



SECTION 32 12 43

FLEXIBLE POROUS PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Base course of sandy gravel, over sub-base prepared by others.
- B. Porous flexible paving and anchors.
- C. Sand cover.
- D. Turf cover for paver units.
- E. Fertilizer

1.2 RELATED SECTIONS

- A. Section 31 20 00 - Earth Moving.
- B. Section 33 46 19.13 - Underslab Drainage Piping.
- C. Section 32 10 00 - Bases, Ballasts, and Paving.
- D. Section 32 30 00 - Site Improvements.
- E. Section 32 84 23 - Underground Sprinklers.
- F. Section 32 90 00 - Planting.

1.3 REFERENCES

- A. AASHTO M6 - Standard Specification for Fine Aggregate for Hydraulic Cement Concrete.
- B. ASTM C 33 - Standard Specification for Concrete Aggregates.
- C. United States Golf Association (USGA) - Greens section sand mix "The Root Zone Mixture."

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Submit manufacturer's shop drawings including laying pattern and anchoring.
- D. 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.
- E. Samples: Submit two 10 inch square samples of Porous Flexible Paving Units product specified.
- F. Manufacturer's Certificates: Certify base course, sand fill materials and products meet or exceed specified requirements.
- G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic fertilizing and maintenance.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum for five years documented experience with the products specified.
- B. Installer Qualifications: Installer experienced in performing work of this section that has specialized in installation of work similar to that required for this project. Installer must also be able to provide skilled workman with satisfactory record of performance on landscaping or paving projects of comparable size and quality.
- C. Pre-Installation Meetings:
 - 1. Convene a pre-installation meeting a minimum of two weeks prior to start of porous paving systems.
 - 2. Verify project requirements, subbase and base conditions, manufacturer's installation instructions and coordination with other related work.
 - 3. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, engineer, and installer. Manufacturer's representative may attend by phone conference as needed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect porous paver units from damage during delivery and store under tarp when time from delivery to installation exceeds 30 days.
- C. Keep supplied fertilizer with a Guaranteed Analysis in a dark and dry location.

- D. Protect materials during handling and installation to prevent damage.

1.7 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions recommended by manufacturer for desired results. Do not install products under conditions outside manufacturer's absolute limits.
- B. Do not begin installation of porous pavements until all hard surface paving adjacent to porous pavement areas, including concrete walks and asphalt paving, is completed.
- C. Install turf when ambient air temperature is at least 55 degrees F.
- D. In cold weather, do not use frozen materials or materials coated with ice or frost, and do not build on frozen base or wet, saturated or muddy subgrade.
- E. Protect partially completed porous paving against damage from other construction traffic when work is in progress.
- F. Protect turf paving from traffic until grass root system has matured for at least 3 to 4 weeks. Use barricades to only permit accessible by emergency and fire equipment

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Airfield Systems, which is located at: 8028 N. May Ave. Suite 201 ; Oklahoma City, OK 73120; Tel: 405-359-3775; Web:www.airfieldsystems.com ; Email: michaelb@airfieldsystems.com or tparker@airfieldsystems.com
- B. Substitutions: Not permitted.

2.2 MATERIALS

- A. Base Course: Sandy gravel material from local sources commonly used for road base construction and conforming to the following sieve analysis and requirements:
 1. Sieve Analysis:
 - a. 100 percent passing sieve size 1 inch (25 mm).
 - b. 90-100 percent passing sieve size 3/4 inch (19 mm).
 - c. 70-80 percent passing sieve size 3/8 inch (9 mm).
 - d. 55-70 percent passing sieve size #4.
 - e. 45-55 percent passing sieve size #10.
 - f. 25-35 percent passing sieve size #40.
 - g. 3-8 percent passing sieve size #200.
 2. For turf pavers, provide materials nearly neutral in pH (range from 6.5 to 7.2) to provide adequate root zone development for turf.
 3. Material may be either "pit run" or "crusher run." Crusher run material will generally require coarse, well-draining sand conforming to AASHTO M6 or ASTM C 33 to be added to mixture (20 to 30 percent by volume) to ensure long-term porosity.

4. Alternative materials such as crushed shell, limerock, or crushed lava may be used for base course use, provided they are mixed with sharp sand (20 to 30 percent) to ensure long term porosity, and are brought to proper compaction. Without added sand, crushed shell and limerock set up like concrete and become impervious.
- B. Porous Flexible Paving Units: AirPave Geocell Grass Paving Units.
1. Materials:
 - a. Lightweight injection-molded copolymer polypropylene plastic units using impact modifier.
 - b. Plastic is 100 percent post-consumer recycled copolymer polypropylene resin using a polymer impact modifier, with minimum 3 percent carbon black added for UV protection.
 - c. Chemical resistance: Excellent.
 - d. UV resistance: High.
 - e. Toxicity: Non-Toxic.
 2. Performance Properties:
 - a. Loading capability is equal to 233 psi empty capacity and 6,747 psi when filled with sand, over an appropriate base depth that provides adequate support for project design loads.
 3. Dimensions:
 - a. AirPave Grid: 31.784 inches by 31.880 inches by 1.000 inches or 7.03 SF.
 - b. Weight (Nominal): 3.10 lbs per paver grid, 8 percent solid.
- C. Paver Unit Anchors: 8 inch Chisel Point Pins 6 gauge BB Wire with 1.5 inch round attached washer, as required by the Architect or licensed geotechnical engineer to secure units in place
- D. Sand Cover:
1. Coarse, well-draining sand (washed concrete sand conforming to AASHTO M6 or ASTM C-33.
 2. United States Golf Association (USGA) greens section sand mix "The Root Zone Mixture."
 3. Other Soil Mix as recommended by the manufacturer.
- E. Grass: Coordinate with Section 32 92 26.13 - Stolonizing
1. Sodding: Sod: Use a 1/4 inch shallow cut rolled sod from a reputable local grower. Species should be wear resistant, free from disease, and in excellent condition. Sod shall be grown in sand or sandy loam soils only with less than 15 percent clay content. Sod grown in soils of clay, silt, or high organic materials such as peat, will not be accepted.
 2. Seeding: Use seed materials, of the preferred species for local environmental and projected traffic conditions, from certified sources. Seed shall be provided in containers clearly labeled to show seed name, lot number, net weight, percentage weed seed content, and guaranteed percentage of purity and germination. Pure Live Seed types and amount shall be as shown on plans. Mulch using wood or paper cellulose types of commercial mulch materials used in hydroseeding operations. Mulches of straw, pine needles, etc. will not be acceptable because of their low moisture holding capacity.
 3. Hydro Seeding: Approved seed mix and mulch using wood or paper cellulose types of commercial mulch materials for hydroseeding operations.

- F. Fertilizer with Guaranteed Analysis: [Sustane Natural Fertilizer](#) with guaranteed analysis of 4-4-4+Fe and provided with AirPave paving system. Applying Fertilizer per spec is critical to the success of the project.
- G. Firelane Signage and Markings: Identify entrance and physical location of firelanes using signs if gates, curbs, bollards, and other built elements do not adequately indicate firelanes; comply with requirements of local fire authorities.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Before beginning installation, verify site conditions are as indicated on the Drawings. Notify the Architect if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.
 - 1. Complete all hard surface paving adjacent to flexible paving areas, including concrete walks and asphalt paving prior to installation of flexible paving.
- B. Obtain approval of local fire authorities of sub-base prior to installation of base course for flexible porous paving.
- C. Ensure that sub-base Specified in Section 32 10 00 - Bases, Ballasts, and Paving is adequate to receive designed base course, wearing course, and the required design loads. Ensure that grading and soil porosity of the sub-base will provide adequate subsurface drainage.

3.2 PREPARATION

- A. Subgrade Preparation:
 - 1. Prepare subgrade as specified in Section 32 10 00 - Bases, Ballasts, and Paving. Verify subgrade in accordance with porous paving system manufacturer's instructions.
 - 2. Excavate area allowing for unit thickness and the engineered base depth (where required).
 - 3. Provide adequate drainage from excavated area if area has potential to collect water, when working with in-place soils that have poor permeability.
 - 4. Provide a subdrainage system as specified in Section 33 46 19.13 - Underslab Drainage Piping.
 - 5. Ensure in-place soil is relatively dry and free from standing water.
 - 6. Uniformly grade base.
 - 7. Level and clear base of large objects, such as rocks and pieces of wood.
- B. Base Course: Place base course material over prepared sub-base to grades indicated on the Drawings. Place in lifts not to exceed 6 inches (150 mm), compacting each lift separately to 95 percent Modified Proctor. Leave 1 inch (25 mm) of depth below final grade for porous paver unit and gravel fill.
- C. Base Preparation:
 - 1. Leave minimum 25 mm (1 inch) to 35 mm (1.5 inches) for porous flexible paving units and sand/sod fill to final grade.
 - 2. Spread all [Sustane fertilizer mix](#) at the rate of 25 kg per 100 m² (25 lbs per 1,000 SF) evenly over the surface of the base course with a hand-held, or wheeled, rotary spreader. Place fertilizer mix should be immediately before installing the porous flexible paving units.
<http://www.sustane.com/products/landscape/bolster-granular-4-4-4-3fe>

3.3 INSTALLATION

- A. Paving Units: Install Porous Flexible Paving Units in accordance with manufacturer's instructions.
1. Install by placing units with connectors and the pinning platforms flush against the prepared subbase with the larger diameter clover openings (cup side down) and pinning platforms facing downwards (grid side down). Place the first unit panel to the field's upper left hand corner. Orient the paving unit materials with the integral indicator tab (painted yellow) to the panel's bottom left hand corner. Proper sequencing and orientation of panels will result in a more rapid installation.
 2. Install unit panels across the field in a rowed pattern. Staggering of rows will allow for multiple row completion by a multi-manned crew. Secure the first panel to the base with pins and commence with panels 1-2, 1-3 and so on with one directional pull to secure. After each one directional pull secures the panel connectors together, slightly push back each panel to allow for contraction space at each connector. Verify each integral connector is snapped in place with sufficient contraction room allowed as panel installation proceeds.
 3. Once the first row has progressed across the project, start with the second row. By maintaining proper panel orientation, the top edge panel connectors will drop into the previously installed panel receptors after the one directional pull secures the panel.
 4. Panels can be shaped to individual field areas as needed with an appropriate cutting device. If you have many parts to trim use a circular saw with a no melt, plastic cutting saw blades.
 5. Anchor units to base course on curves, slopes, high traffic areas and any other areas as required.
 6. Anchor units using paver unit anchors. Tops of clovers shall be between 6 mm to 13 mm (0.25 inch to 0.5 inch) below the surface of adjacent hard-surface pavements.
- B. Sand: Place sand in clovers by back-dumping directly from a dump truck, or from buckets mounted on tractors, which then exit the site by driving over clovers already filled with sand. Spread sand laterally from the pile using flat bottomed shovels and/or wide asphalt rakes filling the clovers. Use a stiff bristled broom for final finishing of the sand uniformly over the clovers. Compact sand by using water from hose, irrigation heads, or rainfall, with the finish grade no less than the top of clovers and no more than 6 mm (0.25 inch) above top of clovers.
1. Spread all Sustane fertilizer mix at the rate of 25 kg per 100 m² (25 lbs per 1,000 SF) evenly over the surface of the sand filled AirPave with a hand-held, or wheeled, rotary spreader.
<http://www.sustane.com/products/landscape/bolster-granular-4-4-4-3fe>
- C. Grass: Coordinate with Section 32 92 26.13 - Stolonizing and in accordance with porous paving manufacturer's instructions.
1. Hydroseeding/hydro-mulching: Mix a combination of water, seed and fertilizer homogeneously in a purpose-built, truck-mounted tank. Spray the seed mixture uniformly onto the site at required rates. Following germination of the seed, areas lacking germination larger than 20 cm by 20 cm (8 inches by 8 inches) shall be reseeded immediately. Seeded areas shall be fertilized and kept moist during development of the turf plants.

2. Thin Cut Sod: Install directly over sand filled clovers, filled no higher than the top of the clovers. Place sod strips with very tight joints, moistened and rolled to create good contact for growth. Fertilize and keep moist during root establishment (minimum of 3 weeks). Protect from any traffic for a period of 3 to 4 weeks or until the root system has penetrated and established well below the porous paving units.
3. Seeding: Place grass seed at recommended rates per grass type. Place a light dusting of commercial topsoil mix, not to exceed 1/4 inch (25 mm) above the clovers and seed mix to aid germination rates. Fertilize and keep moist seeded areas during development of the turf plants.

3.4 MAINTENANCE

- A. Remove and replace segments of porous paving units where three or more adjacent clovers are broken or damaged, reinstalling as specified, so no evidence of replacement is apparent.
- B. Maintain grass in accordance with manufacturer's instructions and as specified in Section 32 92 26.13 - Stolonizing Lawns and Grasses.

3.5 PROTECTION

- A. Protect turf area from any traffic for a period of 4 to 8 weeks, or until the grass is mature enough to handle traffic.
- B. Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.
- C. Repair or replace damaged products before Substantial Completion.

END OF SECTION

DISCLAIMER: The preceding and following drawings and/or general installation guidelines are provided only to show a concept design for installation and are not instructions for any particular installation. These drawings and general instructions are not complete and are provided only to assist a licensed Geo-Technical Engineer, a Landscape Architect and/or Civil Engineer in preparing actual construction and installation plans. These drawings and instructions must be reviewed by a licensed Geo-Technical Engineer, a Landscape Architect and/or Civil Engineer and adapted to the condition of a particular installation site and to comply with all state and local requirements for each installation site. THESE DRAWINGS AND/OR GENERAL INSTRUCTIONS DO NOT MODIFY OR SUPPLEMENT ANY EXPRESS OR IMPLIED WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IF APPLICABLE RELATING TO THE PRODUCT.