

**Section 32 12 43
(1997 Section 02795)**

PERMEABLE, FLEXIBLE and PLANTABLE CONCRETE PAVEMENT SYSTEM

PART 1: GENERAL

1.01 Description

- A. Work shall consist of furnishing all material, labor, services and related items to complete the installation of Drivable Grass® a permeable, plantable and flexible concrete pavement system in accordance with these specifications.

1.02 Related Sections

- A. Section 31 10 00 - Site Clearing
- B. Section 31 20 00 - Earth moving
- C. Section 32 14 00 - Unit Pavers
- D. Section 32 80 00 - Irrigation
- E. Section 32 91 13 - Soil Preparation
- F. Section 32 92 00 - Turf and Grass
- G. Section 03 30 00 - Cast in place concrete

1.03 Reference Documents

- A. ASTM D-422 - Particle Size Analysis
- B. ASTM D-698 - Laboratory Compaction Characteristics of Soil - Standard Proctor
- C. ASTM D-1557 - Laboratory Compaction Characteristics of Soil – Modified Proctor
- D. ASTM C-39/39M – Std. Test Method for Compressive Strength of Cylindrical Concrete Specimens
- E. ASTM C-33 Std. Spec. for Concrete Aggregates
- F. ASTM C31/ C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field
- G. ASTM C 150 Std. Spec for Portland Cement
- H. ASTM C94 / C94M Std. Spec. for Ready – Mixed Concrete
- I. ASTM C 1157 Std. Performance Specification for Hydraulic Cement
- J. ASTM C595 Std. Spec. for Blended Hydraulic Cement
- K. ASTM C618 Std. Spec. for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete*
- L. ASTM C1611 / C1611M Std. Test Method for Slump Flow of Self-Consolidating Concrete
- M. ASTM C989 Std. Spec. for Ground Granulated Blast-Furnace Slag for use in Concrete and Mortars *
- N. ASTM C979 Std. Spec. for Pigment for Integrally Colored Concrete
- O. ACI 201 American Concrete Institute- Report on Durability
- P. ACI 211 American Concrete Institute- Std. Practice for Selecting Proportions for Normal, Heavy Weight, and Mass Concrete

* Denotes regional applicability

1.04 Submittals/Certification

- A. Procedures: Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Samples:
 - a. Submit 8" x 8" Drivable Grass® sample
 - b. Submit sieve analysis for grading of bedding sand and base material
 - c. Verify source of compost material for bedding and seed cover
 - d. Verify grass seed mix and sources

1.05 Quality Assurance

- A. Installer Qualifications: An experienced installer who has successfully completed installations of pavers or other pavement systems on projects of similar or larger scope and magnitude.
- B. Prior to commencing the work of this section, verify the accuracy of layout and grading. Verify that all sub-grades, base course aggregate conditions, and subdrains are as specified. Notify the owner and / or engineer of any discrepancies and coordinate the correction of those discrepancies with other trades as necessary.

1.06 Delivery, Storage and Handling

- A. Deliver materials to site in manufacturer's original palletized configuration with labels clearly identifying product style number, color, name and manufacturer.
- B. Check all materials upon delivery to assure that the proper type, grade, color, and certification have been received.
- C. Store materials in clean, dry area in accordance with manufacturer's instructions.
- D. Protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

1.07 Project Conditions

- A. Review installation procedures and coordinate Drivable Grass[®] installation with other work around installation area.
- B. All adjacent hardscape, paving, and mow curbs/strips required by construction documents shall be completed prior to the installation of the Drivable Grass[®] paving mats.
- C. Gradients for Drivable Grass[®] paving mats can vary from flat to 12%. For steeper conditions, consult with manufacturer.
- D. Cold weather applications:
 - i. Coordinate maintenance contracts.
 - ii. Snowplow equipment operators should be educated about the underlying surface prior to beginning snow removal. Snowplow equipment should be fitted with teflon runners, which will help keep the snowplow blade from damaging the product.
 - iii. For sites that will require the use of heavy-duty snowplowing machinery, install mow curb/strips prior to installation of Drivable Grass[®] paving mats. Drivable Grass[®] should be depressed ½" below the top of the mow curb/strip to protect the product from the snowplow blade.
 - iv. Do not use frozen materials or materials mixed or coated with ice or frost.
 - v. Do not build in freezing conditions.
 - vi. Ensure proper drainage to avoid standing freezing water in contact with paving mats.
 - vii. Do not use deicing agents that are known to damage concrete such as rock salt.
- E. Protect partially completed paving against damage from other construction traffic when work is in progress and until grass root system has had time to mature after 2 mowings. Projects using aggregate infill instead of planting are drivable upon completing infill.
- F. Areas adjacent to Drivable Grass[®] installation should be protected during construction.

PART 2: PRODUCTS**2.01 Acceptable Manufacturer**

- A. Soil Retention Products, Inc., Corporate Office: 2501 State Street, Carlsbad, CA 92008. Phone: 760-966-6090 and 800-346-7995, fax: 760-966-6099, website: www.soilretention.com, e-mail: sales@soilretention.com.

- B. No substitutions permitted. For approved equal, equal field test data shall be submitted. Compressive strength results shall not be based on sand infilled lab tests.

2.02 Permeable, Flexible, Plantable Pavement System

- A. Permeable, Flexible, Plantable Pavement System: Drivable Grass®
- | | |
|---|------------------|
| a. Nominal Dimensions in inches (l x w x h) | 24 x 24 x 1.5 |
| b. Gross Area of Each Mat in square feet | 4 |
| c. Weight of Each Mat in pounds | 45 |
| d. Plantable Area in percent | 60 (100 for sod) |
| e. Mats per pallet (each) | 60 |
| f. Area Covered per Pallet in square feet | 240 |
- B. Color** Buff/Tan, Grey
- | | |
|--|--------------------|
| a. Flexibility (minimum radius of curvature in inches) | 12 |
| b. Concrete Compressive Strength @ 28 days in psi | 5000 |
| c. Propriety Grid Reinforcement | Engineered Plastic |

**Other colors available for special order

- C. Filter Fabric (If required) – Appropriate filter fabric if required by engineer to separate subgrade and base for site specific conditions.

- D. Base Aggregate* –

Local, state or provincial standards for aggregate base materials for roads should be used for the gradation and quality of dense-graded aggregate base materials. If no standards exist, follow ASTM D 2940, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports. The gradation for base material from this standard is given in Table 1 below. This material should be compacted to a minimum of 95% standard Proctor density per ASTM D 698. For planted applications, verify aggregate does not include harmful materials that could prevent healthy root growth.

Table 1
ASTM D 2940
Gradation for Dense-Graded, Crushed Stone Base

Sieve Size	Percent Passing
2 in. (50 mm)	100
1 1/2 in. (37.5 mm)	95 to 100
3/4 in. (19.0 mm)	70 to 92
3/8 in. (9.5 mm)	50 to 70
No. 4 (4.75 mm)	35 to 55
No. 30 (0.600 mm)	12 to 25
No. 200 (0.075 mm)	0 to 8

*For California installations, Caltrans Class II Base is recommended.

Note: Using open-graded material (i.e. #57) may result in shifting, and if used, consultation with manufacturer is required.

- E. Bedding Course – Defined as the initial material directly beneath the Drivable Grass® mats. For planted applications, a minimum thickness of 2 inches of a thorough mix of 75% sand and 25% fine ground compost shall be used. For non-planted applications, a ½” nominal sand shall be used. A uniform thickness of bedding between the base and the Drivable Grass® is required.
- a. Sand shall be clean, non-plastic, and free from deleterious or foreign matter. The sand shall be sharp and manufactured from crushed rock. Do not use limestone screenings stone dust. The particles shall conform to the grading requirements shown below:

ASTM C33 CSA A23.1-M94 Sieve Size	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300mm)	0 to 30
No. 100 (0.15mm)	2 to 10
 - b. Compost material is defined as finely ground, well screened composted products such as composted manures, mushroom compost or green-waste compost. Material should be able to mix well with sand, able to hold moisture, and provide nutrient.
- F. Infill – Infill for planting applications shall be the same as the bedding course. Infill not intended to support vegetation is likely to consist of 3/8” minus crushed angular stone, decomposed granite, and artificial turf.
- G. Grass - Use approved seed, hydroseed mix, or sod as specified for site specific application.
- H. Seed Cover – Use approved seed cover to retain moisture during germination of seed.
- I. Fertilizer - A commercial “starter” fertilizer shall be used. Check with local grass supplier for recommendations.

PART 3: EXECUTION

3.01 Subgrade Preparation

- A. Vertical depth to accommodate structural section (if applicable) of base aggregate, bedding layer, and Drivable Grass® mat thickness.
- B. Excavate to the lines and grades shown on the construction drawings.
- C. Install any mow strips or curbs as specified.
- D. Proof roll foundation area as directed to determine if remedial work is required.
- E. Over-excavation and replacement of unsuitable subgrade soils with approved compacted fill shall be compensated as agreed upon with the Owner.
- F. Owner's representative shall inspect the subgrade and approve prior to placement of base material or fill soils.
- G. Install irrigation system (if required) to the specified depth and location as required by the contract drawings.

3.02 Installation of Aggregate Base and Bedding Layer

- A. Install and compact aggregate base as required by the contract drawings. The recommended base surface should be +/- 3/8” over a 10 ft. straight edge.
- B. Install, level to a uniform thickness, and compact bedding course upon which permeable, flexible and plantable pavement system will be placed.

3.03 Install Drivable Grass[®] Pavement System

- A. Install permeable, flexible, and plantable pavement system in accordance with the manufacturer's guidelines.
- B. Install system to the line, grades and locations required by the contract documents.
- C. Install mats in one axial direction. Butt mats against each other leaving no significant gaps. Adjust mats as required to maintain good grid pattern alignment. For vehicular driving, a running bond pattern is recommended.
- D. Compact and seat the grids into the bedding course using a low-amplitude, 75-90 Hz plate compactor capable of at least 4,000 lbs. centrifugal compaction force. Use a fabric or pad between the compactor and concrete mats to prevent cracking or chipping.
- E. For non-planted infills, staking is recommended. Also, for crushed angular rock infills, ½" of sand should be used to fill the joints between the mats before the crushed angular rock is installed.

3.04 Fill System with Infill Material

- A. Infill for planted applications is to be comprised of the same material as the bedding course.
- B. Spread infill uniformly across the mats with a push broom. Leave the infill about ¼" below the concrete pad surface.
- C. For installations specified without vegetation, mats may be filled with decomposed granite, 3/8" crushed angular rock, or artificial turf. See specific alternative infill details for proper infill procedures.

3.05 Vegetate Mat System

- A. Install planting materials as specified in the construction drawings. Seeding, hydroseeding, sodding, stolonizing, and plugging, may be acceptable provided that planting is conducted in accordance with the project documents.
- B. Installed planting areas, excluding sod and hydroseed, shall be covered by a light layer of topper / seed cover to preserve moisture and promote germination and/or plant establishment.

3.06 Field Quality Control

- A. The Owner shall engage inspection and testing services to provide quality assurance during construction. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.
- B. Qualified and experienced technicians and engineers shall perform testing and inspections services.
- C. As a minimum, quality assurance testing should include subgrade soil inspection, need for subdrain system for poorly draining soils, aggregate base and bedding type, quality, thickness, compaction, and observation of construction for general compliance with design drawings and specifications.
 - a. Check final elevations for conformance to the drawings. Allow 1/8" to 1/4" above specified surface elevations to compensate for minor settlement.
 - b. The final surface tolerance of the concrete mats shall not deviate more than +/- 3/8 in. over a 10 ft. straightedge.
 - c. The surface elevation of the concrete mats shall be 1/8 to 1/4 in. above adjacent drainage inlets, concrete collars or inlets.
 - d. Lippage: No greater than 1/8 in. difference in height between concrete mats.

3.07 Protection

- A. Avoid significant run on during plant establishment and stay off planted areas until established. The contractor shall be responsible for protecting work from damage due to subsequent construction activity on the site.