Case 17-05
SECTION 323 – Revised 8-9-17

PLACEMENT OF PERVIOUS CONCRETE

323.1 DESCRIPTION:

Pervious concrete describes a near-zero-slump, open graded material with sufficient continuous voids to allow water to pass from the surface to underlying layers. It does not look or behave like typical asphalt or concrete. The finished surface is not tight and uniform, but is open and varied to allow permeability. Minor surface irregularities and minimal amounts of surface raveling, and color variations are normal. Pervious concrete is usually part of a water management system used to reduce runoff rates and volumes from on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Sections without sub-surface storage bed systems can achieve reductions in runoff rates and volumes by providing less surface runoff than conventional hardscape surfaces. Sections with sub-surface storage bed systems designed to meet specific groundwater recharge requirements will require additional engineering and supplemental specifications. The work covered by this specification is intended for light traffic areas and consists of furnishing all materials, labor and equipment for the placement of pervious concrete.

323.2 MATERIALS:

Materials utilized in pervious concrete shall conform to the requirements of Section 723.

323.3 GENERAL:

The Pervious Concrete Contractor shall be experienced in the installation of pervious concrete and shall employ no less than one National Ready Mixed Concrete Association (NRMCA) certified Pervious Concrete Craftsman who must be on site overseeing each placement crew during all pervious concrete placements~~,~~ or employ no less than three NRMCA Certified Pervious Concrete Installers on each pervious concrete placement crew during all pervious concrete placements. The minimum number of certified individuals (1 Craftsman or 3 Installers) is to be present at each pervious concrete placement, and a certified individual is to be in charge of the placement crew and the construction procedures.

Field test(s) of pervious concrete shall be performed by an individual certified as both an NRMCA Certified Pervious Concrete Technician or equivalent, and ACI Concrete Field Technician Grade 1 or equivalent as approved by the Engineer.

323.4 CONSTRUCTION OF TEST SECTION(S):

If required by the Engineer or contract documents, the Contractor shall construct a test section(s) using the same equipment, and placement crew as proposed to be used for the remainder of the pervious concrete work and may be placed non-contiguously. Test section(s) shall be a minimum of 225 square feet and shall include a construction joint and a control joint. Test section(s) may be placed at any of the final pervious concrete placement locations and may be incorporated into the work if approved by the Engineer.

323.4.1 Sample fresh pervious concrete in accordance with ASTM C172. The size of the sample shall be at least 1 ft^3. The temperature of the pervious concrete shall be tested in accordance with ASTM C1064 and shall be 95 degrees or less, unless a higher temperature is approved by the Engineer. Complete at least one density test on a sample of freshly mixed

pervious concrete in accordance with ASTM C1688. The acceptable fresh density shall be within ± 5 lbs/ft^3 of the approved mix design density.

323.4.2 Remove cores not less than 7 days after placement in accordance with ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete. Test thickness in accordance with ASTM C–174 and test saturated density in accordance with ASTM Cl40, paragraphs 8.3 and 9.3.

Tolerance for thickness, and density, reported as the average of three cores of each test panel, shall be as follows:

A. The average compacted thickness shall not be greater than 1/2 in. less than the specified thickness, with no single core exceeding 1 in. less than the specified thickness; nor shall the average compacted thickness be 1-1/2 in. more than the specified thickness.

B. The acceptable hardened density shall be within ± 5 lbs/ft^3 of the approved mix design density.

323.4.3 When a test panel is outside any of the limits of 323.4.2A and 323.4.2B, the test panel shall be rejected, removed, and replaced at the Contractor's expense, unless accepted by the Engineer. When the test panel complies with 323.4.2A and 323.4.2B, the panel may be left in place and included in the completed work.

323.5 PERVIOUS CONCRETE BASE PREPARATION:

The surface below pervious concrete shall be prepared in accordance with the contract documents or as directed by the Engineer. Remove any non-compliant or loose material from the prepared base surface before placing pervious concrete. Keep all traffic off of the base during construction to the maximum extent practical. Regrade base material disturbed by concrete delivery vehicles or other construction traffic to the satisfaction of the Engineer, as needed.

323.6 PLACEMENT:

Pervious concrete shall be constructed a minimum of 6 inches in depth, unless otherwise specified in the plans or special provisions.

When hot weather is anticipated, recommended practices in ACI 305, Specification for Hot Weather Concreting, can provide good reference information to help the Contractor prepare and submit detailed procedures for the production, transportation, placement, protection, and curing of pervious concrete for approval by the Engineer. Evaporation retarders shall be available during placement and applied as needed in accordance with the manufacturer's recommendations to protect the pervious concrete from rapid evaporation. In cold weather follow the requirements of Section 725.9(A)(2).

Pervious concrete shall be uniformly deposited over the entire formed area. A self-propelled roller screed shall be used for strike-off, spreading, and compaction. Hand-rodding or other placement methods may be used if approved by the Engineer. Adjacent to the edge of each form, hand tampers shall be used for compaction. Placement operations shall not result in the voids becoming sealed in order to maintain an adequate continuous voids structure for water

passage through the pervious concrete. Surface depressions shall be corrected immediately after compaction by placing fresh pervious concrete in the depressions and compacting using a hand tamper or roller compactor. The final surface shall not deviate more than 3/8 inch from a 10 foot straightedge laid on the surface.

323.6.1 JOINTS:

~~The Contractor shall submit a jointing plan to the Engineer for review and approval.~~ Joints shall be constructed in accordance with an approved jointing plan. Contraction joints shall be constructed ~~at the locations referenced in the plans or~~ at regular intervals not to exceed two times the placement width or 15 feet on center, whichever is less. Joints shall be constructed to a depth of 1/4 of the thickness, or a minimum of 1-1/2 inches whichever is greater. Unless otherwise approved, contraction joints shall be constructed by one of the following methods:

A. Rolling with a small roller to which a beveled fin has been attached around the circumference immediately after compaction and prior to curing.

B. Saw cutting as soon as the pervious concrete can be saw cut without causing raveling along the joint edges. Only the area occupied by the concrete saw shall be uncovered and exposed with all other curing materials remaining in place. Immediately after sawing each joint, the exposed area shall be fogged with water and re-covered in accordance with 323.7.

Use isolation joints only where pavement abuts fixed objects, such as buildings, foundations, and manholes. Extend isolation joints through the full depth of the pavement. Fill the entire isolation joint with expansion joint material that complies with Section 729.

323.7 CURING:

The Contractor shall submit a curing plan to the Engineer for review and approval. Curing shall begin immediately or in any case within 20 minutes of finishing. The surface and edges shall be securely covered with polyethylene sheeting/film having a minimum thickness of 6 mils and meeting the requirements of Section 726.2(A). The cover shall be checked daily to verify that it has not been displaced or damaged, and that condensation is evident underneath the sheeting. Damaged sheeting shall be repaired immediately. Displaced sheeting shall be replaced immediately. When there is no observable condensation, 1.5 gallons of water per square yard shall be applied to the surface. Curing methods shall remain in place for a minimum of 7 days or as directed by the Engineer. Pavement sections shall not be opened to light vehicular traffic until the concrete has cured for at least 14 days (28 days for heavy traffic), and until approved by the Engineer for opening to traffic.

323.8 QUALITY CONTROL FIELD TESTING:

Complete at least one density test on a sample of freshly mixed pervious concrete for each 5000 square feet or each day of concrete placement, whichever is less, in accordance with ASTM C1688. Sample fresh pervious concrete in accordance with ASTM C172. The size of the sample shall be at least 1 ft^3. The temperature of the pervious concrete shall be tested in accordance with ASTM C1064 and shall be 95 degrees or less, unless a higher temperature is approved by the Engineer. Discharge of the previous concrete shall be completed in accordance with 725.9(A)(4).

Remove three cores from each lot of 5,000 square feet or each day's production, whichever is less, in accordance with ASTM C42 not less than 7 days after placement of the pervious concrete. Cores shall be a minimum nominal 4 in. diameter. Select three locations in accordance with ASTM D 3665. Upon approval of the Engineer, small test sections may be cast for sample extraction along with each placement to avoid removing cores from in-place work. Measure the cores for thickness in accordance with ASTM C174. After thickness determination, trim and measure the cores for density in the saturated condition as described in Paragraph 8.3 and 9.3 of ASTM C140. Core holes in the in-place work shall be filled with pervious concrete or other acceptable material in a manner satisfactory to the Engineer.

323.9 TOLERANCES

Mechanically sweep or vacuum pavement with clean equipment or flush with water before testing for compliance with tolerances.

Tolerance for hardened thickness, and density, reported as the average of three cores f each test panel shall be as follows:

A. Average hardened thickness from a lot shall not be more than 1/2 in. less than the specified thickness, with no single core exceeding 1 in. less than the specified thickness; nor shall the average hardened thickness be 1-1/2 in. more than the specified thickness.

B. Average hardened density from a lot shall be within ± 5 lbs/ft^3 of the average hardened density of the test section(s) from Section 323.4.

C. Unless otherwise specified in the Special Provisions, Pervious Concrete shall have a minimum infiltration rate of 50 inches per hour when tested in accordance with ASTM C1701.

323.10 ACCEPTANCE:

Pervious concrete does not look or behave like typical concrete or asphalt. The finished surface shall be open and varied to permit permeability. Minor surface irregularities and moderate amounts of surface raveling and color variations are normal and acceptable. Pervious concrete shall have no visible excess cement paste, tears, or gouges. Roller constructed joints shall have smooth, rounded, and uniformly compacted edges. Saw cut joints shall not contain cement paste or dust nor exhibit evidence of spalling.

Acceptance will be based on conformance to the Specifications. When a lot is outside one of more of the tolerances in 323.9, the lot shall be subject to rejection, removal, and replacement at the Contractor's expense, unless accepted by the Engineer.

323.11 PAYMENT:

Payment for pervious concrete shall be made at the Contract Unit Price per square foot for each thickness shown on the plans.

SECTION 723 – REVISED 5/23/17

PERVIOUS CONCRETE

723.1 GENERAL:

Pervious concrete describes a near-zero-slump, open graded material with sufficient continuous voids to allow water to pass from the surface to underlying layers. The void content will generally range from 15 to 35% and the drainage rate will vary with aggregate size and density of the mixture. Placement of pervious concrete is described in Section 323.

723.2 MATERIALS:

All materials used in the production of pervious concrete shall meet the appropriate requirements of Section 725. Hydration stabilizing and viscosity-modifying admixtures (VMA), if used, shall meet the requirements of ASTM C494.

723.3 MIX DESIGN:

A mix design shall be submitted to the Engineer for approval in accordance with Section 725.6. The minimum cementitious material content shall be 540 pounds per cubic yard. The design shall also show the percent voids, and the intended type of construction. The percent voids shall be tested in accordance with ASTM C1688.

723.4 MIXING:

Pervious concrete mixing shall comply with Section 725.7. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material.