

Cable Concrete Specifications

Original Block – Closed Cell

A. DESCRIPTION

Cable Concrete is an articulated concrete block revetment system, developed by Royal Erosion Control Systems, LLC to control various types of erosion due to water, wind, or vehicular traffic. This system shall be made up of individual concrete blocks strung together in either 4' x 16' or 8' x 16' mattresses (if needed, irregular mat sizes may be designed), which are placed side by side and clamped together to provide one homogeneous erosion protection system. The concrete blocks are held together by integrally woven stainless steel cables, which are poured within the block. A geotextile fabric, specified by the governing engineer, shall be attached to the base of each concrete mat. The size of the concrete blocks shall be 15.5" square at the base and 11.5" square at the top face (a truncated pyramid shape). The only variations between the four different mat systems are the block heights.

Table 1

		<u>C.C. 20</u>	<u>C.C. 35</u>	<u>C.C. 45</u>	<u>C.C. 70</u>
General:	Weight(lbs/sf)	23	41	50	77
	Block Height	2.5"	4.5"	5.5"	8.5"
Cable:	Longitudinal:	1/8"	5/32"	5/32"	3/16"
	Transverse:	1/8"	5/32"	5/32"	5/32"

B. CONCRETE

The minimum required concrete strength should be 4000 PSI @ 28 days. The mix used shall be a DOT (in the state where the project exists) approved mix design. Air entrainment of 4% to 7% shall also be added. The aggregates shall meet DOT standards, with quality requirements for fine and coarse aggregates. All ASTM standards will be met in the production of the concrete.

The finished concrete product shall consist of a minimum density of 140 lbs/ft³, in an average of 3 units. No individual block shall consist of a minimum concrete density lower than 135 lbs/ft³.

C. CABLES

The cables shall be made of stainless steel aircraft cable of type 302 or 304, depending on the specific use and conditions of the project. The cable shall be of type 1 X 19 construction.

Cables shall be integral (poured into) to the concrete block, and shall traverse through each block in both longitudinal & lateral directions of the mat system

D. GEOTEXTILE

The geotextile used is to be specified by the governing project engineer. The standard geotextile material used on non-specific projects is 8-oz. equivalent needle punched nonwoven fabric.

The geotextile shall be attached to the bottom of the concrete block mat system. The overlaps and installation of the mat system shall be site specific.

The geotextile shall be attached to the base of the concrete block mats. An overlap of 2 ft to 3 ft shall be incorporated on three sides of the mat. The overlap shall provide an area for the adjoining mats to be placed upon and prevent undermining of the erosion control system.

It should be noted that when different geotextile weights are used and/or when additional overlap area is added to the mats, additional costs would adjust the price per unit.

E. CLAMPS

Sufficient galvanized or stainless steel wire rope clamps shall be used to secure loops of adjoining Cable Concrete mats. The type of clamp needed shall be determined by the field conditions of the project and by the governing engineer.

The number of loop connections is based on project specifics, and may be shown in the shop drawings or in typical detail sheets (or see the Guide for the Design and Placement of Cable Concrete Mats). Clamping in field must follow project layout details to be acceptable. Details available showing the proper method of clamping.

F. ANCHORING

Cable Concrete mats are designed to take velocities in certain slope and bedding situations. This information is founded on engineered flume testing. The data shows maximum limits of the mat system, based on unanchored mats.

Anchoring Cable Concrete mats offers additional safety to the erosion protection system. But, if a situation arises where velocities exceed maximum limits of a mat system, or if slopes of 1.5 to 1 or greater are encountered, then anchoring becomes an item to be specified by the governing project engineer. See detail sheets of rule-of-thumb procedures when considering anchoring.

International Erosion Control Systems has developed an anchoring system called the Royal Anchor-lock. The anchor is made of nylon fibers reinforced with glass fibers and with steel reinforcement encased to enhance installation durability in hard driving soils. The anchor is placed at perimeters of individual mats and the anchor is attached to the loops of the mat after placement. There shall be no slack in the driven anchor cable when it is attached to the loops of the mat.

Anchoring must follow project layout details to be acceptable.

G. INSTALLATION

The supplier shall have a technician experienced in the installation of the Cable Concrete System available at the start of an installation where the engineer or contractor have not had experience with the product to assist in any special techniques needed to assure a proper installation.

The mats shall be laid from the downstream end of project to the upstream end, so the geotextile joints are shingled to direct flow over the joint and to prevent undermining. Intimate contact with the subsurface is critical to the systems performance in the field. The gaps between each mat shall not be greater than 2"; or else the gap must be closed using a grout mixture. The outside edges of the mat system shall be entrenched and buried at least one block into the ground. Compacted granular fill, or grout may be used to fill the entrenched edges.

It is recommended that after the installation of the mat system, that the mat system be covered with black dirt and seeded with vegetation (grasses). The mat system will allow moisture to traverse back and forth from subgrade to vegetation. The mat system will lend support and an even grade for maintenance vehicles (mowers) to traverse over it. Any surface application should not be placed prior to the inspection of the systems clamping and anchoring.

H. PAYMENT

Payment will be by the square foot and shall include the Cable Concrete mats, the galvanized clamps, and the geotextile (8NP). Upgrades or additional items to what is called for on a project shall be considered additional costs.

Anchors are separate and are an additional cost to the system.

I. TEST STANDARDS AND SPECIFICATIONS

ASTM C33 - Specification for Concrete Aggregates

ASTM C31 – Practice for Making and Curing Concrete Test Specimens in the Field

ASTM C150 - Specification for Portland Cement

ASTM C207 - Specification for Hydrated Lime Types

ASTM C595 - Specification for Blended Hydraulic Cements

ASTM C618 - Specification for Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement Concrete

ASTM D18.25.04 - Specification for Articulated Concrete Block Systems (In Design)

ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D3786 - Hydraulic Burst Strength of Knitted Goods and Nonwoven Fabrics

ASTM D4355 - Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water

ASTM D4491 - Water Permeability of Geotextiles by Permittivity

ASTM D4533 - Trapezoidal Tearing Strength of Geotextiles

ASTM D4632 - Breaking Load and Elongation of Geotextiles (Grab Method)

ASTM D4751 - Determining Apparent Opening Size of a Geotextile

ASTM D4833 - Index Puncture Resistance of Geotextiles, Geomembranes and Related Products

ASTM D5101 - Measuring the Soil-Geotextile System Clogging Potential by the Gradient Ratio

ASTM D5567 - Hydraulic Conductivity Ratio Testing of Soil/Geotextile Systems

AASHTO T88 - Determining the Grain-size Distribution of Soil

AASHTO M288-96 - Standard Specification for Geotextiles

FHWA-RD-89-199, November 1989 – Standard Testing for Hydraulic Stability of Concrete Revetment System During Overtopping Flow