determining the Special Performance of Geotextiles."
2. All numerical values represent minimum average roll values (i.e., average of test results from any sample roll in a lot shall meet or exceed the minimum values). Lots shall be sampled according to ASTM D 43254, "Practice for Sampling of Geosynthetics for Testing."

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Mill width of fabric rolls shall be a minimum of 1.93 m. Each selvage edge of the fabric shall be reinforced for a width of 50.0 mm by adding a minimum of 15 warp yarns to the selvage construction. Mill width rolls shall be cut to the length required, and two layers of fabric shall be joined, top layer to bottom layer, by means of sewing thread to form the required unit dimensions.

Self-sealing filling valves, suitable for use with fine aggregate concrete, shall be installed at predetermined locations. A minimum of two valves shall be provided for bags more than 6.1 m long.

All Seams sewn in the factory shall be not less than 15.7 kN/m when tested in accordance with ASTM D 4884. All sewn seams shall be made using a Type 401 double lock stitch or two rows of single-lock stitch. All double-lock stitches shall be sewn simultaneously and be parallel to each other, spaced between 6 mm to 19 mm apart. Each row of stitching shall consist of 4 to 7 stitches per 25.4 mm. Thread used for seaming shall exhibit ultraviolet, chemical and biological durability.

The Contractor shall submit, to the Engineer, a manufacturer's certification that the supplied fabric forms meet the criteria of these Specifications, as measured in full accordance with the test methods and the standards referenced herein. The certifications shall include the following information about each fabric form delivered:

- Manufacturer's name and current address;
- Full product name;
- Style and product code number;
- Form number(s);
- Polymer types; and
- Manufacturer's certification statement.

**Concrete Grout:** Concrete grout shall comply with the following subsections of §700 – Materials:

701-01 Portland Cement Type II.

703-04 Grout Sand – Aggregate grading shall be reasonably consistent and shall not exceed the maximum size which can be conveniently handled with available pumping equipment.

711-08 Admixtures

711-10 Fly Ash

712-01 Water

Concrete grout shall consist of a mixture of Portland cement, fine aggregate (sand) and water, so proportioned and mixed as to provide a pump able grout. Pozzolan, grout fluidifier or pumping aid conforming to this Specification may be used at the option of the Contractor. The mix shall exhibit a compressive strength of 24 140 kPa at 28 days. The Contractor shall submit in writing to the Engineer a mix design showing the mix proportions and results of two test breaks, performed by an independent testing lab.

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**Bar Reinforcement:** Bar reinforcement shall comply with the following subsection of §700 – Materials:

709-04 Epoxy-Coated Bar Reinforcement, Grade 420

**CONSTRUCTION DETAILS**

Prior to commencing work, the Contractor shall submit a construction procedure and equipment list to the Engineer for their approval. No work shall begin until this approval is received.

Before placement of the custom fitted fabric bags, the channel slope shall be excavated to the dimension shown on the contract plans in order to create a bench for the concrete grout filled fabric bags to sit on. Adequate care shall be taken to keep the turbidity of the stream down during excavation using approved methods in accordance with the Storm Water Pollution Prevention Plan (SWPPP). Material removed shall be disposed of at a location acceptable to the Engineer, provided by the Contractor.

The grout filled bags shall be placed where shown on the plans or where ordered by the Engineer. Bag size and placement shall insure that the slope is adequately stabilized and shall meet the requirements and intent of the contract plans. Bags shall be positioned to stagger joints between rows, and rows shall be anchored together with reinforcing rod dowels as indicated on the contract plans.

The Contractor shall conduct the grout filling operation in a manner that will prevent the possibility of discharge of grout or cement into the water. Grout injection shall be performed in a manner that will avoid rupture of the fabric forms or the formation of cold joints. A cold joint is defined as one in which the pumping of the fine aggregate concrete into a given form is discontinued or interrupted for an interval of forty-five or more minutes.

Concrete pumping equipment shall be capable of delivering up to 19 m<sup>3</sup>/hr.

If the fabric grout filled bags are used as a form, placement of required injection and vent pipes shall be accomplished during bag installation. These pipes shall be positioned to insure that the enclosed volume can be completely filled and the enclosed water displaced. A 1.2 m maximum spacing of the vent/fill pipes is recommended.

Abutting form units, if placed laterally, may be installed immediately after placement of the preceding unit(s). If a form unit is to bear on previously installed units, the lower units must be allotted a minimum of four hours of cure time before the beginning installation of a succeeding; vertically adjacent course of form is used.

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**METHOD OF MEASUREMENT**

Payment for the placement of the concrete grout filled fabric bags will be measured as the number of cubic meters of concrete grout actually placed into production and used to fill the fabric bags.

**BASIS OF PAYMENT**

The price bid shall include the cost of furnishing the fabric bags and all labor, materials and equipment necessary to complete the work.

Payment will be made for the cubic meters of grout introduced into the pumping system even though some of it will be used for delivery purposes and not necessarily incorporated in the work. Material required to refill the system due to the Engineer directing that pumping be discontinued through no fault of the Contractor, their materials, or their equipment, will be paid for by the State. Stoppages attributed to the Contractor shall be the Contractor's responsibility and the cost of the material required to refill the discharge system shall be borne by the Contractor.

Excavation of the benched section of the channel slope shall be paid for separately.

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