SECTION 32 12 44

POROUS PAVEMENT SYSTEM

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\*\* NOTE TO SPECIFIER \*\* Presto Geosystems; porous pavement systems.
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\*\* NOTE TO SPECIFIER \*\* This section is based on the products of Presto Geosystems, which is located at:
670 N. Perkins St. P. O. Box 2399
Appleton, WI 54912-2399
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Web: <http://www.prestogeo.com>
 [ [Click Here](https://www.arcat.com/arcatcos/cos34/arc34952.html) ] for additional information.
PRESTO offers a full range of porous pavement needs with Geoblock, Geoblock®5150 and GeoPave® systems and challenging soil and surface stabilization problems. The systems can be used in a variety of landscape applications meeting a wide range of performance and aesthetic requirements and provide economic and sustainable solutions in many areas of environmental design: permeable pavements, slope, channel and shoreline protection, vegetated earth retention and surface protection applications. Presto offers complimentary project evaluation services, contact Presto for more information.
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This specification covers Presto Geosystems Geoblock®, Geoblock®5150 Porous Pavement Systems and Presto GeoPave® porous pavement system. The systems provide vehicular and pedestrian load support over a grass surface or permeable aggregate while promoting natural storm water infiltration and, if vegetated, protection to grass from the harmful effects of traffic.
Geoblock or Geoblock5150 unit systems, use engineered base support soil where needed, selected topsoil, and selected vegetation.
GeoPave® porous pavement unit system, uses porous aggregate base, (if required) and porous aggregate or an aggregate/topsoil engineered infill and selected vegetation.
Consult Presto Geosystems for assistance in editing this section for the specific application.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete any paragraphs below not applicable to project.

* + 1. Porous Pavement System.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete sections below not relevant to this project; add others as required.

* + 1. Section 31 20 00 - Earth Moving.
		2. Section 33 46 13.13 - Foundation Drainage Piping.
		3. Section 32 10 00 - Bases, Ballasts, and Paving.
		4. Section 32 39 33 - Artificial Rock Fabrications.
		5. Section 32 90 00 - Planting.
		6. Section 32 92 13 - Hydro-Mulching.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. CBR - California Bearing Ratio Method.
		2. ASTM D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
		3. AASHTO - Chapter 5, Aggregate Specifications and Requirements.
		4. U.S. Green Building Council, LEED Building Design and Construction (BD+C) Version 4.0 Rating System. (LEED v4.0)

\*\* NOTE TO SPECIFIER \*\* Select one of the following two Presto Geosystems System Description paragraphs for the product required and delete the one not required.

* 1. SYSTEM DESCRIPTION - GEOBLOCK OR GEOBLOCK5150
		1. Porous pavement system provides vehicular and pedestrian load support over grass areas, while protecting grass from harmful effects of traffic.
		2. Major Components of the Complete System Include:
			1. Porous pavement units.
			2. Engineered base support soil.
			3. Selected topsoil.
			4. Selected vegetation.
			5. Steel anchors (if required)
	2. SYSTEM DESCRIPTION - GEOPAVE

\*\* NOTE TO SPECIFIER \*\* Edit and delete portions below not relevant to this project; add others as required. Vehicles should be limited to vehicles with a maximum tire pressure of 90 psi.

* + 1. GeoPave porous pavement system creates a structural framework to stabilize open-graded aggregate for aggregate surfaces, or an aggregate/topsoil engineered infill for vegetated surfaces.
		2. Increased bearing strength and a permeable load support structure for vehicular or pedestrian traffic loading requirements using porous aggregate or engineered infill material.
		3. Major Components of the Complete System include:
			1. GeoPave units.
			2. GeoPave U-CLIP connectors.
			3. Porous aggregate or aggregate/topsoil engineered base, if required.
			4. Porous aggregate or aggregate/topsoil engineered infill.
			5. GeoPave delineators.

\*\* NOTE TO SPECIFIER \*\* Select one of the two following paragraphs for aggregate or vegetated surface and delete the one not required.

* + 1. Aggregate surface: GeoPave porous pavement units, aggregate infill and aggregate base support materials to support imposed loading.
		2. Vegetated surface: GeoPave porous pavement unit, aggregate/topsoil engineered infill and aggregate/topsoil engineered base support soil to support imposed loading and contribute to vegetation support.
	1. SUBMITTALS
		1. Product Data: Submit manufacturer's product data including printed installation instructions and methods for maintaining installed products.
		2. Shop Drawings: Submit manufacturer's shop drawings including laying pattern and anchoring.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraphs if LEED is not applicable.

* + 1. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
			1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
			2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
		2. Certificates: Submit the following prior to the start of work.
			1. Product certificates signed by the manufacturer certifying material compliance of polyethylene used to make porous paving units.
			2. ISO Certification certifying manufacturer's quality management system is currently registered to ISO 9001:2015 quality standards.

\*\* NOTE TO SPECIFIER \*\* Delete installer and Manufacturer's field representative qualifications if not required

* + - 1. Qualifications certifying installer experience in the installation of Porous Pavement Systems.
			2. Qualifications of Manufacturer's field representative certifying field representative experience in the installation of Porous Pavement Systems.
		1. Manufacturers Warranty Certificate.
	1. QUALITY ASSURANCE
		1. Porous Pavement System shall be provided from a single Manufacturer for the entire project.
		2. Manufacturer's ISO Certification: Manufacturer shall maintain ISO Certification certifying manufacturer's quality management system for its porous paving system is currently registered to ISO 9001:2015 quality standards.
		3. Manufacturer shall have a minimum of 20 years documented experience producing porous pavement systems.

\*\* NOTE TO SPECIFIER \*\* Delete installer and Manufacturer's field representative qualifications if not required

* + 1. Installer Qualifications: Experienced in performing work of this section that has specialized in installation of work similar to that required for this project.
		2. Manufacturer's Field Representative Qualifications: Manufacturer's field representative shall have a minimum of 5 years experience in the installation of the specified products.
		3. Pre-installation Meeting: Convene a meeting a minimum of two weeks prior to start of porous paving system to verify project requirements, subbase conditions, manufacturer's installation instructions and coordination with other work.
			1. Require attendance of all parties directly affecting work of this section, including the Contractor, Architect, and installer.

\*\* NOTE TO SPECIFIER \*\* Retain subparagraphs below if required to suit project. Delete if not required. Coordinate with Field Quality Control specified in this Section.

* + - 1. Require attendance of manufacturer's field representative.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
		2. Storage: Store materials in accordance with manufacturer's instructions. Protect all materials from damage and out of direct sunlight.
		3. Handling: Protect materials during handling and installation to prevent damage.
	2. WARRANTY

\*\* NOTE TO SPECIFIER \*\* Contact the Porous Paving System manufacturer for additional details.

* + 1. Warranty: Manufacturer's ten year limited warranty.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Presto Geosystems, which is located at: 670 N. Perkins St. P. O. Box 2399; Appleton, WI 54912-2399; Toll Free Tel: 800-548-3424; Tel: 920-736-1336; Fax: 920-738-1222; Email: [request info (Katie.bocskor@prestogeo.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Presto+Geosystems&coid=34952&rep=&fax=920-738-1222&message=RE:%20Spec%20Question%20(02795geo):%20%20&mf=); Web: <http://www.prestogeo.com>
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Delete paragraph above or below; coordinate with Division 1 requirements.

* + 1. Substitutions: Not permitted.

\*\* NOTE TO SPECIFIER \*\* Select Geoblock or GeoPave from the following two POROUS PAVING UNIT PRODUCT paragraphs and delete the one not required.

* 1. GEOBLOCK POROUS PAVING UNITS

\*\* NOTE TO SPECIFIER \*\* Select Geoblock® or Geoblock®5150 from the following paragraphs and delete the one not applicable. Geoblock® or Geoblock®5150 provides pedestrian and vehicular load support over grassed areas with appropriate engineered base of topsoil/aggregate mix. Vehicles should be limited to vehicles with a maximum tire pressure of 90 psi.

* + 1. Geoblock Units:
			1. Materials:
				1. Polyethylene: Up to 100 percent recycled materials.
				2. Color: Ranges from dark shades of gray to black
				3. Color Uniformity: Uniform color throughout all units in pallet.
				4. Chemical Resistance: Superior.
				5. Carbon Black for Ultraviolet Light Stabilization: 1.5 to 2.0 percent by weight through addition of a carrier in accordance with ASTM D 1693
			2. Performance Properties:
				1. Empty unit minimum crush strength at 70 degrees F (21 degrees C) shall be 420 psi (2,900 kPa).
				2. Sand-filled unit minimum crush strength at 70 degrees F (21 degrees C) shall be 5,980 psi (41,285 kPa).
				3. Flexural modulus at 70 degrees F (21 degrees C) shall be 35,000 psi (240,000 kPa).
				4. Unit minimum deflection without breakage when units supported at 40 inches (0.50 m) centers at 70 degrees F (21 degrees C) shall be 1.0 inches (25 mm).
				5. Wall compressive strength (simulated tire area loaded) shall be 420 psi (2,900 kPa) when tested using circular plate, 6.5 inches (165 mm) in diameter, and loaded to failure.
				6. Wall compressive strength (full porous pavement unit loaded) shall be 138,240 pound-force (615 kN) when tested using full single unit loaded to failure via flat plate.
				7. Equivalent elastic stiffness shall be 48,000 pound-square inches (140 N-m2) when tested using simply supported porous pavement unit loaded to 1 inch (25 mm) deflection.
				8. Joint shear strength shall be 20,000 pound-force (89.0 kN) when tested using direct shear of tabular connection using special apparatus.
			3. Dimensions:
				1. Nominal Width: 20 inches (0.5 m).
				2. Nominal Length: 40 inches (1.00 m).
				3. Nominal Depth: 1.2 inches (30 mm).
				4. Nominal Coverage Area: 5.3 square feet (0.50 m2).
				5. Nominal product weight: 4.7 pounds (2.1 kg).
				6. Cells per Unit: 128 cells.
				7. Nominal Cell Size: 2.25 inches by 2.25 inches (57 mm by 57 mm).
				8. Top Open Area per Unit: 88 percent.
				9. Bottom Open Area per Unit: 56 percent.
				10. Interlocking Offset Tabs: No interlocking offset tabs on the edges of units.
		2. Geoblock 5150:
			1. Materials:
				1. Polyethylene: Up to 100 percent recycled materials.
				2. Color: Ranges from dark shades of gray to black
				3. Color Uniformity: Uniform color throughout all units in pallet.
				4. Chemical Resistance: Superior.
				5. Carbon Black for Ultraviolet Light Stabilization: 1.5 to 2.0 percent.
			2. Performance Properties:
				1. Unit Minimum Crush Strength at 70 degrees F (21 degrees C): 420 psi (2,900 kPa).
				2. Unit Minimum Crush Strength at 70 degrees F (21 degrees C): 7,058 psi (48,734 KPa.
				3. Flexural Modulus at 70 degrees F (21 degrees C): 35,000 psi (240,000 kPa).
				4. Minimum Deflection without breakage when units supported at 40 inch (0.50 m) centers at 70 degrees F (21 degrees C): 1.0 inch (25 mm).
				5. Wall Compressive Strength (Simulated Tire Area Loaded): 420 psi (2,900 kPa) when tested using circular plate, 6.5 inches (165 mm) diameter, loaded to failure.
				6. Wall Compressive Strength (Full Porous Paving Unit Loaded): 138,240 pound-force (615 kN) when tested using full single unit loaded to failure via flat plate.
				7. Equivalent Elastic Stiffness: 48,000 pound-square inches (140 N-m2) when tested using simply supported porous paving unit loaded to 1 inch (25 mm) deflection.
				8. Joint Shear Strength: 20,000 pound-force (89.0 kN) when tested using direct shear of tabular connection using special apparatus.
			3. Dimensions:
				1. Nominal Width by Length: 20 inches by 40 inches (0.5 m by 1.0 m).
				2. Nominal Depth: 2 inches (50 mm).
				3. Nominal Coverage Area: 5.3 square feet (0.50 m2).
				4. Cells per Unit: 72.
				5. Cell Size: 3.1 inches by 3.2 inches (79 mm by 81 mm).
				6. Top Open Area per Unit: 87 percent.
				7. Bottom Open Area per Unit: 41 percent.
				8. Interlocking Offset Tabs: 12 tabs per 40 inches (meter). Tab system on all edges of unit.
				9. Weight: Nominal weight per Unit: 9.0 pounds (4.0 kg).
				10. Maximum Unit End-to-End or Side-to-Side Warpage: 0.24 inch (6 mm).
			4. Runoff: Runoff Coefficient shall be 0.15 at 2.5 inches per hour.

\*\* NOTE TO SPECIFIER \*\* Coordinate with the following as required to suit loading conditions required for the project. Contact the Porous Paving System manufacturer for additional requirements and recommendations.

* + 1. Related Materials:
			1. Engineered Infill: Coordinate with engineered base of blended aggregate and topsoil specified in Section 32 10 00 - Bases, Ballasts, and Paving to the depths specified.
			2. Topsoil Infill: As specified in Section 32 92 13 - Hydro-Mulching.
			3. Vegetated Surface: Coordinate with vegetated surface materials specified in Section 32 92 13 - Hydro-Mulching.
	1. GEOPAVE POROUS PAVING SYSTEM COMPONENTS

\*\* NOTE TO SPECIFIER \*\* GeoPave with aggregate or an aggregate/topsoil engineered infill provides a permeable, stabilized surface for vehicular and pedestrian load support.

* + 1. GeoPave Units:
			1. Materials:
				1. Polyethylene: Up to 100 percent recycled materials.
				2. Color: Ranges from dark shades of gray to black
				3. Color Uniformity: Uniform color throughout all units in pallet.
				4. Chemical Resistance: Superior.
				5. Carbon Black for Ultraviolet Light Stabilization: 1.5 to 2.0 percent by weight through addition of a carrier in accordance with ASTM D 1693.
			2. Performance Properties:
				1. Empty Unit Minimum Crush Strength at 70 degrees F (21 degrees C): 175 psi (1,202 kPa).
				2. Aggregate or Aggregate/Topsoil Infilled Unit Minimum Crush Strength at 70 degrees F (21 degrees C): 5,160 psi (35,625 kPa).
				3. Empty Unit Wall Compressive Strength (Simulated Loaded Tire Area): 175 psi (1,202 kPa).

Test Procedure: Full single unit loaded to failure via 9 inches (228.6 mm) flat plate.

* + - * 1. Aggregate or Aggregate/Topsoil Filled Unit Wall Compressive Strength (Simulated Tire Area Loaded): 138,240 pound-force (615 kN).

Test Procedure: Full single unit loaded to failure via 9 inches (228.6 mm) flat plate.

* + - 1. Dimensions:
				1. Nominal Width by Length: 20 inches (0.50 m).
				2. Nominal Length: 40 inches (1.0 meter).
				3. Nominal Depth: 2.0 inches (50 mm).
				4. Nominal Coverage Area: 5.38 square feet (0.50 sm).

Cell Size (small cell): 3.25 inches by 3.25 inches (83 mm by 83 mm).

Cell Size (large cell): 3.25 inches by 6.50 inches (83 mm by 165 mm).

* + - * 1. Nominal Weight per Unit: 7.6 pounds (3.4 kg).
				2. Top of Panel Open Area: 90.5 percent.
				3. Bottom of Panel Open Area: 32.6 percent.
				4. Bottom Mesh Openings: .25 in by .25 in (6.35 mm by 6.35 mm).
		1. GeoPave U-Clip Connectors: 12 gauge G90 zinc plated steel locking clip with internal barbs to connect two adjacent GEOPAVE units.

\*\* NOTE TO SPECIFIER \*\* Delete GeoPave delineator if not required

* + 1. GeoPave SNAP Delineators: Fabricated of UV-resistant polymer with a diamond plate, non-skid pattern on the surface. SNAP Delineators are connected with locking tabs designed to fit in the GeoPave porous pavement square or rectangular cells.

\*\* NOTE TO SPECIFIER \*\* Edit the following for infill type, aggregate infill or an aggregate/topsoil engineering infill for vegetated systems.

* + 1. GeoPave Infill Material:
			1. Aggregate Infill: A well-graded 0.375 inch to 0.5 inch (10 mm to 13 mm) crushed angular stone with a fine content less than 5 percent.
			2. Aggregate/topsoil Engineered Infill: A homogenous blended mixture that will promote vegetative growth and provide the required structural support. Mixture shall consist of:
				1. Clear-stone/crushed rock with an AASHTO #5 or similar designation with a particle range from 0.375 inch to 0.5 inch (10 mm to 13 mm) and a percentage void-space of at least 30 percent.
				2. Pulverized Topsoil: Pulverized topsoil equaling 33 percent of the total volume, added and blended to produce a homogenous mixture prior to placement.

\*\* NOTE TO SPECIFIER \*\* Coordinate with the following as required to suit loading conditions required for the project. Contact the Porous Paving System manufacturer for additional requirements and recommendations.

* + 1. Related Materials:
			1. Base Course: Coordinate with base course materials specified in Section 32 10 00 - Bases, Ballasts, and Paving to the depths specified.
			2. Engineered Infill: Coordinate with engineered base of blended aggregate and topsoil specified in Section 32 10 00 - Bases, Ballasts, and Paving to the depths specified.
			3. Topsoil Infill: As specified in Section 32 92 13 - Hydro-Mulching..
			4. Vegetated Surface: Coordinate with vegetated surface materials specified in Section 32 92 13 - Hydro-Mulching.
1. EXECUTION
	1. EXAMINATION
		1. Before beginning installation, verify site conditions are as indicated on the Drawings.
		2. Ensure that structure and adjacent hard-surfaced paving work is completed before installing porous pavement system.
		3. Notify the Architect/Engineer if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.
	2. PREPARATION

\*\* NOTE TO SPECIFIER \*\* Coordinate following paragraphs with work provided by others.

* + 1. Subgrade:
			1. Verify subrade is prepared and placed in accordance with the Drawings and Specifications and the porous paving system manufacturer's requirements.
			2. Ensure foundation soil meets minimum strength requirements through proof rolling or other conventional method and is approved by the Architect/Engineer. If unacceptable foundation soils are encountered, excavate and replace with suitable quality material as directed by the Architect/Engineer.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraph if a geotextile separation layer is not required

* + - 1. Install geotextile separation layer on prepared surfaces ensuring required overlaps are maintained and outer edges of the geotextile are buried in accordance with the Manufacturer's recommendations and subgrade CBR (California Bearing Ratio).

\*\* NOTE TO SPECIFIER \*\* Select one of the following two paragraphs for the system specified and delete the one that is not applicable.
\*\* NOTE TO SPECIFIER \*\* The strength of the porous pavement system is determined, in part, by the support provided by the aggregate/topsoil engineered base. Consult Presto Geosystems' Geoblock® or Geoblock®5150 Design and Construction Overview for engineered base details and thickness recommendations. Design the base to ensure stability of the open graded material.
Proper aggregate/topsoil engineered base materials will promote vegetative growth and provide required structural support. If the topsoil is not present within the engineered base, grass growth may be impaired. Vegetated surfaces should be designed for infrequent or occasional traffic. If required, coordinate paragraphs below with base installation provided by others

* + 1. Base Preparation Geoblock or Geoblock 5150:
			1. Verify subrade is prepared and placed in accordance with the Drawings and Specifications and the porous paving system manufacturer's requirements.

\*\* NOTE TO SPECIFIER \*\* Coordinate following paragraph with work provided by others. Delete if not applicable.

* + - 1. Coordinate base installation and preparation with subdrains specified in Section 33 46 13.13 - Foundation Drainage Piping.

\*\* NOTE TO SPECIFIER \*\* Complete the following two paragraph as applicable.

* + - 1. Place engineered base to the minimum depth of \_\_\_\_ inches (\_\_ mm) as indicated on the Drawings.
			2. Place engineered base open graded crushed rock having an AASHTO #5 or similar designation homogenously blended with topsoil.

\*\* NOTE TO SPECIFIER \*\* Include the following paragraphs for vegetated systems. Coordinate with materials specified in Section 32 92 13 - Hydro-Mulching.

* + - * 1. Ensure aggregate portion of base is free from fines and has 30 percent or more void-space when compacted.
				2. Particle size should range in size from 0.375 to 1.0 inch (10 to 25 mm) with a D50 of 0.5 inch (13 mm).
				3. Add and blend topsoil before placement equal to void percentage in aggregate.
				4. Pulverized topsoil portion shall equal 33 percent of the total volume and be added and blended to produce a homogenous mixture prior to placement.
				5. Compact the mixture to the Architect/Engineer's specifications.
				6. Constrain the edges of the base appropriately to prevent movement.

\*\* NOTE TO SPECIFIER \*\* The strength of the porous pavement system is determined, in part, by the support provided by the aggregate or aggregate/topsoil engineered base. Consult Presto Geosystems' GeoPave® Design and Construction Overview for base details and thickness recommendations. Design the base to ensure stability of the open graded material.
A minimum of 2 inches (50 mm) of base material is generally recommended for drainage even if not required by design for load support. Additional base depth may be added if required over a low-permeable base or to function as a storm water detention/retention layer.
For vegetated systems, proper aggregate/topsoil engineered base materials will promote vegetative growth and provide required structural support. If the topsoil is not present within the engineered base, grass growth may be impaired. Vegetated surfaces should be designed for infrequent or occasional traffic with a maximum H-10 loading

* + 1. Base Preparation GeoPave:

\*\* NOTE TO SPECIFIER \*\* Coordinate paragraphs below with base installation provided by others. The strength of the porous pavement system is determined, in part, by the support provided by the engineered base. Consult Presto Products for engineered base details and thickness recommendations.

* + - 1. Install Base as specified in Section 32 10 00 - Bases, Ballasts, and Paving. Verify base is installed in accordance with porous paving system manufacturer's instructions.

\*\* NOTE TO SPECIFIER \*\* Coordinate paragraphs below with base installation provided by others. Delete subdrain paragraph if not applicable.

* + - 1. Coordinate base installation and preparation with subdrains specified in Section 33 46 13.13 - Foundation Drainage Piping.
			2. If required, place a geotextile separation layer between the natural ground and the ' engineered base.

\*\* NOTE TO SPECIFIER \*\* Select one of the following two paragraphs and delete the one that is not applicable.

* + - 1. Place base to the minimum depth of \_\_\_\_ inches (\_\_ mm) as indicated on the Drawings.
			2. Place base to the minimum depth indicated on the Drawings.

\*\* NOTE TO SPECIFIER \*\* Include the following paragraphs for aggregate systems. Delete for vegetated systems.

* + - 1. Aggregate Systems:
				1. Base shall be an open graded crushed aggregate with a particle range from 0.375 in to 1.0 in (10 mm to 25 mm) a fine content less than 5 percent.
				2. Compact the aggregate to the Engineer's specifications. After compaction, the surface shall be uniform with no protrusions from larger aggregate particle.
				3. Constrain the edges of the base appropriately to prevent movement.

\*\* NOTE TO SPECIFIER \*\* Include the following paragraphs for vegetated systems. Coordinate with materials specified in Section 32 92 13 - Hydro-Mulching.

* + - 1. Vegetated Systems:
				1. Place engineered base of open graded crushed aggregate homogenously blended with pulverized topsoil and a void component generally containing air and/or water.
				2. Ensure aggregate portion of base is free from fines and has 30 percent or more void-space when compacted. Particle size should range in size from 0.375 to 1.0 inch (10 to 25 mm) with a D50 of 0.5 inch (13 mm).
				3. Add and blend topsoil before placement equal to void percentage in aggregate.
				4. Pulverized topsoil portion shall equal 33 percent of the total volume and be added and blended to produce a homogenous mixture prior to placement.
				5. Compact the mixture to the Architect/Engineer's specifications.
				6. Constrain the edges of the base appropriately to prevent movement.
	1. POROUS PAVEMENT INSTALLATION GEOBLOCK OR GEOBLOCK 150

\*\* NOTE TO SPECIFIER \*\* GEOBLOCK/GEOBLOCK5150 UNITS ARE CAPABLE OF BEARING LOAD IMMEDIATELY after placement, once fully installed and the base depth is appropriate to support the loading. Geoblock®/Geoblock®5150 porous pavement units can be driven on with no infill necessary. No barriers are required to prevent passenger cars and trucks or construction equipment from driving on the porous pavement units during installation.

* + 1. Install and infill porous pavement units in accordance with porous paving system manufacturer's instructions.
		2. Installing Porous Pavement Units:

\*\* NOTE TO SPECIFIER \*\* Edit the following paragraphs as required for paving pattern.

* + - 1. Place units with square hole to ground.
			2. Lay units is the following pattern:

\*\* NOTE TO SPECIFIER \*\* Select bond pattern required and delete paragraphs not required.

* + - * 1. Install unit pattern as indicated on the Drawings.
				2. Standard running bond bricklayer pattern for pedestrian access lane or one-direction vehicular driveway applications.
				3. Herring bone pattern for large area with multi-directional traffic flow. Develop staggered herringbone pattern by using half units made by field cutting a full unit.
			1. Field cut units with a hand or power saw to custom fit contours and around obstructions. Alternatively, offset the units such that the coverage approximates the corner or curve feature. Edge restraints are required

\*\* NOTE TO SPECIFIER \*\* Units must be fixed in place and protected during the installation process, if construction traffic causes movement of the units or large temperature changes occur. Note that plastic components have a relatively high rate of thermal expansion and joint separation could occur and rejoining of separated units may be required. Once a healthy turf is developed, the root system will provide the necessary anchoring of the system.

* + - 1. Place first row of units against a single stationary edge, when available. If the units are placed between two perpendicular stationary edges, allow for potential thermal expansion of the units by keeping the units away from the stationary edge.
			2. Slide units together so interlocking tab joint is fully engaged. Units should not protrude above desired surface elevation.
			3. Prevent units from shifting during installation as follows:
				1. Temporary wood stakes or permanent metal stakes through holes in units.
				2. Thread-forming tapping screws through perimeter interlocking tabs. Install 2 to 4 screws on the long side and 1 to 2 screws on the short side.

\*\* NOTE TO SPECIFIER \*\* Anchoring may be required when placing the Geoblock/Geoblock5150 units on a slope of 5-10 percent maximum. Stake length is generally 12 inches (305 mm) or longer depending on the slope, subgrade CBR and loading requirement. Edit the anchor length as required. Delete paragraph if not required.

* + 1. Anchoring of Porous Pavement Units:
			1. Place anchors in accordance with the manufacturer's recommendations.
			2. Anchor units in-place after installation of all the units within the defined area.
			3. Anchor Porous Pavement units with 0.5 inch (13 mm) #4 rebar or wood stakes to prevent movement of the units.
			4. Anchor length shall be 12 inches (300 mm) or as specified by the Engineer.
			5. Anchoring spacing shall be as indicated on the Drawings.
			6. Drive anchors through holes in the Porous Pavement units along the perimeter as required
		2. Infilling Porous Pavement Units:
			1. Infill units with specified aggregate/topsoil engineered infill immediately after units are installed.
				1. Runoff Coefficient is dependent upon the actual site conditions and porous pavement system infill material.
				2. Typical run-off coefficients range from 0.10 to 0.35 for sandy and clay soils, respectively.
				3. Actual run-off coefficient shall be based on site conditions, engineering judgment and the integrated effect of the drainage area.
			2. Spread aggregate/topsoil engineered infill uniformly over the units to a level even with the top of the cell wall.
			3. Use spreading methods to prevent over-compaction of cell infill.
			4. Broom or rotary sweep the infilled surface to remove the top portion of topsoil infill from the porous pavement cells so it has a meniscus appearance. Final topsoil placement should be slightly below the level of the porous pavement cell wall.
			5. If final vegetation is sod, under-fill the porous pavement units by sod depth to allow room to seat or press sod into the units.
			6. Topsoil and Seed or Sod as specified in Section 32 92 13 - Hydro-Mulching.
	1. POROUS PAVEMENT INSTALLATION GEOPAVE
		1. Install and infill units in accordance with porous paving system manufacturer's instructions.
			1. Verify that all adjacent hard-surfaced paving work is completed before installing porous pavement system.
			2. Geopave units are capable of bearing load immediately after placement and once fully connected with UCLIPs. GeoPave porous pavement units can be driven on with no infill necessary. No barriers are required to prevent passenger cars and trucks or construction equipment from driving on the GeoPave porous pavement units during installation
		2. Installing Units:
			1. Place units with mesh bottom to ground.
			2. Lay units is the following pattern:

\*\* NOTE TO SPECIFIER \*\* Select bond pattern required and delete paragraphs not required.

* + - * 1. Install unit pattern as indicated on the Drawings.
				2. Offset pattern for pedestrian access lane applications.
				3. Standard running bond bricklayer pattern for pedestrian and one direction access lane applications. Place units with long direction of unit perpendicular to direction of traffic.
				4. Herringbone pattern for large area with random traffic flow and placed with long direction perpendicular to traffic. Develop staggered herringbone pattern by using half units made by field cutting a full unit.
			1. Field cut units to custom fit contours and around obstructions. Edge restraints are required to create a closed "cell" that can be infilled. Alternatively offset the GeoPave units such that the coverage approximates the corner or curve feature. Edge restraints are required.
			2. Abut adjoining units to form the specified laying pattern. Units shall not protrude above desired surface elevation.
			3. Secure adjoining units together using the U-CLIP connection device. A total of 12 U-CLIPS are required for each unit. U-CLIPS shall be set in place by hammer in the half-wall locations such that adjacent sections have horizontally level profiles. U-CLIP locations are four on each unit long side and two on each unit short side.
			4. Place first row of GeoPave porous pavement units against a single stationary edge, when available. If the units are placed between two perpendicular stationary edges, allow for potential thermal expansion of the units by keeping the units away from the stationary edge.

\*\* NOTE TO SPECIFIER \*\* Anchoring may be required when placing the Geopave units on a slope of 5-10 percent maximum. Stake length is generally 12 inches (305 mm) or longer depending on the slope, subgrade CBR and loading requirement. Delete paragraph if not required.

* + 1. Anchoring of Units:
			1. Place anchors in accordance with the manufacturer's recommendations.
			2. Anchor units in-place after installation of all the units within the defined area.
			3. Anchor units with 0.5 inch (13 mm) #4 rebar to prevent movement of the units.
			4. Anchor length shall be as indicated on the Drawings.
			5. Drive the anchors through the GeoPave cell-wall vent holes either in the middle of the GeoPave units or along the perimeter as required.

\*\* NOTE TO SPECIFIER \*\* Delineators may be required by local agencies for visual identification of parking spaces, drive lanes, center lines or other delineation. Delete the following items if delineation is not required.

* + 1. GeoPave SNAP Delineators:
			1. Insert GeoPave SNAP delineators into the GeoPave unit's square or rectangular cells to mark delineation.
			2. GeoPave SNAP delineators are placed after installation of the GeoPave porous pavement units and before installation of the infill material.
				1. If the SNAP delineators are desired after infill placement, infill may be removed with a vacuum to allow insertion of delineators at select locations.
			3. Place density of the GeoPave SNAP delineators to meet visual and local agency requirements.
		2. Infilling Units - Aggregate Systems:
			1. Infill units with specified aggregate fill.
				1. Runoff Coefficient is dependent upon the actual site conditions and GeoPave porous pavement system infill material.
				2. For aggregate areas, typical run-off coefficients range from 0 to 0.15 for sandy and clay soils, respectively.
				3. The actual run-off coefficient shall be based on site conditions, engineering judgment and the integrated effect of the drainage area.
			2. Spread aggregate infill uniformly over the units with a skid steer, small tractor or small loader. Overfill the cells to allow for settlement of the infill. Overfill height shall be determined by the size of the infill material.
			3. Hand rake the aggregate to assure that the aggregate fill is at the top of the cell walls.
		3. Infilling Units - Vegetated Systems:
			1. Infill units with specified aggregate/topsoil engineered infill.
				1. Runoff Coefficient is dependent upon the actual site conditions and GeoPave porous pavement system infill material.
				2. Typical run-off coefficients range from 0.10 to 0.35 for sandy and clay soils, respectively.
				3. Actual run-off coefficient shall be based on site conditions, engineering judgment and the integrated effect of the drainage area.
			2. Spread aggregate/topsoil engineered infill uniformly over the units to a level even with the top of the cell wall.
			3. If final vegetation is sod, under-fill the GeoPave units by 1.0 inches (25 mm) to allow room to seat or press sod into GeoPave units.
			4. Use spreading methods to prevent over-compaction of cell infill.
			5. Seed as specified in Section 32 92 13 - Hydro-Mulching.
	1. ABOVE GROUND, POST-INSTALLATION DELINEATION

\*\* NOTE TO SPECIFIER\*\* With vegetated systems, once healthy turf has been established, the cell wall structure will have minimal visibility when good turf-maintenance practices are followed. Delineation may be desirable to create greater visibility for those using the access lanes.

* + 1. Above Ground Post-Installation Delineation: Delineate the installed porous pavement system with the following method:
			1. Above-ground curbing.
			2. Shrubbery or vegetation.
			3. Perimeter lighting.
			4. Delineation markers.
			5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. SEED AND GRASSING
		1. Topsoil as specified in Section 32 92 13 - Hydro-Mulching.

\*\* NOTE TO SPECIFIER \*\* Select seeding or sodding from the following paragraphs. Delete the paragraphs not required. Specify sod for areas where immediate use is desired. Young sod that is free from netting materials is recommended. Mature sod with a more developed root system and sod with netting may be difficult to press and cut into the cells.

* + 1. Seeding: As specified in Section 32 92 13 - Hydro-Mulching.
			1. Follow good seeding, fertilizing, and watering procedures for turf establishment based on regional practices.
			2. Increase watering frequency when free draining base materials are used.
		2. Sodding: As specified in Section 32 92 13 - Hydro-Mulching.
			1. Sweep out topsoil to allow room to seat the sod.
			2. Install young sod free from netting materials.
			3. Press sod into partially emptied cells using a roller or other suitable equipment and follow normal watering procedures.
			4. Follow recommended watering procedures to ensure healthy sod growth.
	1. MAINTENANCE

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following two paragraphs as applicable. Delete if not applicable. Normal turf care procedures should be followed, including de-thatching and aerating. Some equipment may slightly scar or cut the porous pavement unit wall structure during some operations, but will not affect overall structural integrity of the system. Coordinate with Section 32 92 13 - Hydro-Mulching.

* + 1. Aggregate Surfaces: Maintain a 0.5 in (13 mm) surcharge of aggregate as a surface wear course. Surface should be inspected from time to time to identify signs of slight cell infill loss.
		2. Lawn Surfaces: Maintain grass in accordance with manufacturer's instructions and as specified in Section 32 92 13 - Hydro-Mulching.
		3. Snow Removal: Remove snow using one of the following basic procedures:
			1. Keep a metal edged plow blade a minimum of 1.0 inch (25 mm) above the surface during plowing operations, or
			2. Use a plow blade with a flexible rubber edge, or
			3. Use a plow blade with skids on the lower outside corners so the plow blade does not come in contact with the units.

\*\* NOTE TO SPECIFIER \*\* Edit the following paragraph to suit the level of Field Quality Control required. Coordinated with the requirements of Section 01 45 16.13 - Contractor Quality Control. Delete entirely if not required.

* 1. FIELD QUALITY CONTROL
		1. Provide Field Quality Control in accordance with the requirements of Section 01 45 16.13 - Contractor Quality Control
		2. Manufacturer shall provide a qualified field representative on site to ensure the system is installed in accordance with the Contract Document and as follows:
			1. Attend Preinstallation meeting.
			2. Provide certification of compliance to all applicable testing procedures and related specifications.

\*\* NOTE TO SPECIFIER \*\* Specify the number of days and number of trips required for the on-site manufacturer's field representative.

* + - 1. On-site time for installation assistance by the Manufacturer's field representative shall be \_\_\_\_ day(s) with \_\_\_ trip(s).

END OF SECTION