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August 2017

**Product Guide Specification**

Specifier Notes: This product guide specification is written in Construction Specifications Institute (CSI) 3-Part Format in accordance with *The CSI Construction Specifications Practice Guide,* including *MasterFormat, SectionFormat,* and *PageFormat.*

This section must be carefully reviewed and edited by the Architect to meet the requirements of the project and local building code. Coordinate this section with Division 1, other specification sections, and the Drawings. Delete all Specifier Notes after editing this section.

Section numbers and titles are based on *MasterFormat 2016 Update.*

**SECTION 32 12 43**

**POROUS / PERMEABLE PAVING**

Specifier Notes: This section covers NDS, Inc. "**Tufftrack TT24 Grass Pavers"**. Consult NDS, Inc. for assistance in editing this section for the specific application.

The performance of NDS Tufftrack Grass Pavers is directly correlated to the load bearing capacity, plasticity, and permeability of native soil; frost-heave potential; volume and load-rating of project traffic; shear & torsional forces imparted by dynamic, heavy loads; as well as the type, gradation, and thickness of the base course on which the paver is installed. The separation between the seasonal high water table and the bottom of the base course shall be a minimum of 3 ft to prevent potential saturation of groundwater into the base course.

Use of "Tufftrack TT24" pavers may contribute to LEED credits. Consult NDS, Inc. for more information.

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

A. Porous / permeable paving using gravel pavers.

## 1.2 RELATED REQUIREMENTS

Specifier Notes: Edit the following list of related sections as necessary. Limit the list to sections with specific information that the reader might expect to find in this section, but is specified elsewhere.

A. Section 31 20 00 – Earth Moving: Subgrade preparation.

B. Section 32 80 00 – Irrigation: Irrigation system.

C. Section 32 91 00 – Planting Preparation: Soil preparation.

D. Section 33 46 00 – Subdrainage: Subsurface drainage.

## 1.3 REFERENCE STANDARDS

Specifier Notes: List reference standards used elsewhere in this section, complete with designations and titles.

A. ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

## 1.4 PREINSTALLATION MEETINGS

Specifier Notes: Edit preinstallation meetings as necessary. Delete if not required.

A. Convene preinstallation meeting [1 week] [2 weeks] before start of Work of this Section.

B. Require attendance of parties directly affecting Work of this Section, including Contractor, Architect, installer, and manufacturer's representative.

C. Review the Following:
   1. Materials.
   2. Protection of in-place conditions.
   3. Preparation.
   4. Installation.
   5. Adjusting.
   6. Protection.
   7. Coordination with other Work.

## 1.5 SUBMITTALS

| Specifier Notes: Edit submittal requirements as necessary. Delete submittals not required. |
|---|

A. Comply with Division 1.

B. Product Data: Submit manufacturer's product data, including preparation and installation instructions.

C. Samples: Submit manufacturer's sample of one 24-inch by 24-inch gravel paver.

D. Submit Material Certification / Gradation Analysis for base course and gravel fill.

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

F. Manufacturer's Project References: Submit manufacturer's list of successfully completed gravel paver projects, including project name and location, name of architect, and type and quantity of gravel pavers furnished.

G. Installer's Project References: Submit installer's list of successfully completed gravel paver projects, including project name and location, name of architect, and type and quantity of gravel pavers installed.

H. Warranty Documentation: Submit manufacturer's standard warranty.

## 1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer regularly engaged, for a minimum of 10 years, in the manufacturing of gravel pavers of similar type to that specified.

B. Installer's Qualifications:
   1. Installer regularly engaged, for a minimum of 5 years, in installation of gravel pavers of similar type to that specified.
   2. Employ persons trained for installation of gravel pavers.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery Requirements: Deliver gravel pavers to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:
   1. Store and handle gravel pavers in accordance with manufacturer's instructions.
   2. Keep gravel pavers in manufacturer's original, unopened containers and packaging until installation.
   3. Store gravel pavers in clean areas, protected from exposure to harmful weather conditions.
   4. Store gravel pavers out of direct sunlight.
   5. Protect gravel pavers during storage, handling, and installation to prevent damage.

## 1.8 AMBIENT CONDITIONS

A. During Cold Weather:
   1. Do not use frozen materials.
   2. Do not use materials mixed or coated with ice or frost.
   3. Do not build on frozen Work.

B. During Wet Weather: Do not build on wet, saturated, or muddy subgrade.

# PART 2 PRODUCTS

## 2.1 MANUFACTURER

A. Manufacturer: NDS, Inc., 851 North Harvard Avenue, Lindsay, California 93247. Toll Free 800-726-1994. Phone 559-562-9888. Toll Free Fax 800-726-1998. Fax 559-562-4488. Website www.ndspro.com. Email nds@ndspro.com.

| Specifier Notes: Specify if substitutions will be permitted. |
|---|

B. Substitutions: [Not permitted] [Comply with Division 1].

## 2.2 MATERIALS

A. **Grass Pavers**: NDS "Tufftrack" pavers, model "TT-24".

**Composition and Dimensions**:
1. Injection-molded, nested-honeycomb, polyolefin plastic-panel gravel pavers for permeable, natural-gravel paved environments.
2. Load-bearing paving system.
3. Use full rigid base course to prevent pavers from being pressed into subbase.
4. Material: 100 percent recycled polyolefin plastic with carbon black for UV stabilization.
5. Recyclable Content: 100 percent.
6. Paver Size: 24 inches by 24 inches by 1-1/2 inches high.
7. Wall Thickness: 0.12 inch.
8. Cells:
   a. Number per Paver: 120.
   b. Shape: Hexagon.
   c. Size: 2-1/2-inches.
   d. Form: Nested honeycomb.
9. Bottom of Each Cell:
   a. 1-1/4-inch-diameter hole in center.
   b. Six 0.475-inch by 0.212-inch perimeter slot openings through bottom of paver.
   c. One opening at bottom of each cell wall to discourage root girdling within cell.
10. Bottom Surface of Pavers: Flat, without vertical posts or obstructions.
11. Top Surface of Pavers: Smooth, without notches or grooves.
12. Latching System Between Pavers:
   a. Tongue-and-groove latching system molded around perimeter lock pavers together.
   b. Does not require additional parts or tools.

c. Tongues: 1 inch by 1 inch by 0.12 inch thick.
d. Grooves: 1 inch by 0.12 inch.

13. Bottom Open Area: Greater than 41 percent, across entire bottom surface.
    a. Total Bottom Open Area per Paver: Greater than 228 square inches.
14. Paver Color: Black.
15. Nominal Coverage Area per Paver: 4 square feet.
16. Weight per Paver: 4.5 pounds.
17. Chemical Resistance: Superior chemical resistance; totally inert.

**Performance**:

18. Paver Compressive Strength, Empty Cells: 86,563 lbs (601 psi)
19. Paver Compressive Strength, Cells Filled with 3/8 inch Gravel: 500,000 lbs.

Specifier Notes: Edit the following for the local available base course material and anticipated traffic loads. Consult NDS, Inc. for more information.

B. **Fill Inside Pavers**: Native Top Soil OR Sandy Loam OR Loam Soil. Sand and native soil with high clay content are nor recommended. Engineer / Landscape Architect may also consider the use of patented engineered soil.

C. **Base Course below Pavers**: AASHTO #57 or equivalent from local sources, passing the following sieve analysis:

| Percent Passing | Sieve Size |
|---|---|
| 100 | 1 1/2 inch |
| 95-100 | 1 inch |
| 25-60 | ½ inch |
| 0-10 | #8 |

NDS recommends rock of igneous origin. The use of limestone is prevalent in the South and Southeastern Regions of the US. The Engineer-of-Record shall refer to his/her State's Department of Transportation (DOT) Standard Specification guidelines regarding the use of limestone in the base course. If limestone rock is used, NDS recommends that a Los Angeles Abrasion Test be performed. The abrasion values recommended by the DOTs varies by state, and ranges from 30 to 45. NDS recommends that the abrasion value shall not exceed 30.

Note:

1. Contact NDS if locally available materials do not meet the above gradation.
2. Sources of the material may include locally-available pit run or crusher run.
3. Confirm base course gradation by performing sieve analysis.
4. Perform Los Angeles Abrasion Test per AASHTO T96 or ASTM C131 if limestone is used.

Engineer / Landscape Architect may consider adding and blending pulverized top soil to the aggregate base in the upper 2 to 3 inches of the base course. The volume of topsoil added to the base course is recommended to not exceed 20% of the volume of the base course in the upper 2 to 3 inches. NDS recommends that this option be evaluated and revised as-needed for site-specific conditions (e.g., depth of root zone for the chosen grass variety, etc).

Engineer may also consider adding 2 inches of sandy loam material between the paver and the gravel base course. If this is done, a non-woven geotextile filter fabric is recommended between the sandy loam and the base course to prevent migration of fines into the base course.

D. **Filter Fabric (Optional)**: Use non-woven, needle-punched geotextile filter fabric. Use filter fabric with Apparent Opening Size (AOS) <0.60 mm for native soils with 50% or less particles by weight passing No. 200 sieve and AOS <0.30 mm for native soils with 50% or greater particles by weight passing the No. 200 sieve. Woven geotextiles should not be used.

E. **Erosion Control Blankets (Optional):** Use erosion control blankets, e.g., coir blankets made of biodegradable fiber, to increase soil stabilization and decrease erosion while vegetation takes root. ECBs may be used in areas where shade or cold temperatures increase seed germination time.

F. **Under Drain (Use if native soil is clayey)**: Use minimum 4-inch diameter perforated PVC or polyethylene pipe. Recommended 2 square inches of opening per linear foot of pipe.

G. **Anchors:** Use NDS 3/8 in x 12 in long galvanized steel stakes (Part No. GPSTAKES) with Fastenal or equivalent 3/8 inch I.D. x 2" O.D. X 0.406" Thick Fender Washers.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Examine areas to receive pavers. Paver installation shall not occur when excavated and exposed subgrade native soil area that is to receive the base course has ponding water or ice. Do not begin preparation or installation until these unacceptable conditions are corrected.

B. Excavate to the required depth and compact Native Soil as follows:
   1. Compact subgrade native soils 90 to 95% standard proctor density per ASTM D696 for soils with California Bearing Ratio >20%, R value >30, AASHTO A-1, A-2, and A-3 soils. Lower compaction levels promote infiltration through soil.
   2. NDS recommends that Engineer-of-Record consider higher level of compaction for native soils with CBR 5 to 20%, R-value 10 to 30, AASHTO A-4 soils for heavy loads (e.g., fire trucks) where infiltration into native soils is not a requirement.
   3. NDS recommends that Engineer-of-Record consult with Project Geotechnical Engineer for potential soil modification (e.g., lime treatment) and compaction level for CBR <5% and R-value <10, AASHTO A-5, A-6, and A-7 soils.

C. Install filter fabric per manufacturer's recommendation.

D. Place Base Course material over prepared subbase to grades indicated on the Drawings, in lifts not to exceed 6 inches. Since it is difficult to measure density of coarse aggregate, approach of requiring a fixed density is not applicable. Compact Base Course with one to three passes of 5-ton steel wheel roller or equivalent. Base Course thickness is based on native soil conditions and anticipated wheel loads.

If pulverized top soil is added to the base course in the upper 2 to 3 inches, it shall be blended in prior to placement to produce a homogenous mixture, and this mixture shall be placed as a separate lift.

E. Install perforated under-drain within the base course layer.

## 3.2 INSTALLATION

A. Install pavers by placing units with cells facing up and connecting tongue and groove locks. NDS recommends installing pavers in a staggered pattern.

B. Clearance: Leave 1-inch-minimum clearance between gravel pavers and fixed objects or surface structures.

C. Top of Cells: Leave top of cells 1/4 inch to 1/2 inch below surface of adjacent hard-surface pavements.

D. Fill the top soil in cells as pavers are laid in sections.

E. Extend topsoil fill inside pavers ¼ inch to ½ inch above paver surface and match surrounding grade. When topsoil fill is properly installed, paver cells will have minimum visibility.

Specifier Notes: Specify one of following methods of planting grass: top dressing with sod, recessed sod planting, seeding, or hydroseeding. Include the section number for the section specifying the appropriate method of planting.

F. Planting: Plant grass by [top dressing with sod] [recessed sod planting] [seeding] [hydroseeding] as specified in Section 32 92 _____.

G. Fill grass pavers with soil and plant within 30 days of being installed. Seeding, fertilizing, watering procedure, and turf maintenance shall be per local conditions.

H. Place Erosion Control Blankets over filled and seeded grass pavers (optional).

I. Re-inspect paver tongue and groove locking prior to filling with topsoil if not filled on same day of installation. Make necessary corrections if displacement has occurred since installation. Remove and replace with new pavers where 3 or more adjacent cells are broken nor damaged.

## 3.3 PROTECTION

A. **Work area consisting of pavers shall be opened to traffic only when sufficient grass cover has been established to handle traffic**. Project's Landscape Architect to consider irrigation of areas that receive seed or sod in order to establish and sustain the grass cover for maximum performance of the surface.

## 3.4 MAINTENANCE TIPS

A. Utilize skid shoes or raise snow plow a minimum of 2 inches above the paver surface.

B. Plant turf that is resistant to thatch.

C. Do not use equipment intended for thatching or scalping over the pavers.

**3.5 NOTES:**

1. TT24 with Soil Fill and Grass Cover is recommended for the following applications:

   - Occasional Use* Overflow Parking Lots with following vehicles:
     Class 1** (Motorcycles)
     Class 2** (Passenger cars with trailers)
     Class 3** (Pickup Trucks with trailers)
     Class 5** (Two axle, six tire, single unit vehicles)
   - Emergency / Fire Lanes with applicable vehicles

   *Occasional use is the period of time that will allow grass to recover after a single use. It is based on local soil and weather conditions.
   **All vehicle classes per Federal Highway Administration Vehicle Classification

2. Do not install TT24 permeable pavers with Soil Fill and Grass Cover:
   - In areas subjected to frequent traffic as grass will wear out and will not have sufficient period of time to recover (e.g., residential driveways and regular parking lots).
   - In areas subjected to heavy semi-trucks with trailers.
   - In areas subjected to movement of trash-hauling trucks
   - As playground surfaces.

3. NDS recommendations for TuffTrack TT24 with Grass fill for slopes are as follows:

| **Slope** | **Recommendation** |
|---|---|
| Up to 5% | Up to Class 3 vehicles. Emergency vehicle access roads shall be staked with 4 stakes per panel at all corners. |
| 5% to 10% | Light vehicles like golf carts. Also, anchoring (2 stakes per panel at diagonally opposite corners or 4 stakes per panel at all corners) is recommended. |
| Greater than 10% | Not recommended |

**END OF SECTION**