



UNILOCK®

INSTALLATION SPECIFICATIONS FOR TURFSTONE™

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FOREWORD

This outline specification has been prepared for the general guidance of architects, engineers, contractors and superintendents associated with the construction of Turfstone™. A qualified engineer must determine the suitability of the design, confirm site conditions and monitor the installation in critical applications.

TURFSTONE™ CONCRETE GRID PAVEMENT INSTALLATION SPECIFICATION

PART 1 GENERAL

1.1. Description

- A. The work covered by this section includes the furnishing of all labor, materials, equipment and incidentals for the inspection and construction of Turfstone™ concrete grid pavement system including subgrade treatment, filter fabric placement and concrete units placement as shown on the Construction Drawings and as described by the Contract Specifications. The work included in this section consists of, but is not limited, to the following:
1. Subgrade preparation.
 2. Furnishing and placement of the filter fabric.
 3. Furnishing and placement of concrete units.

1.2. Related Work

- A. Section 02100 - Site Preparation
B. Section 02200 - Earthwork

1.3. Reference Standards

- A. Articulating Concrete Block
1. ASTM C 1319 - Standard Specification for Concrete Grid Paving Units
 2. ASTM C140 - Standard Method of Sampling and Testing Concrete Masonry Units
- B. Geotextile Filter
1. ASTM D 3786 - Mullen Burst
 2. ASTM D 4491 - Flow Rate
 3. ASTM D 4491 - Permittivity
 4. ASTM D 4533 -Trapezoidal Tear
 5. ASTM D 4751 - Standard Test Method for Apparent Opening Size
- C. Soils
1. ASTM D 698 - Moisture Density Relationship for Soils, Standard Method
 2. ASTM D 422 - Gradation of Soils
 3. ASTM D 424 - Atterberg Limits of Soils

4. ASTM D G51 - Soil pH

1.4. Approved Products

- A. Turfstone™ Concrete Units as supplied by Unilock
Unilock® Location (Address, Phone, Fax) _____
- B. Color to be [_____].

1.5. The Contractor

- A. The term Contractor shall refer to the individual or firm who will be installing the erosion control system.
- B. The Contractor must have the necessary experience for the project and have successfully completed projects of similar scope and size.

1.6. Delivery, Material Handling and Storage

- A. The installing contractor shall check all materials delivered to the site to ensure that the correct materials have been received and are in good condition.
- B. The Contractor shall store and handle all materials in accordance with Unilock's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, breaking, chipping or other causes.

PART 2 MATERIALS

2.1. Definitions

- A. Turfstone™ are dry-cast concrete units that interlock together to form a supported turf matrix.
- B. Subgrade is the base area on which the filter fabric and articulating concrete block are to be placed.
- C. Filter fabric is permeable synthetic fabric as specified in design and placed on top of subgrade. It allows the passage of water while preventing the migration of subgrade soil.
- D. All values stated in metric units shall be considered as accurate. Values in parenthesis stated in imperial units are the nominal equivalents.

2.2. Products

- A. Articulating concrete blocks
 - 1. The Turfstone™ concrete blocks shall be 400 x 600 x 80 mm (16 x 24 x 3.125 inches) with a maximum tolerance of plus or minus 6.4 mm (1/4 inch) for each dimension.
 - 2. The Turfstone™ concrete units shall have a minimum weight of 28kg (62 lbs.) per block.

3. The Turfstone™ concrete units shall have a minimum 28-day compressive strength of 35 MPa (5000 psi) as tested in accordance with ASTM C 140. The concrete shall have a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.

B. Subgrade Soil

1. Undisturbed native soil or imported engineered fill as specified in the Construction Drawings.
2. The Engineer shall review and determine the suitability of the soil at the time of construction.

C. Filter Fabric

1. The filter fabric can be either woven mono-filaments or nonwoven material as specified on the construction drawings. The selection of the appropriate filter fabric should satisfy criteria of retention, permeability, anti-clogging, and survivability/durability based on a specific site condition. Generally, a commonly used geotextile for filtration will have an Apparent Opening Size ranging between 0.149 and 0.210 mm (U.S. Sieve Sizes 100 to 70) and a minimum unit weight of 135 grams per square meter (4.0 oz /square yard). The coefficient of permeability will typically range between 0.1 and 0.3 cm/second.

D. Granular Base

1. The granular base material shall be crushed stone conforming to ASTM C 33 No 57, as presented in Table 1. The granular base thickness and specific aggregate gradation shall be determined by the Designing Engineer.

**TABLE 1
GRANULAR BASE
GRADING REQUIREMENTS**

ASTM C 33 No 57	
Sieve Size	Percent Passing
1 ½ in (37.5 mm)	100
1 in (25 mm)	95 to 100
½ in (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

- E.** The bedding sand shall conform to the grading requirements of ASTM C 33 as shown in Table 2.

**TABLE 2
BEDDING SAND
GRADING REQUIREMENTS**

ASTM C 33	
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 (600 µm)	25 to 60
No. 50 (300 µm)	10 to 30
No. 100 (150 µm)	2 to 10

PART 3 CONSTRUCTION

3.1. Inspection

- A. The Engineer is responsible for verifying that the contractor meets all the requirements of the specification. This includes the use of approved materials and their proper installation.
- B. The Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work related to the articulating concrete block revetment construction.

3.2. Construction Tolerances

- A. The following tolerances are the maximum allowable deviation from the planned construction

Subgrade: 0 to +/- 12.7mm (0 to +/-1/2 inches) over a 3.05m (10 ft) straight edge

3.3. Subgrade Construction

- A. Examine subgrade upon which concrete Turfstone will be placed for improper grade, poor compaction, and quality of the work. Do not proceed with installation until conditions are satisfactory.
- B. Subgrade shall be compacted thoroughly to a 95% Modified Proctor, until no further movement of the soil is observed.
- C. Areas that cannot be consolidated by rolling shall be removed and replaced with sound material or combined with gravel to develop the required stability.

3.4. Filter Fabric Placement

- A. Filter fabric is recommended especially for vehicular traffic areas. It is placed between the subbase and the granular base. Filter fabric shall be placed within the limits as shown in the Construction Drawings.
- B. Filter fabric shall be placed directly on the prepared area. Longitudinal and transverse joints shall be overlapped at least 460mm (18 inches) or as shown in the drawings.
- C. The filter fabric panels shall be placed so that the upstream strip of fabric will overlap the downstream strip.
- D. As needed, securing staples shall be inserted through both strips of overlapped fabric along one line through the midpoint of the overlap to temporarily hold the filter fabric panels in place until the articulating concrete blocks can be placed.
- E. Each securing staple shall be pushed through the fabric until it bears against the fabric and secures it firmly to the ground. Job site sewing of fabric panels shall be allowed in lieu of overlapping methods as approved by Project Engineer.

3.5. Granular Base

- A. Aggregate base shall be placed in uniform lifts not exceeding 6 in (150 mm) loose thickness and roller compacted according to the AASHTO guidelines for installing open graded aggregates. Because the base is open graded aggregated material, a method specification is appropriate for guidance in all aggregate compactive force.

Base thickness shall be: _____ in. (_____ mm).

- B. The granular base shall be trimmed to within to within 0 to 3/8 in. (0 to 10 mm) of the specified grade. The surface of the prepared base shall not deviate more than: (an example: 3/8 in. (10 mm) from the bottom edge of a 10 ft. (3 m) straight edge laid in any direction).

Note: The acceptable final base tolerances shall be determined by the Designing Engineer.

- C. Before commencing the placing of the Unilock® Turfstone concrete units, the base shall be inspected by the Owner or the Consultant.

3.6. Edge Restraints

- A. Adequate concrete edge restraint shall be provided along the perimeter of all paving as specified. The face of the concrete edge restraint, where it abuts pavers, shall be vertical down to the subbase.
- B. All concrete edge restraints shall be constructed to dimensions and level specified and shall be supported on a compacted subbase not less than 6 in (150 mm) thick.
- C. Concrete used for the construction of the edge restraints shall be air-entrained and have a minimum compressive strength as specified. All concrete shall be in accordance with ASTM C 94 requirements.

3.6. Turfstone™ Concrete Units Installation

- A. The bedding sand shall be spread evenly over the base course and screed to uniform 1" – 1-1/2" thickness. The screeded sand should be maintained in a loose condition and not to be disturbed. Bedding sand to be sharp concrete sand.
 - 1. Protect from rain and traffic prior to and following screeding. Do not screed in advance of the installation to an extent that paving will not be completed over sand setting bed on the same day.
 - 2. The sand bedding layer will not exceed 1" – 1-1/2" in thickness following compaction of the units.
- B. Setting Concrete Turfstone Units
 - 1. Install paver in the pattern shown on drawings.
 - 2. Pavers with excessive chips, cracks, or other defects shall not be installed.
 - 3. Use string lines or chalk lines to maintain true pattern lines.
 - 4. Turfstone should be installed hand-tight to adjacent Turfstone units.
 - 5. Required cuts shall be made with a masonry saw to provide clean, sharp unchipped edges.
- C. Compacting:
 - 1. After the units are set in place, they shall be swept clean and inspected.
 - 2. Before ending each day's work, fully compact installed units within 3 feet of the laying face. Cover remaining uncompacted edge of the laying face and sand with waterproof covering.
 - 3. Compact with 3 or more passes of a plate-type compactor capable of 3500 – 5000-pound centrifugal force. A rubber mat should be attached to the compactor to protect the units from cracking or chipping.
- D. Spreading Topsoil or Gravel
 - 1. Topsoil or gravel should be broadcast directly on surface and swept into the openings.
 - 2. Disperse grass seed and fertilizer on top of topsoil.
 - 3. Final level of topsoil or gravel should be ¾" (20mm) below the surface of the Turfstone.
 - 4. The Turfstone should be vibrated again once the voids are full.

3.7. Cleaning and Final Inspection

- A. Upon completion of work, remove rubbish, debris, dirt, equipment, and excess material from site. Clean adjoining surfaces which are soiled by, and during the course of the work.
- B. The final surface elevation shall not deviate more than 1/8" under a 10' long straightedge.

- C. The surface elevation of Turfstone shall be 1/8" to 1/4" above adjacent drainage inlets, concrete collars, or channels.
- D. Surface shall be true to levels and grades as shown on drawings.

END OF SECTION