

SECTION 02279 - HP ARTICULATED CELLULAR CONCRETE INTERLOCKING BLOCKS FOR EROSION CONTROL

PART 1 – GENERAL

1.1 **SCOPE OF WORK.** The work covered by this section consists of furnishing all plant, labor, equipment, and materials and performing all operations in connection with the installation of articulated cellular concrete interlocking blocks in accordance with the lines, grades, design, and dimensions shown on the drawings and as specified herein.

1.2 **REFERENCES.** The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

American Society for Testing and Materials (ASTM) Publications.

ASTM C 33-92	Concrete Aggregates
ASTM C 140-96B	Sampling and Testing Concrete Masonry Units
ASTM D 698-78	Moisture Density Relationship of Soils
ASTM C 42-90	Obtaining and Testing Drilled Cores and Sawed Beams Of Concrete

U.S. Federal Highway Administration (FHWA) and U.S. Bureau of Reclamation
(USBR) Report

FHWA-RD-89-199 -Hydraulic Stability of Articulated Concrete Block Revetment
Systems During Overtopping Flow

1.3 **DELIVERY, STORAGE, AND HANDLING OF MATERIALS.**

1.3.1 **Delivery and Storage.** Materials delivered to the site shall be inspected for damage, unloaded and stored with the minimum of handling. Materials shall be kept free of dirt and debris.

1.3.2 **Handling.** Materials shall be handled in such a manner as to ensure delivery to the site in sound, undamaged condition. Synthetic geotextiles that are not to be installed immediately shall be protected from the direct sunlight and in accordance with manufacturer's recommendations.

1.4 **SUBMITTALS.**

1.4.1 **Shop Drawings.** At least 30 days prior to the start of any installation of the articulated cellular concrete interlocking blocks, the Contractor shall submit to the owner shop drawings for the

layout and details of the interlocking concrete blocks. The articulated cellular concrete interlocking block layout shall be to the lines and grades shown on the drawings. The shop drawings shall include layout, layout sequence, anchor details, and details for grade change.

1.4.2 Representative Samples. The sources, from which the Contractor proposes to obtain materials, shall be selected well in advance of the time when the materials will be required in the work. Suitable samples of the articulated cellular concrete blocks, and filter fabric shall be submitted to the owner for approval, prior to delivery of any such material to the site of the work. Unless otherwise specified, all samples shall be obtained by the Contractor and delivered at his expense to a point designated by the owner at least ten (10) days in advance of the time when the placing of the concrete blocks is expected to begin.

1.4.3 Documentation of Testing. The contractor shall provide to the owner test results documenting that the revetment system has been tested under controlled flow conditions for hydraulic performance characteristics in accordance with FHWA-RD-89-199, utilizing a 2:1 slope in the direction of flow.

1.5 MEASUREMENT OF CELLULAR CONCRETE BLOCK. Unit of measurement for the cellular concrete block shall be by the square foot of cellular concrete blocks placed.

1.6 PAYMENT for acceptable cellular concrete blocks placed will be made at the contract unit price per square foot for “Articulated Cellular Concrete Interlocking Blocks,” which prices shall include all costs for furnishing, hauling, and placing the cellular concrete blocks as specified herein and as shown on the drawings.

PART 2 - MATERIALS

2.1 ARTICULATED CELLULAR CONCRETE BLOCKS. The cellular concrete blocks shall be SHORELOC® or approved equal. SD can be obtained from SHORETEC, L.L.C. from _____ or _____. Proposed equals must be approved by the engineer a minimum of thirty (30) days prior to bid date.

The following information must be included in the submittal to be considered for approval.

1. Test results documenting that the revetment system has been tested under controlled flow conditions for hydraulic performance characteristics in accordance with FHWA-RD-89-199, utilizing a 2:1 slope in the direction of flow.
2. Manufacturer certification that the revetment systems design and components meet all of the requirements of this specification.

Articulated cellular concrete blocks shall have positive interlock with adjacent blocks. The owner or his engineer reserves the right to accept or reject any proposed equal cellular concrete block system for any reasons including but not limited to previous performance record, appropriate and applicable testing, hydraulic performance characteristics and qualified technical support.

2.2 **CONCRETE** shall conform to ACI requirements for normal weight concrete and shall have a minimum compressive strength of 4,000 psi at twenty (28) days.

2.3 **AGGREGATE** shall meet the requirements of ASTM C 33. Aggregate grading shall be reasonably consistent and shall be well graded from the maximum size, which can be conveniently handled with available equipment.

2.4 **CELLULAR CONCRETE BLOCKS** shall be either wet cast using concrete as specified herein, or formed by a vibratory block-forming machine. In the latter case, testing of the concrete shall be conducted on 2-inch cubes cut from the core of the sample cellular concrete block. Compressive strength testing shall be done in general accordance with ASTM C 140, with one (1) cube tested at seven (7) days, and two (2) cubes test at twenty-eight (28) days.

2.4.1 **Design Requirements.** The weight, roughness and permeability of the concrete block shall withstand water flow at the required design capacity. The weight of the block shall have the following minimum requirements:

LOCATION	BLOCK WEIGHT-PSF
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2.4.2 **The assembled block system** shall have eighteen (18) to twenty (20) percent open area to be achieved by penetrations within the block for open cell applications.

2.5 **STRUCTURAL GROUTING** shall be required where gaps in the concrete system occur. Any surface where the clear span between blocks is 3 inches or greater shall be grouted. Grouting shall be with normal weight concrete conforming to ACI requirements, and shall have a minimum compressive strength of 4,000 psi at twenty-eight (28) days.

2.6 **FILTER FABRIC** for the cellular concrete blocks shall be in accordance with the manufacturer's recommendations, and shall be sized appropriately for the soil conditions present.

PART 3 – CONSTRUCTION METHODS

3.1 **SUBGRADE PREPARATION.** Areas on which filter fabric and cellular concrete blocks are to be placed shall be constructed to the lines and grades shown on the drawings. The subgrade for the cellular concrete blocks shall be free of voids, pits, or depressions and shall be proof-rolled to a minimum of 90% of the ASTM D 698 density. Voids, pits or depressions shall be

brought to grade by backfilling in accordance with the applicable portions of the project specifications.

All obstructions, such as roots and projecting stones larger than one (1) inch remaining on the surface, shall be removed and all of the soft or low density pockets of material removed must be filled with selected material and compacted to a minimum of 90% of the ASTM D 698 density.

Special consideration for buried obstructions (i.e. stumps, debris, etc.) will be as shown on the drawings.

3.1.1 **Excavation and preparation** for anchor trenches, side trenches, and toe trenches or aprons shall be done in accordance to the lines, grades and dimensions shown on the drawings.

3.1.2 **Immediately** prior to placing the filter fabric and cellular concrete blocks, the prepared area shall be inspected by the owner's representative and approval obtained before any fabric or mattresses are placed thereon.

3.2 **INSTALLATION OF CELLULAR CONCRETE BLOCKS.**

3.2.1 **General.** Cellular Concrete Blocks shall be placed within the limits shown on the drawings. The cellular concrete blocks shall be placed on the filter fabric in such a manner as to produce a relatively planar surface. No more than 200 linear feet of filter fabric shall be laid before being covered with concrete mattresses, and any fabric installed more than two (2) days shall be lifted and the surface of the slope inspected for any slope defects. The owner may require any uncovered fabric to be lifted after heavy rainfall to inspect for slope damage. Final acceptance and approval of the installation will be made by the owner. The Contractor shall hold the owner harmless from liability of any kind arising from the use of any patented or non-patented invention used in the performance of this work.

3.2.2 **Shoreloc® articulating blocks** are installed by hand. No overlapping of blocks will be accepted and no blocks shall project vertically more than one (1) inch beyond the adjacent blocks.

3.2.3 **Filter Fabric** shall be installed in accordance with the manufacturer's recommendations, and as stated elsewhere herein. Adjacent layers of filter fabric shall have a minimum of two feet of overlap. Fabric shall be secured with 6" x 1" x 6" steel pins prior to placement of cellular concrete mattresses.

3.3 FINISHING

3.3.1 **The voids** of the cellular concrete blocks, for the limits shown on the drawings, shall be filled with topsoil. The soil should then be seeded in accordance with State DOT vegetative grassing specifications.

3.3.2 **The voids** of the cellular concrete mats, for the limits shown on the drawings at bridges, shall be filled with flexible base or crushed gravel.

3.4 CONTRACTOR QUALITY CONTROL

3.4.1 **The Contractor** shall inspect for compliance with contract requirements and record the inspection of all operations including, but not limited to the following, as applicable:

1. Preparation of surface to receive cellular concrete blocks;
2. Individual concrete blocks and filter fabric soundness and free of defects.
3. Assembly of cellular concrete blocks.
4. Placement of blocks and filter fabric on the prepared subgrade.

SHORELOC® Hand-placed Series Spec
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