

# **PERMEABLE ARTICULATING CONCRETE BLOCK (P-ACB) SPECIFICATION FOR PARKING LOTS, DRIVEWAYS, ALLEYS AND ROADWAYS**

## **PART 1: GENERAL**

### **A. Scope of Work**

The contractor shall furnish all labor, materials, equipment, and incidentals required and perform all operations in connection with the installation of the Permeable Articulating Concrete Block (P-ACB) in accordance with the fines, grades, design and dimensions shown on the Contract Drawings and as specified herein.

### **B. Submittal**

The contractor shall submit to the engineer all manufacturer's performance research results and calculations in support of the permeable articulating concrete blocks (P-ACB) system and geotextile proposed for use.

The contractor shall furnish to the engineer all manufacturer's specifications, literature, and installation drawings of the P-ACB.

### **C. Preconstruction Meeting**

Approximately two weeks prior to the start of the installation, a preconstruction meeting shall occur with the representative(s) from the design team, the general contractor, the excavation contractor, the installation contractor and the manufacturer's representative.

## **PART 2: PRODUCTS**

### **A. GENERAL**

Permeable articulating concrete blocks shall be premanufactured of individual concrete blocks with specific stormwater runoff capacities. Blocks may be hand-placed or mechanically installed with the use of a clamping or suction lifting device.

Individual blocks in the P-ACB shall be staggered, beveled, and interlocked for enhanced stability. The blocks shall be constructed of closed cell blocks with an arched storage chamber for additional stormwater runoff as shown on the contract drawings. Each row of blocks shall be laterally offset by one-half block width from the adjacent row so that any given block is interlocked and to four other blocks (two in the row above and two in the row below). Six adjacent blocks shall also surround each block.

Each block shall incorporate interlocking surfaces that prevent lateral displacement of the blocks. The interlocking surfaces must not protrude beyond the perimeter of the blocks to such an extent that they reduce the flexibility or articulating capability of the system.

**Infiltration Performance:** The P-ACB will only be accepted when accompanied by documented third party infiltration performance characteristics based on ASTM C1701/C1701M-09, or C1781. The infiltration rate shall be no less than 1,500 inches per hour on an outdoor working surface, with typical base material utilized for the test.

**Structural Performance:** The design of the P-ACB shall be capable of supporting AASHTO H-25 and HS-25 truck loading. The blocks should be analyzed as unreinforced concrete arches supporting a uniform truck tire load with impact per AASHTO standards. *As with all vehicular traffic paving systems, the subgrade soil, geosynthetic and base preparation for the P-ACB must be properly designed and prepared. This is critical to the performance of the system.*

## **B. Cellular Concrete Blocks**

### **1. Materials**

- 1.1 Cementitious Materials – Materials shall conform to the following applicable ASTM specifications:
  - 1.1.1 Portland Cements - Specification C 150, for Portland Cement.
  - 1.1.2 Blended Cements - Specification C 595, for Blended Hydraulic Cements.
  - 1.1.3 Hydrated Lime Types - Specification C 207, for Hydrated Lime Types.
  - 1.1.4 Pozzolans - Specifications C 618, for Fly Ash and Raw or Calcinated Natural Pozzolans for use in Portland Cement Concrete.
- 1.2 Aggregates shall conform to the following ASTM specifications, except that grading requirements shall not necessarily apply:
  - 1.2.1 Normal Weight - Specification C 33, for Concrete Aggregates.

### **2. Visual Inspection**

- 2.1 All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. 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 in width and/or 1.0 inch in depth shall be deemed grounds for rejection.

### **3. Physical Requirements**

- 3.1 At the time of delivery to the work site, the units shall conform to the physical requirements prescribed below.

**TABLE 1: PHYSICAL CHARACTERISTICS**

Item	Description	Values
Dimensions	Length x Width x Height	12" x 12" x 5.65" (+/- 1/8")
Compressive Strength	ASTM D-6684 / C-140	Avg. of Three: 4,000 psi min. Individual units: 3,500 psi min.
Block Weight		Arched Block: 45-50 lbs/sf Solid Block: 55-60 lbs/sf
Loading Capabilities	Truck Load Traffic Rating	AASHTO H-20, HS-20, HS-25
Joint Filler Between Blocks	Material Used	NONE Required
Percent Open Space		Surface: 7% Storage: 20%
Water Absorption (%) Density (lbs/cf)	ASTM D-6684 Table 1 / ASTM C-140	9.1% Avg. of Three, 11.7% Individual 130 Avg of Three, 125 Individual
Storage Capacity	Above Aggregate Within Arch	0.0833 cf/block
Post-Installation, Verified Surface Infiltration Rate	ASTM C1701/C1701M-09 ASTM C1781	Ave of three tests: 1,500 inches/hour/sf (MIN. 3 tests)

#### 4. **Sampling and Testing**

- 4.1 The purchaser or his authorized representative shall be accorded proper access to the manufacturer to inspect and sample the permeable articulating concrete blocks at the place of manufacture from lots ready for delivery.

#### 5. **Expense of Tests**

Additional testing, other than that provided by the manufacturer, shall be borne by the purchaser.

#### 6. **Manufacturer**

The permeable articulating concrete blocks shall be PaveDrain® or pre-approved equal, as represented by:

##### **LOCALY**

Quick Supply

PH. (800) 362-2245

[www.quicksupplydm.com](http://www.quicksupplydm.com)

##### **NATIONAL**

PaveDrain, LLC

[info@pavedrain.com](mailto:info@pavedrain.com)

PH. (888) 575-5339

[www.pavedrain.com](http://www.pavedrain.com)

### **PART 3: FOUNDATION PREPARATION AND BLOCK INSTALLATION**

#### **A. Foundation and Preparation**

**General.** Areas on which permeable articulating concrete blocks are to be placed shall be constructed to the lines and grades shown on the Contract Drawings and to the tolerances specified in the Contract Documents, and approved by the Engineer.

**Subgrade.** Unless required on engineering drawings, compaction of underlying subgrade soil should be avoided or minimized in order to encourage infiltration of stormwater.

**Geotextile Separator or Geogrid Stabilization.** Install monofilament or multifilament geotextile (such as Mirafi RS380i, equivalent, or other material as shown on engineered drawings). The geotextile should be used on the bottom and sides of the installation to prevent contamination of clean base stone. A geogrid is also appropriate for base stabilization, but is not recommended on the sides of the aggregate base.

**Stone Base.** If more than 6" of base stone is required, only the top 4-6" shall be AASHTO #57 stone (3/4" – 1" clean, angular, with no fines), which is used as a leveling course directly beneath the blocks. Additional stone depth should consist of either AASHTO #2 or #3 stone, or as shown in drawings.

**Grading & Compaction.** The aggregate bedding layer shall be graded to a smooth plane surface to ensure intimate contact is achieved between the legs of the permeable articulating concrete block/mats and the aggregate bedding layer.

All base stone (AASHTO #2 or #3) shall be compacted in 6-8" lifts with roller. Leveling course of AASHTO #57 stone shall be rolled and then compacted with a plate compactor in both the perpendicular and parallel directions in the area of coverage.

**Recommended Geogrid Separator.** Install Miragrid BXG110, Tensar BX-1100, (or equal) geogrid separator directly on top of prepared leveling course.

**Inspection.** Immediately prior to placing the P-ACB the prepared area shall be inspected by the Engineer, the owner's representative, and or by the manufacturer's representative. No blocks shall be placed thereon until that area has been approved by one of these parties.

### C. **Placement of Permeable Articulating Concrete Blocks**

**General.** Permeable articulating concrete blocks shall be constructed within the specified lines and grades shown on the contract drawings.

**Placement.** The P-ACB shall be placed on the geogrid separator so as to produce a smooth plane surface. No individual block within the plane of placed articulating concrete mats shall protrude more than one-quarter of an inch or as otherwise specified by the Engineer.

**Consultation.** The manufacturer's representative shall provide design and construction advice during the design and installation phases of the project.

**Finishing.** The joints between the P-ACB do not require backfilling with smaller aggregates or sand in order to function properly. The joints are meant to be left open. This includes following maintenance of the P-ACB

**D. Maintenance of Permeable Articulating Concrete Blocks**

**General.** The maintainability of the permeable articulating concrete blocks shall be based on a maintenance study of at least 24 months conducted by an independent or third party representation.

- The study shall include multiple pre and post testing documentations in multiple locations of infiltration rates according to ASTM C1701 or a modified version of ASTM C1701 where the infiltration rate is recorded without a head pressure.
- Subsurface aggregate performance of pre and post testing shall also be documented over a 24 month period.
- The study shall show that following proper maintenance the original performance of the P-ACB/M can effectively be restored to at least 90% of its original performance.

**Inspection & Maintenance.** The manufacturer's representative of the P-ACB shall provide a minimum 36 month maintenance program; including a visual inspection report with photos and a recommended cleaning schedule with a Vacuum truck such as the Elgin® Whirlwind® or Megawind® or with the PaveDrain® Vac Head and associated combination sanitation vac truck. The visual inspection and recommended cleaning schedule is to be included with the price of the system.

Maintenance utilizing a combination sanitation vacuum truck with the PaveDrain vac head will be quoted and supplied by others based on the maintenance program.

Maintenance shall be required when either of the following are reached:

- The surface infiltration rates of more than 75% of the surface area fall below 10% of the rate required in Table 1.
- Surface ponding remains for 24 hours in an area larger than 10 square feet.