

8-14.3(12)A DESCRIPTION

The work of this Section includes subgrade preparation and installation of Portland Cement Pervious Pavement structures (i.e., porous concrete sidewalks).

8-14.3(12)B MATERIAL REQUIREMENTS

All materials, methods of construction and workmanship shall conform to the applicable requirements of the 2000 Seattle Standard Specifications, ASTM, and AASHTO Standards, unless otherwise specified.

Annual Book of ASTM Standards, 1997; American Society for Testing and Materials, Philadelphia, PA.
Material References:

- ASTM C 29 "Test for Unit Weight and Voids in Aggregate."
- ASTM C 33 "Specification for Concrete Aggregates."
- ASTM C 42 "Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete"
- ASTM C 117 "Test Method for Material Finer than 75 μ m (No. 200) Sieve in Mineral Aggregates by Washing."
- ASTM C 138 "Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete."
- ASTM C 140 "Methods of Sampling and Testing Concrete Masonry Units."
- ASTM C 150 "Specifications for Portland Cement" (Types I or II only).
- ASTM C 172 "Practice for Sampling Fresh Concrete."
- ASTM C 494 "Specification for Chemical Admixtures for Concrete."
- ASTM C 642-97 "Test Method for Specific Gravity, Absorption, and Voids in Hardened Concrete, V04.02"
- ASTM C 1077 "Practice for Laboratories Testing Concrete and concrete Aggregates for use in Construction and Criteria Laboratory Evaluation."
- ASTM D 448 "Specification for Standard Sizes of coarse Aggregate for Highway Construction."
- ASTM E 329 "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as used in Construction."
- ASTM C 642-97 "Test Method for Specific Gravity, Absorption, and Voids in Hardened Concrete."

8-14.3(12)B1 PORTLAND CEMENT PERVIOUS CONCRETE

Materials for the Portland Cement Pervious Concrete shall meet the following requirements:

Cement: Portland Cement Type I or II conforming to ASTM C 150 or Portland Cement Type IP or IS conforming to ASTM C 595.

Aggregates: Use crushed gravel, stone meeting No 8 coarse aggregate (3/8 to No. 16) per ASTM C 33 or No. 89 coarse aggregate (3/8 to No. 50) per ASTM D 448. If other gradation of aggregate is to be used, submit data on proposed material to owner for approval.

Admixtures: The following admixtures shall be used:

Type D Water Reducing/Retarding -- ASTM C 494.

A hydration stabilizer that also meets the requirements of ASTM C 494 Type B Retarding or Type D Water Reducing/Retarding admixtures. This stabilizer suspends cement hydration by forming a protective barrier around the cementitious particles, which delays the particles from achieving initial set.

Water: Potable shall be used. Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. (Mix water yielding a cement paste with a dull-dry appearance has insufficient water for hydration). Water cement ratios can range from 0.27 to 0.35.

Proportions: Aggregate and Cement Content: the volume of aggregate, cement, water, and admixture per cu. yd. shall be equal to 27 cu.ft. when calculated as a function of the unit weight determined in accordance with ASTM C 29 rodding procedure. Fine aggregate, if used, should not exceed 3 cu. ft. and shall be included in the total aggregate volume. Admixtures: Shall be used in accordance with the manufacturer's instructions and recommendations. Mix Water: Insufficient water results in inconsistency in the mix and poor bond strength. High water content results in the paste sealing the void system primarily at the bottom and poor surface bond.

8-14.3(12)B2 SUBMITTALS

The Contractor shall submit for the Engineer's approval, in accordance with Section 1-06 and 1-08.1(2) and 1-08.3(2), the following:

A Request for Acceptance of Material Sources (RAMS) which identifies the supplier(s) from which the porous concrete walk materials are to be obtained, along with certificates, signed by the materials producer and the paving subcontractor, stating that materials meet or exceed the specified requirements

Locally available material having a record of satisfactory performance shall be used. Samples of the following materials shall be submitted for the Engineer's approval:

Stone Recharge Beds

Coarse aggregate for stone recharge bed shall be 2-1/2 inch to 1-1/2 inch uniformly graded coarse aggregate, with a wash loss of no more than 0.5%, AASHTO size number 2 per Table 4, AASHTO Specifications, Part I, 13th Ed., 1982, or later. Coarse aggregates shall meet the size and grading requirements as defined in Standard Sizes of Coarse Aggregate, Table 4, AASHTO Specifications, Part I, 13th Ed., 1982, or later, unless otherwise specified. Crushed aggregate mixes and round aggregate mixes compacted unit weights shall be 132.2 pcf.

Choker base course aggregate for groundwater recharge bed shall be 3/8 inch to 3/4 inch uniformly graded coarse aggregate AASHTO size number 57 per Table 4, AASHTO Specifications, Part I, 13th Ed., 1982 (p. 47).

Filter fabric: shall be Typar fabric, style 3341, or approved equal.

Slotted pipe (SSD): shall be PVC per ASTM 2241 Class 200.

8-14.3(12)C CONSTRUCTION REQUIREMENTS

The Owner shall be notified at least 48 hours prior to all recharge bed and pervious paving work, including subgrade preparation.

8-14.3(12)C1 WEATHER CONSIDERATIONS

The Contractor shall not place Portland cement pervious pavement mixtures when the ambient temperature is 40 degrees Fahrenheit or lower or 80 degrees Fahrenheit or higher, unless otherwise permitted in writing by the Engineer.

8-14.3(12)C2 TEST PANELS

The first part of the Work on the site of the N 145th Street Improvements shall be to construct and allow to cure two test panels of porous concrete sidewalk. Each of the panels shall be a minimum of 225 sq. ft. at the specified thickness to demonstrate that the Contractor's methods attain the specified in-place unit weights and compliance with all of the performance requirements of Section 5-05.3(28). *No such*

Test panels may be placed at any of the locations shown on the drawings. Test panels shall be tested for thickness in accordance with ASTM C 42; void structure in accordance with ASTM C 138; and for core unit weight in accordance with ASTM C-140, paragraph 6.3.

Satisfactory performance of the test panels will be determined by:

1. Compacted thickness no less than 1/4" of specified thickness;
2. Void Structure: 15% minimum; 21% maximum; and
3. Unit weight plus or minus 5 pcf of the design unit weight.

If the measured void structure falls below 15% or if measured thickness is greater than 1/4" less than the specified thickness or measured weight is more or less than 5 pcf of the design unit weight, the test panel shall be removed and disposed of in an approved landfill at the Contractor's expense.

8-14.3(12)C3 STONE RECHARGE BEDS

8-14.3(12)C3a Subgrade Preparation

The existing subgrade under bed areas shall NOT be compacted or subject to excessive construction equipment traffic prior to filter fabric and stone bed placement.

Where erosion of subgrade has caused accumulation of fine materials and/or surface ponding, this material shall be removed with light equipment.

The Contractor shall bring the subgrade of the stone recharge bed to the line, grade, and elevations indicated. Any areas damaged by erosion, ponding, or traffic compaction shall be filled and lightly regraded before the placing of stone.

8-14.3(12)C3b Recharge Bed Installation

Upon completion of subgrade work, the Engineer shall be notified and will inspect and approve the subgrade work before the Contractor proceeds with the recharge bed installation.

Filter fabric, pipe, and recharge bed aggregate shall be placed immediately after approval of subgrade preparation. Any accumulation of debris or sediment which has taken place after approval of subgrade shall be removed prior to installation of filter fabric at no extra cost to the Owner.

Filter fabric shall be placed in accordance with manufacturer's standards and recommendations. Adjacent strips of filter fabric shall overlap a minimum of sixteen inches (16"). Fabric shall be secured at least two feet (2') outside of bed. The Contractor shall take any required measures necessary to prevent any runoff or sediment from entering the storage bed. The impervious liner shall be placed over the geo-textile extending 6' beyond toe of slope face at building face, and be secured as recommended by manufacturer.

Coarse aggregate shall be lightly compacted in 8-inch maximum lifts with equipment movement over storage bed subgrades kept to a minimum. Aggregates shall be installed to the grades indicated on the drawings.

A 1" thick choker base course size No. 57 (AASHTO) aggregate shall be evenly placed over the surface of the stone bed, sufficient to allow placement of slotted pipe (SSD) and pavement.

Following placement of bed aggregate and SSD, the filter fabric shall be folded back along all bed edges to protect from sediment washout along bed edges. A minimum of a two-foot edge strip shall be used to protect beds from adjacent bare soil. This edge strip shall remain in place until all bare soils contiguous to beds are stabilized and vegetated. In addition, hay bales shall be placed at the toe of slopes which may be adjacent to beds to prevent sediment from washing into beds during site development. After the site is fully stabilized, excess filter fabric along bed edges shall be cut back to gravel edge.

8-14.3(12)C4 Portland Cement Pervious Pavement Concrete Mixing, Hauling and Placing

The following requirements shall be met in the mixing, hauling and placement of the Portland Cement Pervious Pavement Concrete:

Mix Time: Truck mixers shall be operated at the speed designated as mixing speed by the manufacturer for 75 to 100 revolutions of the drum.

Transportation: The Portland Cement aggregate mixture may be transported or mixed on site and shall be used within one (1) hour of the introduction of mix water, unless otherwise approved in writing by the Engineer. The one (1) hour requirement can be increased to 90 minutes when utilizing the hydration stabilizer specified in Section 2.2.C.4, as long as the temperature of the concrete does not exceed 90 degrees Fahrenheit. Under no circumstance will retamping of concrete be allowed after any water adjustments have been made to concrete delivered to the jobsite. Prior to placing concrete, the subbase shall be moistened and in a wet condition.

Discharge: Each mixer truck will be inspected for appearance of concrete uniformity according to Section 2.2.C.6.d. Water may be added to obtain the required mix consistency. Any water adjustments made at the jobsite shall be made by QC representatives of the concrete supplier. A minimum of 20 revolutions at the manufacturer's designated mixing speed shall be required following any addition of water to the mix. Discharge shall be a continuous operation and shall be completed as quickly as possible. Concrete shall be deposited as close to its final position as practicable and such that fresh concrete enters the mass of previously placed concrete. The practice of discharging onto subgrade and pulling or shoveling to final placement is not allowed.

Placing and Finishing Equipment: Unless otherwise approved by the Owner or Engineer in writing, the Contractor shall provide mechanical equipment of either slipform or form riding with a following compactive unit that will provide a minimum of 10 psi vertical force. The pervious concrete pavement will be placed to the required cross section and shall not deviate more than +/- 3/8 inch in 10 feet from profile grade. If placing equipment does not provide the minimum specified vertical force, a full width roller or other full width compaction device that provides sufficient compactive effort shall be used immediately following the strike-off operation. The pavement surface shall be covered with a minimum six (6) mil thick polyethylene sheet or other approved covering material prior to compaction. Prior to covering, a fog or light mist shall be sprayed above the surface when required due to ambient conditions (high temperature, high wind, and low humidity). The cover shall overlap all exposed edges and shall be secured (without using dirt or stone) to prevent dislocation due to winds or adjacent traffic conditions. After mechanical or other approved strike-off and compaction operation, no other finishing operation will be allowed. If vibration, internal or surface applied, is used, it shall be shut off immediately when forward progress is halted for any reason. The Contractor will be restricted to pavement placement widths of a maximum of fifteen (15') feet unless the Contractor can demonstrate competence to provide pavement placement widths greater than the maximum specified to the satisfaction of the Engineer.

Cure Time: Portland Cement Type I, II - 7 days minimum. No truck traffic shall be allowed for 10 days (no passenger car/light trucks for 7 days).

Jointing: Control (contraction) joints shall be installed at intervals of a maximum of 15 feet, or as directed by the Engineer. They shall be installed at a depth of the 1/4 the thickness of the pavement. These joints can be installed in the plastic concrete or saw cut. If saw cut, the procedure should

begin as soon as the pavement has hardened sufficiently to prevent raveling and uncontrolled cracking (normally after curing). Transverse construction joints shall be installed wherever placing is suspended a sufficient length of time that concrete may begin to harden. In order to assure aggregate bond at construction joints, a bonding agent suitable for bonding fresh concrete shall be brushed, trolled, or sprayed on the existing pavement surface edge. Isolation (expansion) joints will not be used except when pavement is abutting slabs or other adjoining structures.

8-14.3(12)C4a Portland Cement Pervious Pavement Concrete Testing, Inspection, and Acceptance

Laboratory testing will be conducted by the SPU Materials Laboratory.

The paving contractor shall provide two cores taken from each panel in accordance with ASTM 42 at a minimum of seven (7) days after placement of the pervious concrete. The cores shall be measured for thickness, void structure, and unit weight. Untrimmed, hardened core samples shall be used to determine placement thickness. The average of all production cores shall not be less than the specified thickness with no individual core being more than 1/2 inch less than the specified thickness. After thickness determination, the cores shall be trimmed and measured for unit weight per ASTM C 642-97. Ranges of satisfactory unit weight values are +/- 5 pcf of the design unit weight.

After a minimum of 7 days following each placement, three cores shall be taken in accordance with ASTM C 42. The cores shall be measured for thickness and unit weight determined as described above for test panels. Core holes shall be filled with concrete meeting the pervious mix design per ASTM C 642-97

Acceptance: The Engineer will test, in accordance with ASTM C 172 and ASTM C 29, at least one sample for each day's placement of pervious concrete to verify unit weight shall be conducted. Delivered unit weights are to be determined in accordance with ASTM C 29 using a 0.25 cubic foot cylindrical metal measure. The measure is to be filled and compacted in accordance with ASTM C 29 paragraph 11, rodding procedure. The unit weight of the delivered concrete shall be +/- 5 pcf of the design unit weight.

8-14.4 MEASUREMENT

Supplement this Section with the following:

"Measurement for "Sidewalk, Cement Concrete, Pervious", and "Sidewalk, Cement Concrete, Pervious with Detention", will be by the linear foot along the top of the curb adjacent to the sidewalk."

8-14.5 PAYMENT

Supplement this Section with the following:

"The Contract unit price for "Sidewalk, Cement Concrete, Pervious", and "Sidewalk, Cement Concrete, Pervious with Detention" shall include all costs for the work required to install the sidewalk as shown on the drawings and described in Section 8-14.3(12) including, but not limited to: excavation; filter fabric; stone recharge bed; choker base course aggregate; pervious (porous) concrete; CDF trench; and the three inch diameter SSD installations including reinforcing steel, polyethylene sheathing and the 2 foot section of Modified Curb and Gutter as shown in detail 4 on sheet three of the Drawings.

Replacement of the concrete driveway runners at 15738 Ashworth Avenue North and the concrete steps at 15520 Ashworth Avenue North, will be paid under the bid item for "Sidewalk, Cement Concrete" per square yard."