

REVETBLOK ARTICULATING CONCRETE BLOCK (ACB)  
SYSTEM SPECIFICATION

**Part 1: General**

**A. Scope of Work:**

The contractor shall furnish all labor, materials, equipment, and incidentals required. The contractor should perform all operations in connection with the installation of the REVETBLOK ACB mattresses in accordance with the following. Finishes, grades, design, and dimensions shown on the Contract Drawings and as specified herein.

Contact information

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**B. Deliverables:**

The contractor shall submit to the engineer all manufacturers' performance research results, calculations in support of the proposed REVETBLOK ACB mattresses system and geotextile proposed for use.

The contractor shall furnish certificates of compliance for REVETBLOK concrete block/mat, revetment cable and any revetment cable fittings and connectors as specified per this document. The contractor should also furnish manufacturer's specifications, literature, shop drawings for mats layout, and any recommendations, if applicable, specific to the project.

All deliverables must be submitted to the governing engineer prior to the start of mat fabrication. Alternative material may be considered. Such materials must be pre-approved in writing by the engineer. Such packages must be submitted to the engineer a minimum of 15 days prior to bid date.

**Part 2: Product**

**A. General Description:**

REVETBLOK articulating concrete mats shall be pre-manufactured of individual concrete blocks with specific hydraulic capacities, laced with revetment cables. The blocks shall be assembled in a staggered, beveled and interlocked manner for enhanced stability.

The mats shall be constructed of open cell units only as shown on the contract drawing. The open cell units have two vertical openings of rectangular cross section with sufficient wall thickness to resist breakage during shipping and installation. Open cell units have an open area of 18-23% as measured from the base of the mat. Closed cell units are also available for projects that require units with a higher performance, less growth, and more coverage of the geotextile fiber.

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Cable shall extend parallel through two cable ducts in each block allowing for longitudinal binding of the units and subsequent ability of the blocks to move freely along the cable. All blocks must be secured with a minimum of two cables. Each row of units shall be laterally offset by one-half a unit width to the adjacent row. Any given block must be cabled to four other blocks, two in the row above and below. Lateral displacement while lifted shall be minimized by interlocking surfaces that each block shall incorporate. The interlocking surfaces must not protrude beyond the perimeter of the block to such an extent that the flexibility or articulation capabilities of the mats are reduced, are broken or become damaged at the time mats are lifted during shipment or placement. The mats must be able to flex between any row or column of blocks a minimum of 18° and 45° in the uplift direction and downward direction, respectively. The interlocking surfaces shall also minimize lateral displacement of the blocks if the cables become damaged or removed once the mats are placed in desired location.

### **B. Certification and Performance:**

Completed mats will only be accepted when accompanied by the documented hydraulic performance characteristics that are derived from tests under controlled flow conditions. All hydraulic testing shall be performed in a 2H:1V flume. The designed safety factor shall be a minimum of 1.5. The analysis shall be performed based upon stability of the mat due to gravity forces alone. Conservative forces added by cabling, mechanical anchorage, contact with adjacent blocks, or other restraints not attributable to gravity shall be neglected. The analysis must account for a 0.0- inch block projection. All design calculations submitted must be based upon the smallest block utilized in the mats. The following equation is used:

$$SF = ((\vartheta_2 / \vartheta_1) \alpha_0) / ((1 - \alpha_0^2)^{0.5} \cos \beta + \eta (\vartheta_2 / \vartheta_1) + (\vartheta_3 F_d' \cos \delta + \vartheta_4 F_i') / \vartheta_1 W_s) \geq 1.5$$

## **Part 3: Materials and Properties**

### **A. Cement**

Cementitious materials shall conform to the following applicable ASTM standards:

- Portland Cements (C 150)
- Blended Cements (C 595)
- Hydrated Lime Types (C 207)
- Pozzolans (C 618)

Aggregates shall conform to the following ASTM Specifications:

- Normal weight (C 33)
- Light weight (C 331)

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**B. Revetment Cable**

Polyester Revetment cable shall be constructed of high tenacity, low elongating and continuous filament polyester fibers. Cable shall be constructed of a core construction comprised of parallel fibers contained within an outer jacket or cover. The weight of parallel core shall be 65% to 70% of the total weight of the cable. The supplier, based on the size of the mats to be placed, shall determine the cable. Physical characteristics are listed below.

**Table 3.1**

Nominal Cable Diameter/Circumference	Approx. Average Strength	Weight/100 ft. Min./Max.
1/4" / 20 mm	3,700 lbs.	2.47 lbs. - 2.74 lbs.
5/16" / 27 mm	7,000 lbs.	3.99 lbs. – 4.42 lbs.

The revetment cable shall exhibit well to excellent resistance to most concentrated acids, alkalis, and solvents. The materials used in the construction of the cable shall not be affected by continuous immersion in storm water runoff. Elongation requirements specified below are based upon stabilized new, dry cable.

**Table 3.2**

	% Breaking Strength		
	10%	20%	30%
Permanent Elongation	0.7	1.8	2.6
Elastic Elongation	0.6	1.4	2.2
<b>Total Stretch</b>	<b>1.3</b>	<b>3.2</b>	<b>4.8</b>

Cable and fittings shall be selected in a manner that allows for the mats to be lifted from both ends, and ensures a high safety factor. The cables should form loops at both ends allowing them to lift the mat with a spreader bar. Using sleeves may do this or tying the cables in such a manner. The cables shall be crimped with aluminum stops that are selected by the engineer. The cables and stops shall be prevented from intruding further than required by plastic washers.

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**C. Physical Requirements:**

All units shall conform to the physical requirements of ASTM D 6684-04. They will be sampled and tested in accordance with ASTM D 6684-04, Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment System.

**TABLE 3.3**

<b>Compressive Strength Net Area Min. psi (mPa)</b>		<b>Water Absorption Max. lb/ft<sup>3</sup> (kg/m<sup>3</sup>)</b>		<b>Density Min. lb/ft<sup>3</sup> (kg/m<sup>3</sup>)</b>	
<b>Avg. of 3 units</b>	<b>Individual Unit</b>	<b>Avg. of 3 units</b>	<b>Individual Unit</b>	<b>Avg. of 3 units</b>	<b>Individual Unit</b>
4,000 (27.6)	3,500 (24.1)	9.0 - 10 (160)	11.5 - 12 (192)	130 (2082)	125 (2002)

**Part 4: Production and Quality Assurance**

**A. Casting:**

Production of concrete units shall be produced by a dry cast method. The dry cast units obtain strength in a shorter duration as well as an increase in the durability and overall quality of the product. The sizes are as listed below:

**TABLE 3.4**

<b>OPEN CELL UNITS</b>						
<b>Length (in)</b>	<b>Width (in)</b>	<b>Height (in)</b>	<b>Unit Coverage (ft<sup>2</sup>)</b>	<b>Weight (lbs)</b>	<b>Lbs/ft<sup>2</sup></b>	<b>Open Area %</b>
15.88	15.88	4	1.75	63	35	20
15.88	15.88	5	1.75	76	44	20
15.88	15.88	6	1.75	98	56	20
15.88	15.88	7	1.75	130	56	20
15.88	15.88	8	1.75	146	56	18

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**TABLE 3.5**

<b>CLOSED CELL UNITS</b>						
<b>Length (in)</b>	<b>Width (in)</b>	<b>Height (in)</b>	<b>Unit Coverage (ft<sup>2</sup>)</b>	<b>Weight (lbs)</b>	<b>Lbs/ft<sup>2</sup></b>	<b>Open Area %</b>
15.88	15.88	4	1.75	72	40	7
15.88	15.88	5	1.75	88	51	7
15.88	15.88	6	1.75	108	62	7
15.88	15.88	7	1.75	132	73	7
15.88	15.88	8	1.75	150	84	7

**B. Size of Mattresses:**

Mattresses shall be fabricated at the manufacturer or another approved location. Units, cables and fittings should be assembled into mats with a width of up to eight feet and a length of up to **45 feet**. The engineer must approve all mat sizes. Mattresses shall have the ability for fabrication in various lengths, widths, and any combination within. Special mats may be also fabricated; these special mats are a combination of two opposing dimensions either in the longitudinal or transverse directions. These special mats are available in various dimensions that allow for a custom-fit to a site-specific project.

**C. Visual Inspection:**

All units shall be sound and free of any defects that would interfere with either the proper placement of the unit or impair the performance of the system. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery shall not be deemed grounds for rejection. Cracks exceeding 0.25 inches (.635 cm) in width and/or 1.0 inch (2.54 cm) in depth shall be deemed grounds for rejection. Chipping resulting in a weight loss exceeding 10% of the average weight of a unit shall be deemed grounds for rejection. Units rejected prior to delivery shall be replaced at the manufacture's expense. Blocks rejected or damaged at the job site shall be repaired with structural grout or replaced at the expense of the contractor.

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**D. Sampling and Testing:**

The purchaser or their authorized representative shall be accorded proper access to facilities to inspect and sample the units at the place of manufacturing from lots ready to deliver. Sample coupons shall have a height to thickness ratio of 2:1 and length to thickness ratio of 4:1 for purposes of compressive strength testing. The compressive strength of the sample shall be considered to be the net area compressive strength of the full size unit. Field installation procedures shall comply with the procedures utilized during the hydraulic tested procedures recommended system. Additional testing, other than that provided by the manufacture, shall be borne by the purchaser.