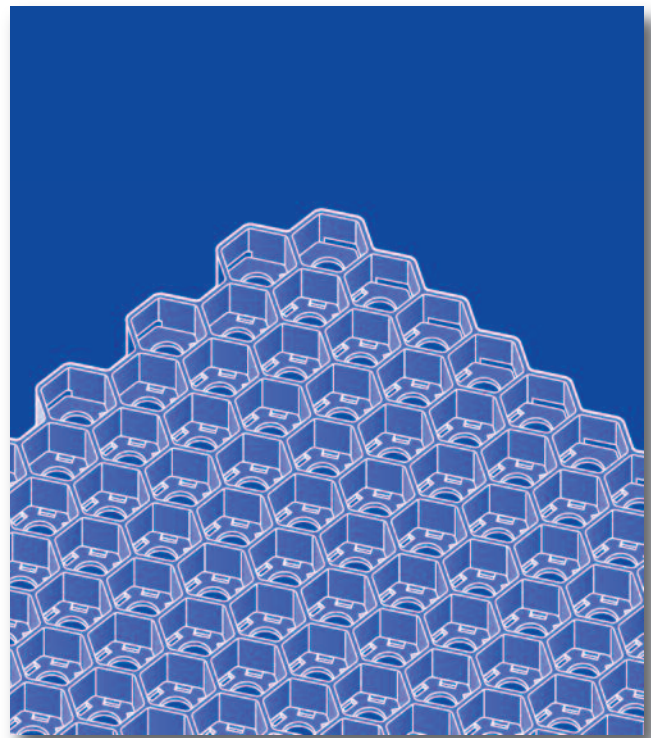


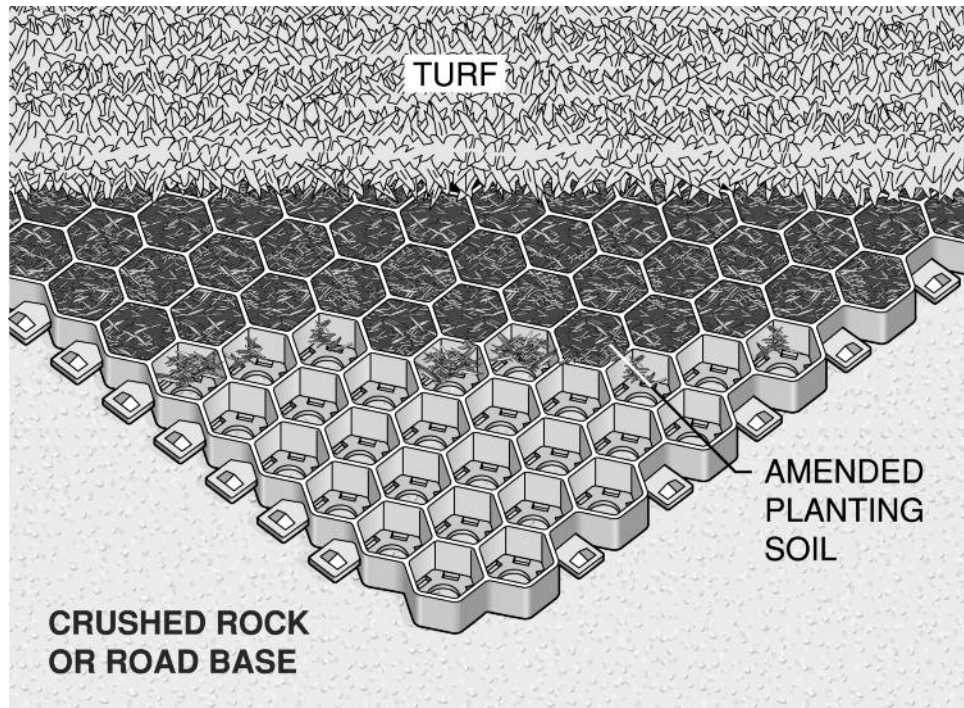
# TECHNICAL SPECIFICATION GUIDE

## TUFFTRACK® GRASSROAD PAVERS®



Rated to 98,500 p.s.f.  
(empty cells)

**Model Numbers:**  
**TT-24**



This information is relevant *only* to the product(s) identified within this document and is not intended for use with any other products. Please consult NDS Technical Services at (888) 825-4716 or e-mail [TechService@NDSpro.com](mailto:TechService@NDSpro.com) if you have any questions pertaining to specifications, installations, or recommended applications that are beyond the scope of this document. BEFORE BEGINNING ANY PROJECT, CONSULT A CURRENT EDITION OF THESE SPECS AT: [WWW.NDSPRO.COM](http://WWW.NDSPRO.COM)



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TUFFTRACK® Grassroad Pavers® is a *load-bearing* paving system.

TUFFTRACK® Grassroad Pavers® is designed to be placed directly over a lightly compacted planting base which is installed on a Class II compacted gravel road base. Proper installation will prevent soil compaction that damages the root system of the grass. TUFFTRACK® can also be used for light duty applications without the road base by simply compacting the planting base as per the manufacturer's detailed installation instructions and drawings, along with a local engineer compaction recommendation.

### Recommended Uses:

Light to moderate traffic loads, including:

- Golf Cart Paths
- Service Roads
- Trail Reinforcement
- Bike Paths
- Roadway Shoulders
- Truck & cart wash-down areas
- Outdoor drinking fountain runoff areas
- Residential Driveways
- Parking Lots
- Overflow Parking Area
- RV and Boat Parking
- Wheelchair access paths
- Outdoor shower runoff areas

Heavy Traffic Loads, including:

- Fire lanes
- Emergency vehicle access roads
- Service vehicle utility roads
- Truck maintenance and equipment yards
- Construction entrance soil stabilization

### Non-Recommended Uses:

- Not recommended for traffic on slopes exceeding a 10% grade (staking may be required.).
- Not recommended for the playing surface of any sports field (e.g. baseball diamonds, football fields, etc.).
- Not recommended to support tread driven military vehicles.
- Not recommended for light or heavy-duty tread driven construction equipment or bobcat style tractors.
- Other non-recommended uses exist, consult NDS Technical Services for details.

### Paver Turf Maintenance Tips And Techniques

1. Do not use aeration equipment over turf areas containing grass pavers.
2. Do not use scalping equipment over turf areas containing grass pavers.
3. Do not use de-thatching equipment over turf areas containing grass pavers.
4. Turf care and mowing practices that minimize the need for de-thatching should be adopted. These may include:
  - Planting turf varieties that are resistant to thatch build-up (like tall fescues) provided the selected variety is appropriate for the site's growing conditions.
  - Collecting grass clippings when mowing.
  - Using slow-release fertilizers.
  - Adopting deep watering irrigation techniques.
5. When snow clearing equipment is used, skid shoes must be used or the snow plow must be raised a minimum 2" above the paver surface. This will prevent the plow from digging into the sod area and keep from breaking the paver mat.



## Installation Guidelines

### Pre-Installation

1. Order approximately 5% additional product over the total square footage required for a project to offset for curves and possible installation errors.
2. Check with local permitting or fire authority as to any requirements for “during installation” inspections before the installation of the base course in any area that may provide emergency vehicle access.
3. Back filled and reclaimed areas may require compaction and testing before the installation of the base course.
4. Define the boundary of the proposed grid work using a string line, header board, concrete curb or other hardscape border as specified by the landscape architect or engineer.
5. The installation of **TUFFTRACK**<sup>®</sup> Grassroad Pavers<sup>®</sup> should occur after the completion of any nearby curbs, sidewalks, asphalt, sprinkler systems, or other hardscape.

### Site Selection

1. Install with no more than a 6% grade for emergency access lanes or for heavy vehicle access.
2. Install with no more than 10% grade when used for light vehicular traffic. Anchoring pins must be installed in this application in a manner specified by a qualified architect or soils engineer.
  - i. “U” shaped staples are not recommended. This includes 11 gauge 6” x 1” x 6” or 9 gauge 8” x 1” x 8” staples normally used to secure jute and blanket erosion control products, as opposed to grass pavers.
  - ii. Geotextile pins or nails are recommended. Industry practices suggest 6” nails with 1.5” washers for hard or rocky soils. For sandy soils, 12” or 18” geotextile pins with 1.5” washers may be used. Consult a qualified architect or soils engineer for the proper method of anchoring the **TUFFTRACK**<sup>®</sup> application specific to your project. Note: air gun installation devices used for driving geotextile pins should not be used in a manner that damages the **TUFFTRACK**<sup>®</sup> Grassroad Pavers<sup>®</sup>.
  - iii. Anchoring frequency and patterns are determined by steepness of slopes and channel beds (e.g. determining how many anchoring pins are needed per square yard). Consult a qualified architect or soils engineer for the proper method of anchoring the **TUFFTRACK**<sup>®</sup> application specific to your project.
3. Installations *over 10%* grades are not recommended for **TUFFTRACK**<sup>®</sup> Grassroad Pavers<sup>®</sup>.

### Installation

1. The installation of **TUFFTRACK**<sup>®</sup> Grassroad Pavers<sup>®</sup> is generally done at the same time as other grass installation on the site, and after the completion of major area construction.
2. Ensure that the paver is installed right-side-up. Warranties are voided for pavers installed upside-down.
3. Lay the first section of **TUFFTRACK**<sup>®</sup> Grassroad Pavers<sup>®</sup> either where there is an available straight border, or where there is the longest available single run.
4. Continue to lay additional panels of **TUFFTRACK**<sup>®</sup> Grassroad Pavers<sup>®</sup> to cover the entire area, securely connecting the Tongue & Groove latching system to create an integral paver mat.
5. Stagger the joint lines (between adjoining panels) among neighboring rows of installed **TUFFTRACK**<sup>®</sup> Grassroad Pavers<sup>®</sup> for an even stronger mat.
6. Be sure to leave the recommended 1 inch minimum clearance between the paver mat and any (pre-installed) fixed objects or surface structures such as utility poles, valve boxes, sprinkler heads, drainage grates, curbs, walls, poured concrete, etc.
7. The paver can be trimmed/cut to fit any fixed objects or surface structure using a hand saw, PVC pipe cutter, utility cutter, or appropriate power saw may also be used if desired. Be sure to follow all manufacturers operating and safety instructions when using such tools.



## Planting

1. TUFFTRACK® Grassroad Pavers® should be filled with soil and planted within 30 days of being installed.
2. A sandy loam or loam soil should be used to fill the empty grass paver cells. The selection of sandy loam or loam soil should be made based upon the soil requirements of the turf variety selected for the project. Sand is not a suitable fill material for TUFFTRACK® Grassroad Pavers®.
3. Select a turf variety well suited to the anticipated traffic frequency and local heat and growing conditions.
  - i. For example, faster growing varieties are preferred for light traffic applications (quickly regenerates blades bent by traffic). Perennial rye grass and tall fescues may be preferred over slower growing blue grass turf varieties.
  - ii. Resistance to thatch build-up, drought and disease resistance should be considered too.
4. Seeded or sodded areas should be protected from non-emergency traffic for 4 to 6 weeks or until the grass is sufficiently established to handle traffic.
5. Seed vs. Sod planting should be determined based upon the anticipated frequency of traffic, noting that:
  - i. Seeding or hydroseeding is recommended for light to moderate traffic applications.
    - Seeded grass pavers should be filled with soil 1/4" below the cell walls (protects the crown of mature grass below the top of the cell wall, the top of the cell wall takes the weight of traffic).
    - Broom the soil into the paver, lightly water and allow soil to settle overnight before seeding (soil should settle about 1/4" below top of cell walls).
  - ii. Sodding is recommended for emergency traffic applications.
    - Sodded pavers should be filled with soil to the top of the cell walls.
    - Broom the soil into the paver, lightly water and allow soil to settle overnight (soil should settle about 1/4" below top of cell walls). Broom a second layer of soil flush with the top of the cell wall before laying sod.
6. Grass paved areas must have irrigation systems sufficient to maintain year-round healthy turf.
7. When planting trees nearby a TUFFTRACK® Grassroad Pavers® surface, it is advisable to install a root barrier product around the root ball to prevent shallow roots from interfering with surface integrity or the road base. NDS root barrier products are recommended.
8. When a path of TUFFTRACK® Grassroad Pavers® is installed bisecting a large lawn or grass field to provide a service road, it is recommended to plant shrubs or trees to mark the ends and edges of the grass paved strip. This guides service vehicle drivers to stay on the grass paved strip whenever they have to traverse the large lawn or grass field.

## Product Specifications

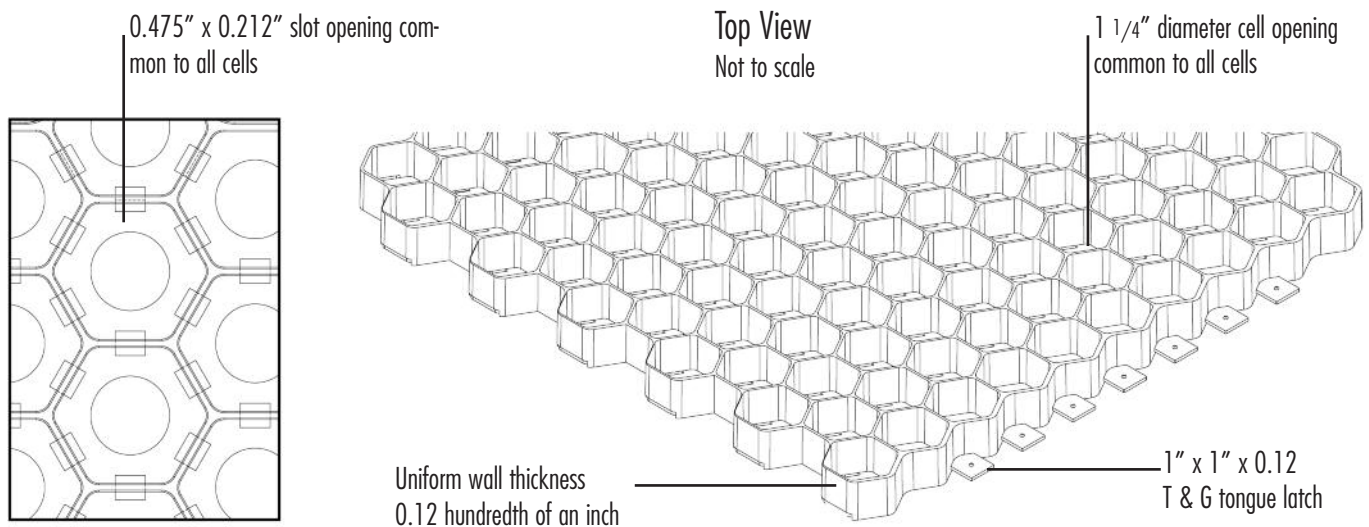
<b>Specify</b>	TUFFTRACK® Grassroad Pavers® is an injection-molded, nested honeycomb, plastic panel grass paver structure. Designed for natural grass paved environments.
<b>Material</b>	TUFFTRACK® pavers are manufactured from up to <i>100% recycled</i> Polyolefin plastic.
<b>Recyclability</b>	TUFFTRACK® pavers are <i>100% recyclable</i> Please recycle whenever possible.
<b>Paver Size</b>	24" x 24" by 1 1/2" in height per panel. Each paver approximates a 2' by 2' flat profile, square structure when assembled to another TUFFTRACK® paver.
<b>Paver Wall Thickness</b>	All internal and external walls, the bottom surface and the tongue latches are injection-molded to a uniform thickness of 12 hundredths of an inch (0.12).
<b>Paver Description</b>	Each paver shall contain (120) 2 1/2" hexagon cells, in a nested honeycomb form. The bottom of each cell shall contain a 1 1/4" diameter hole in the center and a series of (6) 0.475" x 0.212" perimeter openings (through the bottom of the paver); one opening at the bottom of each cell wall to discourage root girdling within the cell. The bottom surface of the paver shall be flat and void of vertical post or obstructions.
<b>Paver Top Surface</b>	The top surface of the hexagonal cell walls of the TUFFTRACK® paver is (smooth), and void of notches or grooves.
<b>Assembly Mechanism</b>	Each paver shall have a Tongue & Groove latching system molded around the perimeter of the paver structure. The Tongues measures 1" x 1" by 0.12 in thickness and the groove (receiver opening) measures 1" by 12 hundredths of an inch (0.12).
<b>Bottom Open Area</b>	TUFFTRACK® paver structure has over 41% open area across the entire bottom surface, a total area equal to over 228 square inches per paver.
<b>Unique Product Features</b>	The series of (6) 0.475" x 0.212" perimeter openings at the bottom of each cell wall serves as an "anti-girdling device" to discourage grass roots from circling inside the cell structure. The slot openings represent 56% greater water and oxygen exchange through the paver bottom over competitors. These features are unique to the TUFFTRACK® only.
<b>Paver Color</b>	The color of the paver is black and contains carbon black for ultraviolet stabilization.
<b>Compressive Strength</b>	The compressive strength of the TUFFTRACK® is 98,770 lbs. (psf) "empty" (unfilled cells) which is equal to 685 lbs. (psi). United States Testing Company, Inc. #720148-2.
<b>Nominal Coverage Area</b>	When assembled each paver approximates a 4-foot square surface area of coverage.
<b>Chemical Resistance</b>	The product has superior chemical resistance and is totally inert.
<b>Weight Per Unit</b>	4.5 pounds per (1) 24" x 24" paver structure.

## Product Features

TUFFTRACK® Grassroad Pavers® have features found in no other grass paver product in the industry. The unique slot opening (though the bottom surface of the paver) at the base of each hexagonal cell wall is a one-of-a-kind feature. In addition to promoting a greater flow of water, oxygen and nutrients through the paver, the slot openings promote grass root penetration into the soil below. Additionally the open slot design prevents roots from circling (girdling) inside the bottom of the hexagon cells (circling roots can diminish healthy grass establishment and stunt future growth). The anti-girdling effect of the slot openings can make the difference between success or failure of your project. In floodplain areas where drainage is critical, TUFFTRACK® Grassroad Pavers® excel in water runoff capabilities by an additional 56% drainage capacity over any other paver in the honeycomb class.

The Tongue & Groove (T&G) latching system is another unique feature found only on this product. The heavy-duty tongue latches molded strategically around the perimeter of each paver measure 1 inch by 1 inch by 12 hundredths of an inch (0.12) in thickness. The advantage of the heavy-duty latching system, in addition to the increased wall support against shear stresses, is the extended longevity of the grid work system as the grass matures and the ground settles. The T&G latching system enables rapid assembly of the product, locking one paver to another in the process and reduces labor costs.

TUFFTRACK® Grassroad Pavers® section



The unique design of the bottom surface of the TUFFTRACK® Grassroad Pavers®, with hundreds of openings/edges acting as a superior gripping mechanism, promotes lateral stabilization of the grid working within the soil environment.

**“From an Arboricultural standpoint, the greater the ratio of cell openings to the surface of the soil, the greater the opportunity for natural, healthier grass root penetration and water & oxygen movement.”**

## Paver Design

**TUFFTRACK®** Grassroad Pavers® are configured in a nested honeycomb format utilizing hexagonal cells to form a 4 square foot flat block structure measuring 24” by 24” by 1 1/2” depth, (approximate dimensions.) The paver design utilizes a full rigid base to prevent the paver from being pressed into the sub-base. In addition to the 1 1/4” hole typically found in the cells of nested honeycomb pavers, the **TUFFTRACK®** paver has a series of 1/4” x 1/2” slot openings through the bottom at each cell wall, thus increasing the movement of water, oxygen, nutrients and root growth through the paver bottom by an additional 56% over any other paver in its class.

Design aspects address overall mat strength, fatigue and durability factors. These aspects are addressed through three main design areas: paver design, material composition and molding technique.

## Design Theory

**TUFFTRACK®** Grassroad Pavers® are engineered to withstand several types of forces that are capable of being applied in traffic situations, as well as pedestrian traffic applications.

- Major forces that are applied during traffic include lateral pressure from turning, braking and acceleration. These torsional forces must be addressed in two key areas. They are paver mat movement and paver separation. **TUFFTRACK®** design incorporates two unique features that address these issues. The first is the heavy-duty T&G “tongue & groove” latching system. Each tongue measures 1” by 1” by 0.12” in thickness. There are 26 in all strategically positioned around the perimeter of each paver block. When assembled to another paver, the walls and T&G latching system enhances the integrity of the wall structure to provide superior strength. The insertion depth of each tongue into the receiver slot of the other block is 1 inch: This provides a greater assurance against paver separation. The six ground slot openings in each of the 120 cells, coupled with the 1 1/4” center hole through the cell bottom provides for exceptional gripping power into the sub-surface soil, thus preventing lateral paver mat movement.
- Nesting integrity is critical, unlike a simple overlapping connection, or post and eye connection, the heavy duty T&G latching system does not allow the paver units to be pulled apart (on the flat plane). The paver latching system securely fastens the entire mat into one continuous section. This becomes extremely important in two types of situations. The first is obvious – traffic load movement. The second, not so obvious condition can occur as the project ages. Subtle changes in ground conditions could easily result in paver displacement or separation (mat failure), as would be the case with inferior locking mechanisms found in other paver products.
- In any consideration of product durability involving heavy traffic or compression “impact” loads, the ultimate tested and documented load rating of the product must be considered. **TUFFTRACK®** has been tested for compressive strength at 98,770 pounds per square foot (bare product), with an ultimate stress load capacity of 128,400 lbs per square foot (mature site). In working terms that means the capability to support a vehicle weighing in excess of 90 tons (or) 180,000 lbs gross vehicle load! The T&G latching system is differentiated from other types of paver connections in that the joints will actually become stronger as more pressure is applied. When connected it is nearly impossible to separate the **TUFFTRACK®** paver units without raising the paver to a 30 degree angle, thus providing a secure paver locking mechanism. As the grass matures, the **TUFFTRACK®** produces an astounding sub-structure capable of handling the heaviest loads imaginable.
- In addition to securing the paver mat into one solid, contiguous area, the heavy duty T&G latching system distributes the downward vertical forces over the entire paver mat grid work. This allows point loads to be carried by multiple adjoining pavers. While this effectively prevents single incident failures, it also works to prevent accumulative load failures over time. The T&G latching system in conjunction with the full base design, work together in preventing the compaction of the paver mat into the sub-base, and eventual failure of the porous paved area.

- In the area of “friendly” pedestrian traffic design the TUFFTRACK® has eliminated the out-dated slots found on the top surface of most nested honeycomb type pavers thus providing for enhanced pedestrian safety when applied in pedestrian areas such as overflow parking, driveways, general pedestrian walkways, and RV parking areas.

## Material Composition

TUFFTRACK® Grassroad Pavers® material must be made from up to 100% recycled Polyolefin plastic. The nature of Polyolefin plastic is rugged, flexible and ideally suited for outside exposure and longevity. Plastic polymers can show a decline in mechanical properties during service lifetime when they are exposed to sunlight. At NDS, we use UV inhibitors within our plastics in order to prevent a breakdown in the strength of our pavers over time due to environmental effects.

TUFFTRACK® Grassroad Pavers® are manufactured in the color black to utilize carbon black polymers to their fullest extent in providing the highest quality of ultra violet protection for the paver product. It is well known that in the general application of grass pavers, the final grid work of pavers is covered with grass, as is the typical application of a fire access road. The top edge of the paver may be visible in a new vehicular traffic access installation; however, the natural green grass look is apparent at a slight angle from the perpendicular. If you are considering a large project utilizing the TUFFTRACK® Grassroad Pavers® and the paver color represents a significant factor in your decision-making process, please contact NDS or your manufacturer’s representative to discuss your project.

As good corporate custodians of our environment, NDS uses quality reprocessed recycled materials in the manufacture of TUFFTRACK® Grassroad Pavers®. With the growing in the use of recycled materials, TUFFTRACK® should qualify for all projects requiring recycled construction materials.

## Molding Technique

TUFFTRACK® Grassroad Pavers® are proudly manufactured in the U.S.A. in our own facility in Lindsay, California. The pavers are injection-molded with computerized machines, which means that they are manufactured to very exacting specifications. The pavers are molded to an exact temperature range that will not damage the molecular chain of the polymer. The use of a high-quality reprocessed recycled resins and UV inhibitors coupled with computerized manufacturing technologies guarantees the TUFFTRACK® Grassroad Pavers® will preserve their strength over time.

## Compression Tests

Compression tests are used to determine the yield and ultimate load strength of a given paver. The United States Testing Company, Inc. performed the stress load testing on the TUFFTRACK® Grassroad Pavers® using the following procedure: each sample paver was individually placed flat on the fixed plate of an Instron machine. A load was then applied to the top surface of the paver, through a 5-inch by 5-inch steel plate, at a rate of crosshead motion of 0.5 inch per minute until failure. The test was performed at two locations on each sample. The compressive strength of the specimen was then determined by dividing the maximum load into the area through which the load was applied. The ultimate compressive strength of the TUFFTRACK® grass paver product was 98,770 pounds per square foot (see testing and documentation data in the TUFFTRACK® Grassroad Pavers® brochure.)

## Drive-on Tests

The drive-on tests are the true test of how the paver will perform under vehicle load. The pavers are installed and turf is established, then a test vehicle (usually a fire truck) is maneuvered on the installed pavers. The pavers must not show any signs of movement. The pavers must not raise or tilt up in any way (often the case with flexible pavers and large concrete block systems), the driving surface must not interfere

with the ability of the vehicle to maneuver anywhere on the grass paved area. Many fire departments will saturate the area with water, which ensures a true test of how the pavers will perform in an actual emergency situation. Tests vary depending on the final application (fire land, parking, utility access etc.). Please contact the manufacture or manufacturer’s representative for additional support data.

## Permeability

### Runoff

In comparing concrete or asphalt storm management with the use of TUFFTRACK® Grassroad Pavers® there are several factors to consider. In general, TUFFTRACK® grass paver provides a lower runoff coefficient, a prolonged time of concentration, a much higher rate of percolation and a cleaner runoff.

As a general rule, using TUFFTRACK® grass paver over a rock and sand base with a sandy loam site soil (CN30) will promote a situation unlikely to generate surface runoff in an average rainstorm. We define an average storm as one delivering less than six inches of rain in a twenty-four hour period.

When TUFFTRACK® grass paver is installed over clay soils (CN78), the performance will vary slightly depending upon the depth of the base course because of internal water storage capacity less antecedent moisture present. TUFFTRACK® grass paver provides a permeable area of approximately 61% per square foot of surface area.

As per **Technical Release #55, US Dept of Agriculture, Soil and Conservation Service**, the evaluation of storm water management objective is done by the following method. Calculate the existing (pre-construction) runoff volumes and time of concentration factors. Next calculate area and runoff volumes, which will be generated by new hard surface areas. Runoff reduction can be calculated and compared when using Table 1 which lists runoff percentages from various soils based on “meadow” type cover and a 24-hour rainfall.

### Frequent Traffic & Parking Considerations

Commonly we are asked about using TUFFTRACK® Grassroad Pavers® as an overflow parking or driveway situation. This is how we typically address the requirements for a satisfactory installation. The root systems of indigenous turf are protected within the cellular walls of the paver. Frequent vehicular traffic does not harm the grass root structure because of the cellular wall protection, however blades of grass will be cut off if driven on daily. If someone parks over the same spot everyday, the grass simply cannot survive. Turf requires light, and that requirement cannot be met unless parking areas are used less than daily or are rotated. We cannot specify the rotation you will require. This is determined by your climate, turf and other factors. Most likely it is something that will require a certain amount of testing and client feedback.

Runoff % - 24 Hr Rainfall				
Sand to Clay Soils				
Inches	CN30	CN58	CN71	CN78
1.0	0.0	0.0	0.01	0.06
1.2	0.0	0.0	0.03	0.10
1.4	0.0	0.0	0.05	0.14
1.6	0.0	0.0	0.08	0.18
1.8	0.0	0.01	0.11	0.21
2.0	0.0	0.02	0.13	0.24
2.5	0.0	0.05	0.20	0.32
3.0	0.0	0.09	0.25	0.38
4.0	0.0	0.17	0.35	0.47
5.0	0.0	0.23	0.42	0.54
6.0	0.01	0.29	0.48	0.60
7.0	0.03	0.34	0.53	0.64
8.0	0.05	0.39	0.57	0.67
9.0	0.08	0.43	0.61	0.70
10.0	0.10	0.46	0.64	0.73
11.0	0.12	0.49	0.66	0.75
12.0	0.15	0.52	0.68	0.76

**Table 1:** Technical Release #55, US Dept of Agriculture, Soil and Conservation Service table

**Root Penetration**

The primary source of water and nutrients will not be above the road base. As an example the roots of fescue can penetrate to a depth of over 20 feet (6m). The entire base and paver structure is not designed to retain water – in fact its primary purpose is to allow the water to percolate into the soil quickly, while retaining strength. While the soil in the paver structure is important and is a source for nutrients and moisture, is it not the primary source.

As a general reference on base preparation, the main purpose of the base is to obtain 95% compaction while still allowing the water to percolate through the entire paved area. The type of stone used for the base will usually have no bearing on growth, except in one instance. Some areas of the country use gravel which is heavy in lime (limestone based) and can slow root growth. Generally speaking you should use good, clean 3/4” (1.9cm) gravel which is free from any agents which would slow turf growth.

**A General Statement of Fact**

A grass paving structure such as TUFFTRACK® Grassroad Pavers® or any other grass paving structure for that matter, whether it is constructed of plastic or concrete, is only as good as the base foundation upon which it is installed. This is the primary factor that must be considered beyond design or desire.

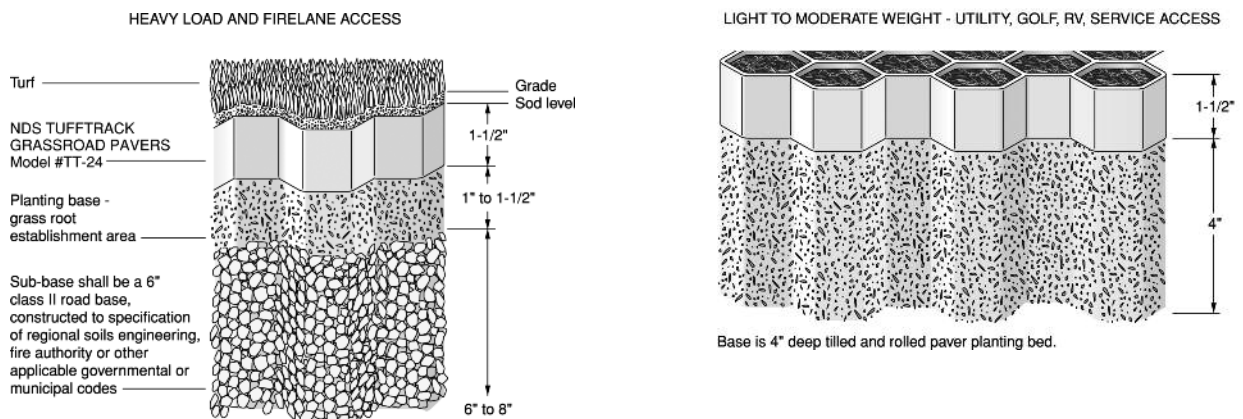
**Paver Installation Guidelines**

**Architectural and Engineering “Base” Determination**

The first decision in your project planning must address the correct “base construction” that will support the proposed traffic load weight anticipated on your site. i.e. fire lane, overflow parking, light utility access road, etc. There are three base options from which to choose:

- Option A Light Load/High Traffic – Base shall be prepared using a 3” course aggregate base (CA-7) & 1” fine aggregate (FA-1)
- Option B Fire Lane/Heavy Load – Base shall be prepared using a 6” course aggregate base (CA-7) & 1” fine aggregate (FA-1)
- Option C Local Municipal Codes – Base shall be installed according to the local specifying authority or municipal codes

In general terms the *Fire Land/Heavy Load base* is composed of two components (1) the *sub-base*, constructed as a Class II road base, 6 inches of course aggregate mix brought to a 95% compaction, (2) the *planting base*, of 1 1/2” to 2” Depth of prescribed planting soil mix leveled and firmly rolled. The *planting base* is the actual paver base.





## Site Preparation

- A Remove all foreign top grade structures and excavate existing site soil to accommodate the base specified for your traffic/load requirements. (see typical section, page 12).
- B Install the *sub-base* per architectural and/or engineering drawings and written specifications describing the depth, load rating, construction materials and required compaction.
- C Add the *planting base* soil required per site soil conditions, as specified by the landscape architect or engineer, fine grade the planting base soil and apply roller pressure to establish moderate compaction.

## Paver Assembly & Installation

- A Position pallets of pavers strategically to their distribution needs and begin the assembly of pavers in the initial run (longest straight run) lay down the first row of assembled pavers against the string line or header, then connect the next assembled row of pavers to the first row and so on until assembly is completed. (See paver assembly guide, page 14).
- B In the assembly process described above you must cut clearance openings through individual pavers as required to assure that all (pre-installed) surface structures such as valve boxes, drainage grates, utility poles, sprinkler heads etc. are correctly positioned within the paver grid work at the appropriate level to finished grade.
- C Upon completion of the assembled paver grid work it is important to re-examine all paver fittings around surface utilities and bordering structures to assure proper (1" clearance). Make all adjustments or replacements prior to soil fill or planting.
- D If you are installing a fire lane / heavy load access that requires a top sod planting, fill the grid work with the prescribed planting soil mix and back rake the entire surface to level the soil to the top edge of the paver grid work and water moderately to promote soil setting. (See options below)

## Planting – Sod, Seed or Hydroseeding

Note: There are generally three methods of plantings to consider. These are described below.

For soil planting elevations (See **Planting Profile/Soil Level**, page 15)

1. *Top Dressing with Sod* – (typical fire lane application): Sod is laid on top of the paver grid work after it has been filled with soil, back raked to top of cell walls and watered moderately. Note: Within a few hours after water is applied, the soil within the cells will settle down into the cells about 1/4". The surface is now ready for the final top dressing of soil (If deemed necessary) and then the sod laid in a staggered pattern on top of the planting surface. Water the sod and set a watering schedule.
2. *Recessed Sod Planting* – (Typical high use traffic application): In this treatment you must order 3/4" or 1" sod. Do not add soil to paver grid work. Lay sod in a staggered pattern on the paver grid work, water sod (saturate) to prepare for compression into paver cells. Use a hand water roller or power driven roller to compress the sod and root system completely into the cells. When using a roller always follow the Manufacturer's Operation, Maintenance and Safety instructions. Note: If you are unable to obtain a 3/4 to 1" sod you must use a thinner cut sod. When using a thinner sod you will need to add planting soil into the cells prior to laying the sod: i.e. with 1/2 inch thick sod add 1/2 inch of planting soil into cells. Apply sod as described above, water and set a watering schedule.
3. *Seeding or Hydroseeding* – (typical high traffic application): Fill the entire paver grid work with planting soil, back rake soil to top of cell walls and water *generously*. Note: Within a few hours after water is applied, the soil within the cells will settle downward into the cells about 3/8 of an inch. Broadcast fertilizer and seed or hydroseed over the paver grid work. Water the new planting and set a watering schedule.

Different soil textures and planting mixtures will settle at different depths into the cell walls when watered initially. In the event of excessive soil settling, additional soil must be added to adjust the final planting level within the cells.



## Paver Assembly Tips & Techniques

### Five Simple Steps to Assembly

Generally speaking the fastest assembly technique is to pre-assemble long individual rows of TUFFTRACK® Grassroad Pavers® along a major lateral of the proposed grid work. Continue joining the pavers, row after row until the grid work is completed. It sounds easy to assemble because it really is easy, using the right techniques described below.

**Step 1.** Define the boundary of the proposed grid work, using a string line, header board, concrete border or other devices as specified by the landscape architect or engineer. If you are installing a fire lane, for example, you may be required to pour 10" by 10" concrete "visual boarder" strips on major laterals. If there is no boarder required you can stake a 2" x 4" along the initial row of pavers to give you a good back up support edge and straight line to begin with.

**Step 2.** Assemble the first row of pavers along the established lateral nesting the hexagonal cells as illustrated in (A) and (step 1.A). Snug the assembled row of pavers up against the boarder or header with 1 inch spacers. The tongue and groove latching system on the paver will only fit one side of the other paver, eliminating misconnections & speeding up assembly.

**Step 3.** Assemble the second row of pavers, laying the row in close proximity to the first row nesting the hexagonal cells, as illustrated in (B). When completed, move the second row into a nesting position with the first row. (See Step 1.B below) and join them together, lifting each side slightly as illustrated in (C).

**Step 4.** Continue the assembly as described in Step 3 (above) until the major grid work is completed. In this process you must cut clearance openings through individual pavers as required to assure that all pre-installed surface structures such as valve boxes, drainage grates, utility poles, sprinkler heads etc. are correctly positioned within the paver grid work at the appropriate level to finished grade.

**Step 5.** If the grid work has an irregular shape, cut the pavers with a skill saw, saber saw or hand saw to conform to the regular shape. The finished cuts should be made to a 1" tolerance. See Illustration 1.

**Notes:** 1. Allow 3 to 5 percent additional product to the total required to offset for cuts, curves and mistakes.  
2. The TUFFTRACK® grass pavers can be assembled and nested "off center" to fit irregular shapes & reduce waste.

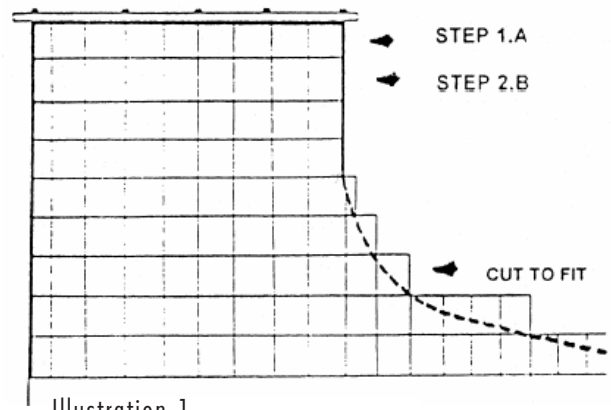
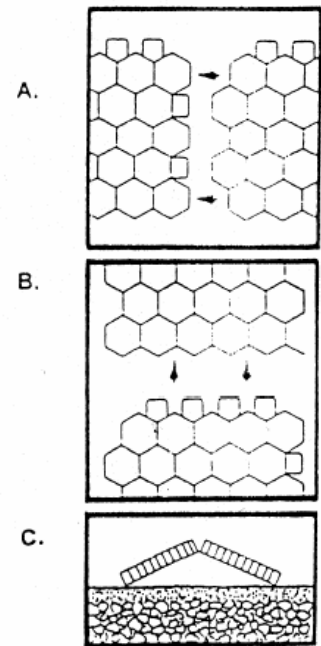


Illustration 1

## Planting Profile/Soil Levels

When using plastic grass pavers in a professional landscape applications involving fire lanes, utility roads, and overflow parking there are several textures of grasses and planting methods that can be achieved, however there are only two planting profiles that address the soil elevation adjustment to final grade and ultimately determine the finished surface you can achieve. They are *Top Profile Plantings* which can include laying sod, seeding, or hydroseeding, and *Recessed Plantings* which also include laying sod, seeding or hydroseeding. The primary difference in the two planting profiles is the planting soil elevation or finished grade in relationship to the top surface of the grass paving grid work.

### Top Profile Planting

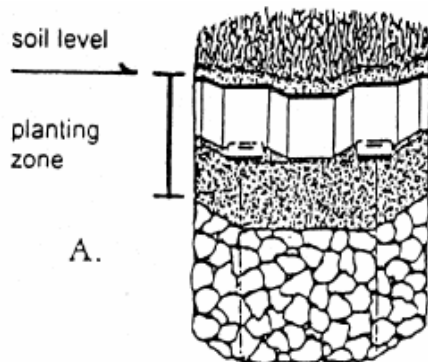
Sod or grass is grown on top of the grass paver grid work after assembly of the product is completed and the grid work has been filled, watered and “re-filled” with the prescribed planting soil mix. This is by far the most common application used in the construction of fire lanes integrated within building structures. In this application the surface of the grass has all the appearance of a natural landscape green environment within the surrounding landscape. The actual access to the fire lane, as well as turns and perimeters of the fire lane, must be marked with shrubs, borders, gates or other fire warning devices or signage, as prescribed by the governing fire authority or municipal code. The *Top Profile Planting* method, using sod laid on top has an advantage over seeding or hydroseeding because the sod totally covers the surface of the paver grid work immediately and thus reduces pedestrian tripping and potential liability. Additionally the paver grid work is protected from the damaging ultra violet rays of the sun. This is the most economical and the easiest planting application to install. See detail A below.

### Recessed Planting

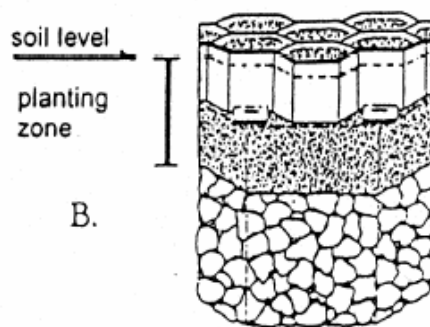
This planting method is used in both fire lanes and most other application where vehicular traffic, vehicular storage and other temporary parking/traffic are anticipated. The concept here is to achieve an ultimate grass/soil level recessed about 1/4 to 1/2 inch down inside the grass paver cell. When the grass/soil level is recessed within the cells it is possible to drive vehicles over the surface (on the top of the cell walls) without inflicting serious damage to the grass blades or compacting the soil within the individual cells. The radius of the tire, traveling across the surface does not extend down inside the hexagonal cell walls of the grass paver to a depth that would compact the soil or damage the grass. See detail B and C below.

Whether you are going to use the *Top Profile Planting* or the *Recessed Planting* method you must consider appropriate horticultural practices associated with the planting soils, mixes, amendments and treatments within the soil planting zones illustrated below. In adverse soil conditions consult a horticulturist or soils specialist.

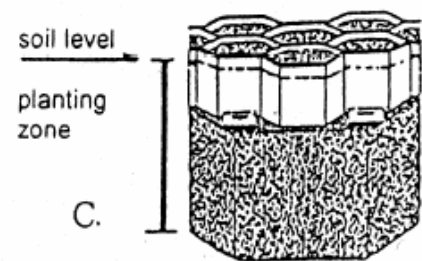
## Planting Profile/Soil Levels



Top Profile Planting



Recessed Planting

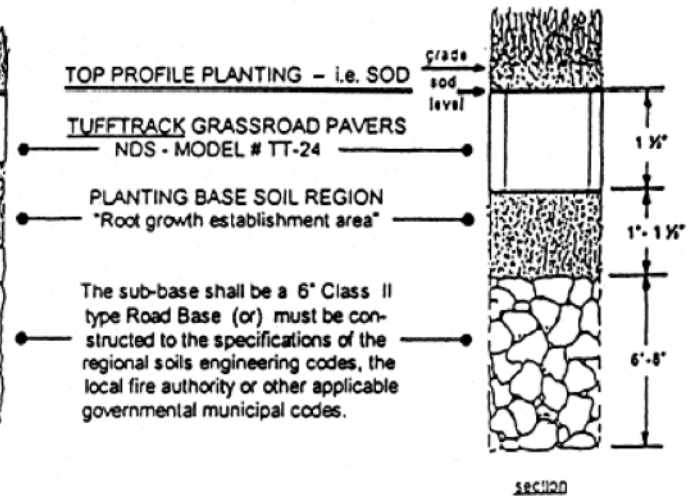
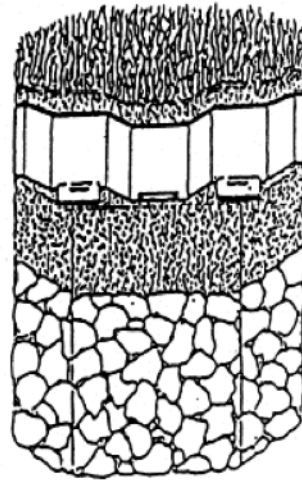


**Section Drawings**

**TOP PROFILE PLANTING**

**LIMITED DRIVING - OK**  
**FIRE LANE OR**  
**HEAVY LOAD**  
**(ANNUAL INSPECTION)**

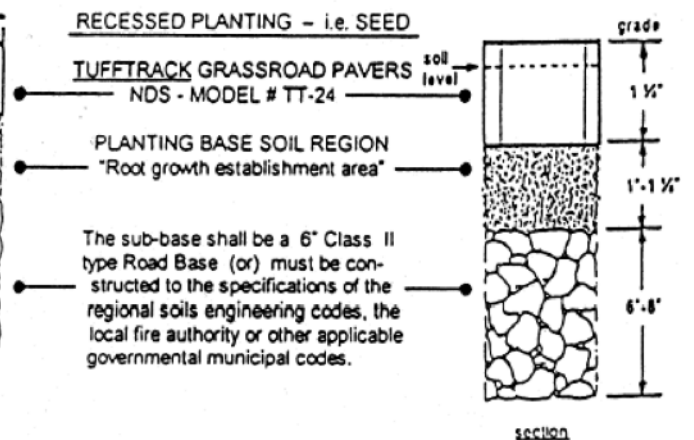
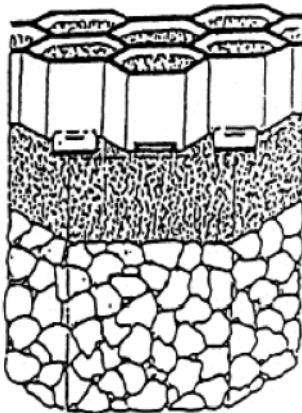
**PLANTING METHOD**  
**TOP WITH SOD, SEED**  
**OR HYDROSEED**



**RECESSED PLANTING**

**TRAFFIC USE - OK**  
**FIRE LANE ACCESS**  
**HEAVY LOAD AND**  
**UTILITY ROAD**

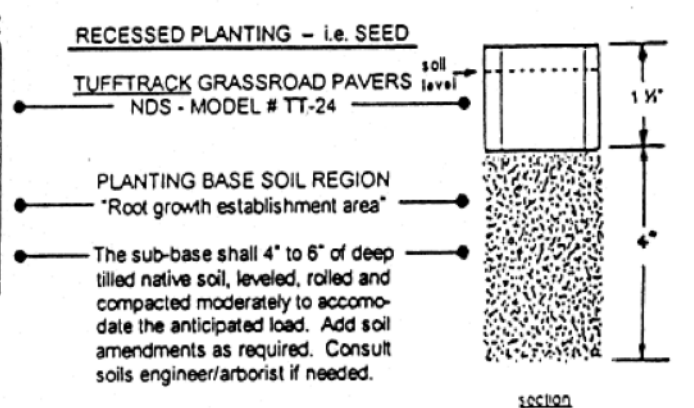
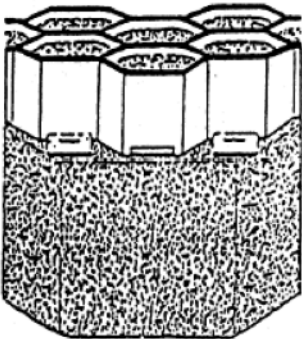
**PLANTING METHOD**  
**ROLL SOD INTO CELLS**  
**SEED OR HYDROSEED**



**RECESSED PLANTING**

**TRAFFIC USE - OK**  
**LIGHT LOAD, RV PAD**  
**MODERATE TRAFFIC**  
**OVERFLOW PARKING**  
**LIGHT UTILITY ROAD**  
**GOLF CART PATH**

**PLANTING METHOD**  
**ROLL SOD INTO CELLS**  
**SEED OR HYDROSEED**  
**GRAVEL OR SAND FILL**



## Soil Definitions

### Sandy loam

Soil material that contains either 20% or less clay, with a percentage of silt plus twice the percentage of clay that exceeds 30, and 52% or more sand; or less than 7% clay, less than 50% silt, and between 43% and 52% sand.

#### Coarse sandy loam

25% or more very coarse and coarse sand and less than 50% any other one grade of sand.

#### Sandy loam

30% or more very coarse, coarse, and medium sand, but less than 25% very coarse sand, and less than 30% very fine or fine sand.

#### Fine sandy loam

30% or more fine sand and less than 30% very fine sand or between 15 and 30% very coarse, coarse, and medium sand.

### Loamy Sand

Soil material that contains at the upper limit 85% sand, and the percentage of silt plus 1.5 times the percentage of clay is not less than 15, at the lower limit it contains not less than 70 to 85% sand, and the percentage of silt plus twice the percentage of clay does not exceed 30.

#### Loamy coarse sand

25% or more very coarse and coarse sand and less than 50% any other one grade of sand.

#### Loamy sand

25% or more very coarse, coarse, and medium sand and less than 50% fine or very fine sand.

#### Loamy fine sand

50% or more fine sand or less than 25% very coarse, coarse, and medium sand and less than 50% very fine sand.

### Sand

Soil material that contains 85% or more sand; the percentage of silt plus 1.5 times the percentage of clay does not exceed 15. Coarse sand (sable grossier) 25% or more very coarse and coarse sand and less than 50% any other one grade of sand.

#### Sand

25% or more very coarse, coarse, and medium sand and less than 50% fine or very fine sand.

#### Fine sand

50% or more fine sand or less than 25% very coarse, coarse, and medium sand and less than 50% very fine sand.

#### Very fine sand

50% or more very fine sand.

### Loam

Soil material that contains 7 to 27% clay, 28 to 50% silt, and less than 52% sand.



**United States Testing Company, Inc.**

5555 TELEGRAPH ROAD • LOS ANGELES, CALIFORNIA 90040 • 213-723-7181 • Fax: 213-722-8251

**REPORT OF TEST**

**AMERICAN DRAINAGE PRODUCTS**  
 430 N. Varney Street  
 Burbank, CA 91502

**720148-2**  
 11/21/95

**SUBJECT - TUFF TRACK PAVER**

**REFERENCES:**

1. Conferences and correspondence with Mr. Darren Fine commencing June 28, 1995.
2. Witnessing of testing by Mr. Joe Dvoracek on October 24, 1995.
3. Purchase order No. 1200.

**SAMPLE DESCRIPTION:**

The Client submitted and identified one section of Tuff-Track Paver, measuring 2 feet by 2 feet.

The sample was submitted on August 8, 1995.

**OBJECTIVE:**

The purpose of this project was to perform a Client-specified load test on the submitted paver.

Marco Tachiquin  
 Test Engineer

**Signed for the Company:**

David Pereg  
 Manager, Engr. Dept.



**United States Testing Company, Inc.**

720148-1  
11/21/95

**PROCEDURE:**

Each sample paver was individually placed flat on the fixed plate of an Instron machine. A load was then applied to the top surface of the paver, through a 5-inch by 5-inch steel plate, at a rate of crosshead motion of 0.5 inch per minute until failure.

The test was performed at two locations on each sample.

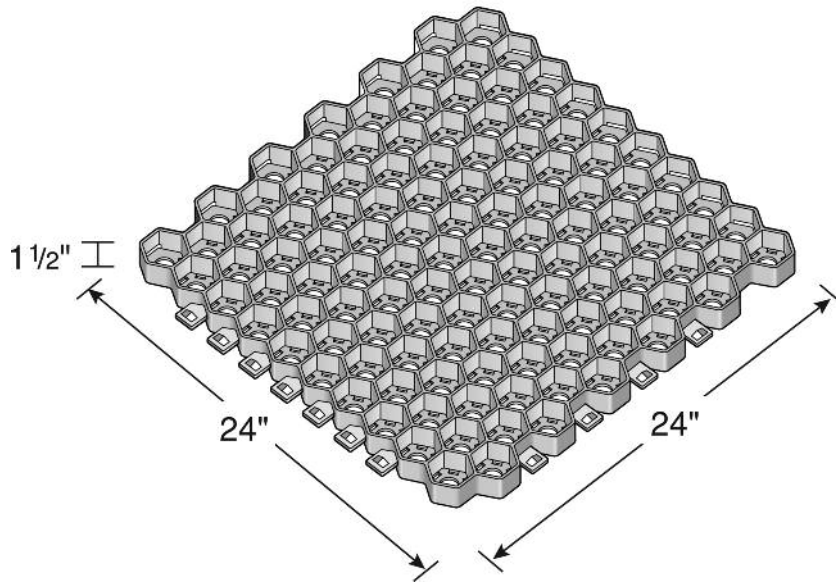
The compressive strength of the specimen was determined by dividing the maximum load into the area through which the load was applied.

Testing was performed on October 24, 1995.

**Results:**

<b><u>Specimen</u></b>	<b><u>Maximum Load (lbs)</u></b>	<b><u>Compressive Strength</u></b>	
		<b><u>(psi)</u></b>	<b><u>(psf)</u></b>
<b><u>Grass Cell Paver</u></b>			
1	8,500	340	48,960
2	<u>8,800</u>	<u>352</u>	<u>50,690</u>
	8,650	346	49,820
<b><u>Grass Road Paver</u></b>			
1	6,200	248	35,710
2	<u>5,500</u>	<u>220</u>	<u>31,680</u>
	5,850	234	33,700
<b><u>Tuff Track Paver</u></b>			
1	16,900	676	97,340
2	<u>17,400</u>	<u>696</u>	<u>100,200</u>
	17,150	686	98,770





TUFFTRACK® Grassroad Pavers® BY NDS