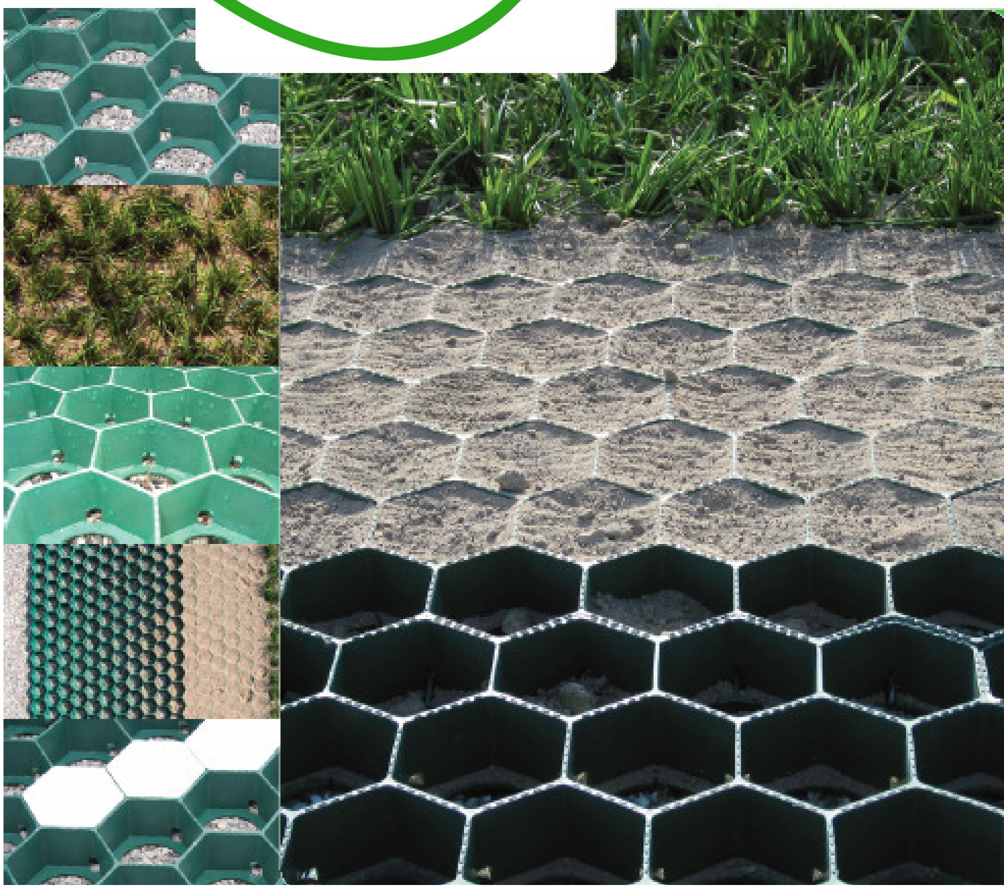
## DESIGN & CONSTRUCTION PACKAGE

# PRATEX

The friendly sustainable alternative to pavement



**Permeable, Ecological friendly, Simple and an Environmentally Sound Alternative**

## PRATEX® , POROUS PAVEMENT SYSTEM

PONTAROLO®
ENGINEERING

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PONTAROLO ENGINEERING

# PRATEX® POROUS PAVEMENT SYSTEM
# DESIGN & CONSTRUCTION OVERVIEW

**Contents**

## The PRATEX Porous Pavement System Components

**The friendly sustainable alternative to pavement**

The PRATEX System provides vehicular and pedestrian load support over grass areas while protecting the grass from the harmful effects of the traffic. The fully developed system has four major components (see Figure 1). The components are (1) the PRATEX unit, (2) the engineered base for support, (3) the selected topsoil infill and (4) the selected vegetation. Both the PRATEX unit and the base support soil work together to support the imposed loading. Both the PRATEX unit and the topsoil contribute to the vegetation support. A review of the four major components follows.

Other components may include a geo-synthetic separation / reinforcement layer, sub-drain components, and topsoil additives, which enhance vegetative growth.

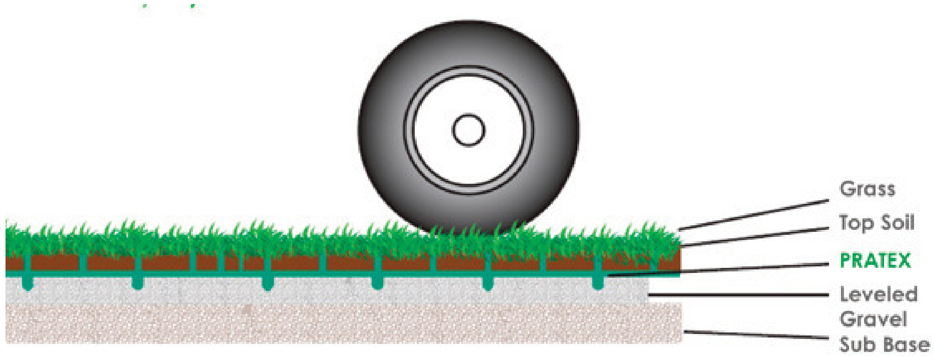



*Figure 1. four major components for the PRATEX system.*

### *Function of the PRATEX Unit*

The PRATEX unit has two basic purposes:

1. To adequately support and dissipate the design loads over a worst-case soil scenario;

2. To provide a healthy environment for the vegetative cover.

***An example of a worst-case scenario might be a large fire truck, responding to an alarm, and passing over a rain-soaked porous pavement system to reach an area of a building containing people.***

## *Function of the Engineered Base*

For a given applied load over an existing sub base soil, both the engineered base and the PRATEX unit provide support. The depth of the engineered base should be determined using both loading and sub base strength.

For vegetated systems, the engineered base is comprised of an open-graded aggregate and topsoil. The aggregate portion, once compacted, provides support for the load and the topsoil portion provides support for the vegetation. With a proper mixture, over compaction of the aggregate portion should not cause over compaction of the topsoil portion. The topsoil component allows for sufficient air voids, water percolation and root penetration. However, excessive topsoil will compact and not allow for healthy vegetation.

***See Engineered Base Preparation under Installing the PRATEX System for additional details.***

For non-vegetated systems, the engineered base is comprised of a well-graded aggregate with no fine content.

## *Function of the Topsoil Infill*

The topsoil infill placed within the cells of the PRATEX unit must provide a nourishing medium for development of a healthy root system for the vegetative cover. The topsoil should be a good quality, drainable soil and not be compacted within the PRATEX unit. When used as a porous pavement system (vegetated or non-vegetated), the infill (topsoil or aggregate) determines the permeability and controls the rate of water infiltration within the PRATEX layer. If climatic conditions are such where prolonged periods of dryness exist, moisture retention additives within the topsoil may be appropriate. Final topsoil placement should be at or slightly below the level of the PRATEX cell wall.

***See Infilling the PRATEX Unit under Installing the PRATEX System for additional details.***

## *Function of the Vegetation*

The completed system should provide a healthy and aesthetically pleasing vegetative cover. Vegetation type should be selected by a qualified agronomist and be resilient enough to withstand anticipated load frequencies. Heat and automotive fluids from excessive traffic can over-stress any vegetative cover resulting in periodic maintenance. In all cases, proper fertilizing, watering, thatch removal, and aeration is a must for healthy vegetation.

***See Finishing Procedures under Installing the PRATEX System for additional details.***

## *Function of the Geo-synthetic Layer*

Under some conditions, a geo synthetic layer may be a required component between the in-situ soil and the required engineered base in the porous pavement system. Generally, the geo synthetic component will serve one or more of the following functions and be one or more of the following materials:

| | |
|---|---|
| •Tensile Reinforcement Geosynthetics:...................... | Woven geotextiles, Geogrids |
| • Separation Geosynthetics:..................................... | Non-woven geotextiles, Woven geotextiles, |
| • Drainage / Separation Geosynthetics:................. | Non-woven geotextiles, Geonet / geotextile separation / drainage materials |

***See Geo-synthetic Separation Layer under Installing the PRATEX System for additional details***.

## *Function of the Sub-drain Component*

If the PRATEX system is built over non-porous soils and an excavation is required such that water could be trapped, sub drainage becomes a required component of the system. Sub-drainage will remove harmful water accumulation that will cause degradation of the in-situ soils resulting in loss of support capacity.

***See Sub-Drainage Component under Installing the PRATEX System for additional details.***

## *Material Properties & Unit Dimensions*

PRATEX units shall be made from materials with physical and chemical characteristics described in Table 1. The manufactured PRATEX unit shall have a minimum deflection without breakage of 25 mm (1.0 in) when units are supported at 0.50 m (1.64 ft) centers at 21°C (70°F). The color shall be uniform throughout all units in any given pallet.
PRATEX units shall have physical dimensions as specified in Table 1 and shown in Figure 2. PRATEX units shall have an interlocking offset tab system on all edges as detailed in both Figure 2 and Figure 3. End-to-end or side-to-side war-page of the PRATEX unit shall not be greater than 6 mm (0.25 in).

## Table 1 PRATEX® System

| Item | Specifications & Details |
|---|---|
| Material | 100% Recycled Polyethylene |
| Color | Green |
| Chemical Resistance | Superior |
| Carbon Green for Ultraviolet Light Stabilization | 15% - 20% |
| Unit Minimum Crush Strength @ 21°C (70°F) | 2,900 kPa (420 psi) |
| Material Flexural Modulus at 23°C (73°F) | 240,000 kPa (35,000 psi) |
| Nominal Dimensions (width x length) | 0.56 m x 0.60 m (22 in x 24 in) |
| Unit Depth | 0.04 m (1.5 in) |
| Nominal Coverage Area | 0.33 m² (3.62 ft²) |
| Cells per Unit | 80 |
| Cell Size | 70 mm x 70 mm (2.75 in x 2.75 in) |
| Top Open Area per unit | 87% |
| Bottom Open Area per unit | 40% |
| Interlocking offset tabs | 1 tab for each peripheral cell |
| Nominal Weight per Unit | 1.30 kg (2.86 lb) |
| Runoff Coefficient @ 63.5 mm/hr (2.5 in) Rainfall | 1.5% |
| Units per Pallet | 228 |

**NOTE**: Dimensions and weight are subject to manufacturing tolerances and are influenced by recycled component characteristics.

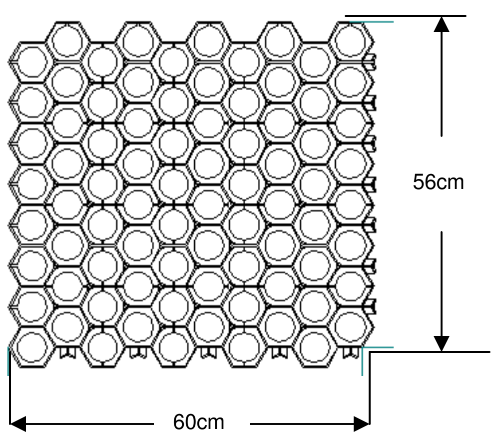



*Figure 2 The PRATEX Unit*

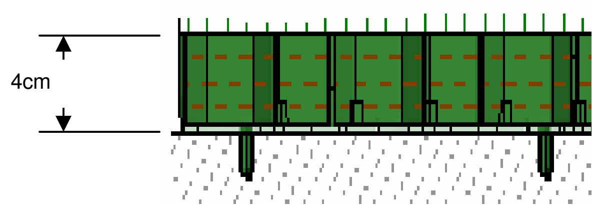



*Figure 3 The PRATEX Cell*

## Design Guideline

## Table 2 Base Recommendations for the PRATEX Unit

| Load Description[1] | Depth of Engineered Base | |
|---|---|---|
| | CBR[2] 2 – 4[3] | CBR[2] > 4[3] |
| Heavy Fire Truck Access & H-20 loading. Typical 620 kPa (90 psi) maximum tire pressure. Single axle loadings of 145 kN (32 kip), tandem axle loadings of 220 kN (48 kip). Gross vehicle loads of 36.3 tonne (80,000 lb). Infrequent passes[4]. | 150 mm (6 in) | 100 mm (4 in) |
| Light Fire Truck Access & H-15 loading. Typical 586 kPa (85 psi) maximum tire pressure. Single axle loadings of 110 kN (24 kip). Gross vehicle loads of 27.2 tonne (60,000 lb). Infrequent passes[4]. | 100 mm (4 in) | 50 mm (2 in) |
| Utility & Delivery Truck Access & H-10 loading. Typical 414 kPa (60 psi) maximum tire pressure. Single axle loadings of 75 kN (16 kip). Gross vehicle loads of 18.1 tonne (40,000 lb). Infrequent passes[4]. | 50 mm (2 in) | 50 mm (2 in) |
| Cars & Pick-up Truck Access. Typical 310 kPa (45 psi) maximum tire pressure. Single axle loadings of 18 kN (4 kip). Gross vehicle loads of 3.6 tonne (8,000 lb). Infrequent passes[4]. | None | None |
| Trail Use. Loading for pedestrian, wheelchair, equestrian, bicycle, motorcycle and ATV traffic. | None | None |

1. The PRATEX System can be applied in areas where loading is greater than those listed above. In these situations, call Pontarolo Engineering or a Pontarolo Engineering representative for specific recommendations.
2. CBR is the abbreviation for California Bearing Ratio. Methods for determining CBR vary from more sophisticated laboratory methods to simple field identification methods that use hand manipulation of the soil. Pontarolo Engineering does not recommend one method over the other, however, the user must have a high degree of confidence in the results produced by the chosen method.
3. If other-than-CBR soil strength values exist, use available correlation charts to relate the value to CBR.
4. Infrequent passes is defined as the number of passes over any period of time that causes no lasting damage to the vegetation. This number will be a function of vegetation type and age, climatic conditions, and maintenance practices. This number is not a function of the PRATEX material.

### *The Engineered Base – Vegetated Systems*

A recommended engineered base is a homogenous mixture consisting of 1) a clear-stone / crushed rock having an AASHTO #5 or similar designation blended with 2) a top soil. This homogenous mixture will promote vegetative growth and provide required structural support.

***See Function of the Engineered Base.***

The aggregate portion shall have particles ranging in size from 9.5 to 25 mm (0.375 to 1.0 in) with a $D_{50}$ of 13 mm (0.5 in). The percentage void-space of the aggregate portion when compacted shall be at least 30%. Topsoil, equal to but not exceeding the aggregate void percentage, shall be added and blended to produce a homogenous mixture prior to placement. Once placed, the mixture shall be compacted to a density that will produce a California Bearing Ratio (CBR) of 7% minimum.

Under some conditions, a geo-textile separation layer may be required between the natural ground and the engineered base.

***See Geo-synthetic Separation Layer, Sub-Drainage Component, and Engineered Base Preparation for information relative to installation.***

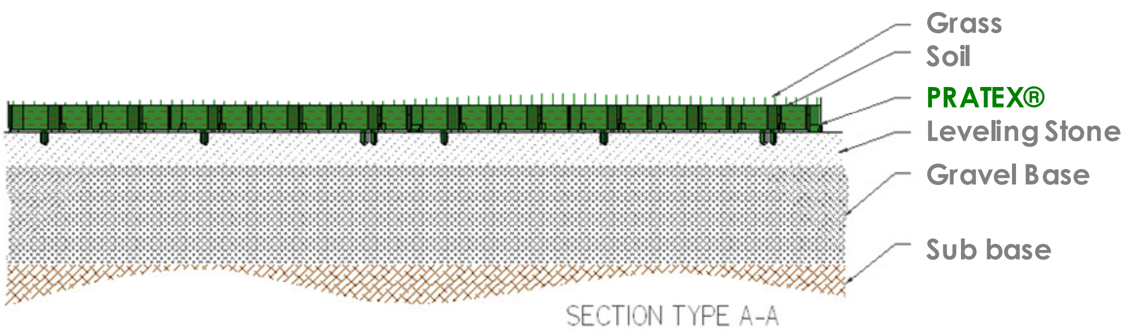



*Figure 4. System Components*

## *The Engineered Base – Non-Vegetated Systems*

A recommended engineered base for non-vegetated porous pavement systems shall be a well-graded aggregate with a fine content less then 10%. The aggregate shall be compacted to a density that will produce a California Bearing Ratio (CBR) of 7% minimum. After compaction, the surface shall be uniform with no protrusions from larger aggregate particles.

## Characteristics of a Good Porous Pavement System

### *Elements Important to Structural Integrity*

The PRATEX unit (or any other similar material) must have five primary characteristics to adequately support loads. Those characteristics are (1) suitable wall strength, (2) sufficient unit stiffness, (3) significant joint strength, (4) a supporting base and (5) a large overall area.

1) The wall strength must support wheel loading from the heaviest anticipated vehicles that will travel over the porous pavement system. Vehicular loading will create direct wall compression from tires and equipment outriggers as well as lateral forces from vehicle breaking and acceleration. The wall should resist vertical and lateral deformations when loaded. **Caution** should be exercised when using systems with thin walls.

2) The unit stiffness must allow deflections without unit breakage or separation when sub base soils yield under loading. When the unit is too flexible, the base soils support the complete load. When the unit is too rigid, it could break under normal loading in low temperature conditions. **Caution** should be exercised when using systems that are either too flexible or too rigid.

3) The strength of the joint must transfer load from unit to unit while staying engaged under normal deflections. Some deflection should be expected due to the physical characteristics of plastics and soils. High joint shear-strength causes greater load dissipation resulting in lower pressure on the base and sub base soils. If the joint has inadequate shear-strength, load support will occur through each unit causing the unit to act independently. **Caution** should be exercised when using systems that have little or no physical material in the joint.

4) The unit support base must have a large enough area-of-contact with the base soil so high wheel loads at the top of the unit are reduced sufficiently when transferred to the base soil. This will provide a system with a greater range of stability. **Caution** should be exercised when using systems that have little contact area between the porous pavement unit and the base soil.

5) A large overall area, in conjunction with the other characteristics, ensures maximum load dissipation. If unit separation should occur and any given unit functions independently, larger unit areas will lower the pressure on base and sub grade soils. **Caution** should be exercised when using systems that have smaller contact areas.

## *Elements Not Important to Structural Integrity*

Avoid specifications that state material compressive strength only. Material compressive strength, with applied factors-of-safety, must be sufficient to resist compressive and lateral load application. Beyond that, ultra-high material compressive strengths add little to the porous pavement system. Table 3 provides a listing of strength characteristics of the PRATEX System. These values provide a balanced system meeting all criteria important to the integrity and performance of a porous pavement system.

**Table 3 Strength Characteristics of the PRATEX Unit**

| Test | Value |
|---|---|
| **Wall Compressive Strength** (simulated tire area loaded)<br>Test Procedure - Circular plate, 165 mm (6.5 in) diameter, loaded to failure | 2200 kPa<br>(320 psi) |
| **Wall Compressive Strength** (full PRATEX unit loaded)<br>Test Procedure - Full single unit loaded to failure via flat plate | 615 kN<br>(138,240 lbf) |
| **Equivalent Elastic Stiffness**<br>Test Procedure - Simply supported PRATEX unit loaded to 25 mm (1 in) deflection | 140 N-m²<br>(48,000 lb-in²) |
| **Joint Shear Strength**<br>Test Procedure - Direct shear of tongue-and-groove using special apparatus | 89.0 kN<br>(20,000 lbf) |

## *Elements Important to the Vegetation*

The PRATEX unit provides an environment for maintaining healthy vegetative cover by preventing loads from excessively damaging the vegetative cover through compaction of the topsoil layer. The wall system has the strength and spacing needed to support any tire loading from influencing the topsoil layer. The open area in the bottom of the PRATEX unit allows water and nutrients to pass through the soil layers. The PRATEX unit alone will not ensure healthy vegetation. Vegetation must grow in organic soil and receive adequate water and nutrients to remain healthy.

# Installing the PRATEX System

## *Subgrade Preparation*

Excavate the area, allowing for the PRATEX unit thickness and the engineered base depth (where the engineered base is required). When working with in-situ soils that have poor permeability, provide adequate drainage from the excavated area if the area has the potential to collect water. The in-situ soil should be relatively dry and free from any standing water. Finish-grade the surface of the in-situ soil specifically when the PRATEX unit is to be installed without an engineered base. Level and clear the area of large objects such as rocks, pieces of wood, etc. to enable the PRATEX units to interlock properly and remain stationary after installation.

## *Geosynthetic Separation Layer*

If required, the geo-synthetic layer shall be rolled out over the prepared sub grade along the alignment of the reinforced surface. The geo-synthetic shall be pulled taut to ensure that there are no folds. Geo-synthetic layer overlaps, if required, shall be according to plans.

## *Sub-Drainage Component*

If required, install the specified sub-drain and outlet according to construction drawings. Ensure that a proper slope is maintained throughout the drainage system and that the outlet is free from any obstructions preventing free drainage.

## *Engineered Base Preparation*

The strength of the PRATEX System is determined, in part, by the support required by a stable engineered base. The health of the vegetation, however, requires that the engineered base be loose to facilitate root penetration. These two requirements seem to be in direct conflict – but they are not. Using an engineered base recommended, one can construct a base meeting both requirements.
Start with an aggregate relatively free from fines and with a void space of 30% or greater. A convenient field method to determine the void space and volume of topsoil to be blended with the aggregate is:

1. Overfill a 5-gallon plastic bucket (or other calibrated container) with the selected aggregate. The exact capacity of the container must be known to obtain correct results.

2. Completely compact the aggregate in the bucket and level so the surface of the aggregate is at the top of the bucket.

3. Fill the bucket with water and let stand for several minutes then add additional water so the water is at the same level as the top of the bucket.

4. Drain the water off into another container making sure that all the water is captured.

5. Measure the volume of the captured water and compare it to the volume of the bucket to determine the percentage of voids in the aggregate. This is the amount of loose topsoil that is to be blended with the aggregate. **Caution** – do not exceed this amount of topsoil.

The engineered base material is spread over the prepared base and compacted to a density that will produce a CBR of 7%. Refer to **Table 2 Base Recommendations for the PRATEX Unit** for engineered base depth recommendations.

**NOTE**: Typical compaction densities and testing do not apply to the engineered base since only the aggregate portion of the engineered base is compacted. The topsoil portion will remain relatively un-compacted when the mixture is correct. Therefore,

conventional compaction testing and resulting densities will produce values that are not meaningful.

## *PRATEX Unit Installation*

**Orientation & Laying Pattern of Units**

Place the PRATEX units with the round hole to the ground. When the application is an access lane, the pattern is positioned such that the long direction of the unit is perpendicular to the primary direction of traffic.

**Other laying patterns are generally not recommended.**

**Positioning of Units**

Place the first row of PRATEX units against a stationary edge when available. If the units are placed between two perpendicular or near-perpendicular stationary edges (i.e. two parallel concrete curbs) allow for potential thermal expansion of the PRATEX units by keeping the units away from the stationary edge. The separation distance can be calculated using the reference value given in the section titled Thermal Expansion.
Slide the units together so that the interlocking tab joint is fully engaged. Units should be placed such that corners and seams do not protrude above the desired surface elevation.

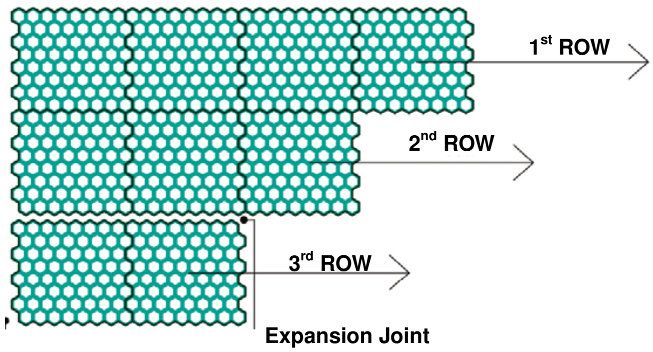
**Anchoring Units**

The PRATEX units can be fixed in-place to prevent the units from shifting during installation with optional wood or metal stakes through the perimeter units, or, by placing thread-forming tapping screws or nails through the perimeter interlocking tabs. This may be needed if 1) traffic and/or turning of heavier construction vehicles may cause movement of the units during the installation process or 2) large temperature changes occur during the installation process.

**Thermal Expansion**

The PRATEX polyethylene stabilized with carbon has a relatively high rate of thermal conductivity and thermal expansion. The rate of thermal expansion is approximately 1.7% per 100 °F (55 °C). Based on the temperature of the PRATEX unit exposed to full sunlight for several hours, a temperature gain of 60-70 °F (33-38 °C) is typical. As a result, a compensation of 1.375 in (34 mm) could be applied for each 10 ft (3 m) increment of length.
When the installation day(s) is optional, install the PRATEX units on cooler cloudy days as opposed to hot sunny days.
Note that joint separation occurring from large temperature fluctuations is normal. Rejoining of the PRATEX units should be considered normal construction practice. Once

infilled, thermal expansion is minimized. If the system is to be vegetated, the developed root system provides all necessary anchoring of the system.




Commence installation on first row from left to right. Repeat on all other rows and secure the interlocking clips of each element.

**Simplicity and Speed are the main characteristics of PRATEX.**
**On average, 2 laborers install 65 m2 (700 sq.ft) per hour.**

## *Infilling the PRATEX Unit*

Infill the PRATEX units with infill material suitable for the intended application. Infilling should take place immediately after the units are installed to minimize the potential of joint separation caused by thermal expansion/contraction. Upward buckling of the PRATEX area is generally not an issue if the units have been installed using the recommended laying patterns and infill.
If the PRATEX units are to remain unfilled, the inclusion of expansion joints may be recommended for the application.

### Infill Procedures for Vegetated Systems

Infill the PRATEX units with a suitable topsoil. Use spreading methods that will leave the cell infill un-compacted. Overfilling the cells is not recommended since vehicular loading will cause undesirable compaction of the topsoil.

***For application of the vegetation, see Seeding and Sod Application in the Finishing Procedures section.***

### Infill Procedures for Non-Vegetated Systems

Infill the PRATEX units with aggregate or other suitable infill material. If aggregate is used, ensure that the aggregate particle size and gradation is suitable for the intended use.
Other infill material may include bark/wood chips, rubber chips, crushed shells, soils not intended to be vegetated, etc.
Spread the infill material uniformly over the units to a level even with the top of the cell wall.

## *Finishing Procedures*

### Seeding

Follow seeding, fertilizing, and watering procedures for turf establishment based on regional practices. An increase in watering frequency may be necessary when free-draining base materials are used. Use of a free draining base is generally not recommended.

### Sod Application





Sod can be used for areas where immediate use is desired. Young sod that is free from netting materials is recommended. Mature sod with a more developed root system and sod with netting may be difficult to press/cut into the PRATEX cells.

When sod is used:

• Sweep out the topsoil from the PRATEX unit to allow room to seat the sod. Enough topsoil must be removed so that the crown of the sod is recessed slightly below the top of the cell after pressing the sod in place. If too much topsoil is removed, the bottom of the sod will not make contact with the topsoil after it is pressed into the cell. Avoid removing too much topsoil.

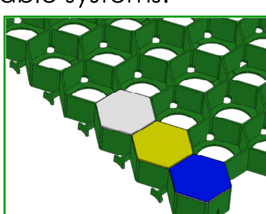
• Place the sod per normal practices.

• Press the sod into the partially emptied cells using a roller or other suitable equipment.

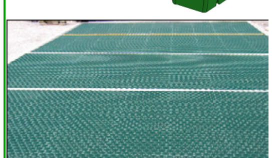
• Use recommended watering procedures to ensure healthy sod growth.

### Delineation

With vegetated systems, once healthy turf has been established, the PRATEX cell wall structure will have minimal visibility when good turf-maintenance practices are followed.
If used for an emergency access lane, delineation may be desirable to create greater visibility. Delineation methods can include the following: in-ground or above-ground curbing, shrubbery or vegetation, perimeter lighting or delineation markers, or other suitable systems.



Edge caps are inserted in PRATEX cells to mark driveway or parking lines. Installation of caps is very simple and they are available in white, yellow and blue.




**Maintenance**

If required, snow removal should be done using one of the following basic procedures:

• Keep a metal edged plow blade a minimum of 25 mm (1.0 in) above the surface during plowing operations, or

• Use a plow blade with a flexible rubber edge, or

• Use a plow blade with skids on the lower outside corners so that the plow blade does not come in direct contact with the porous pavement system.

When deeper ground freeze occurs, the system functions as a typical hard pavement surface. If a sharp metal plow-blade comes in direct contact with the surface during plowing, any portion of the PRATEX system that protrudes above the normal surface level could be removed by the blade.

**NOTE**: Damage can occur to the grass and topsoil if plowing abuse is prevalent.

## Estimating Time and Cost of Installation

### *Typical Crew Size and Responsibilities*

| | |
|---|---|
| 2 | People to set the PRATEX units in place. |
| 2 | People to spread and level the topsoil infill. |
| 1 | Equipment operator for the front-end loader. |

**NOTE**: Adding or subtracting one or two people to the crew may result in a cost-effective productivity increase depending on local work habits.

### *Equipment Needed and Purpose*

• Saws, screw drivers, hammers, stakes, nails, screws – all or some of these for cutting and securing the PRATEX units as required per the plans or as needed during construction.

• A small front-end loader for infilling of the PRATEX units.

• Rakes and shovels for final leveling of the infill material.

## *Typical Construction Sequences and Times*

Productivity is a variable and the ranges below are typical. Select an installation rate through personal experience or after discussion of project details with PONTAROLO ENGINEERING or one of its qualified distributors.

| | | |
|---|---|---|
| 1 | Place the PRATEX units on the prepared base. | 100-150 units/man-hr |
| 2 | Fill the in-place PRATEX units using the small loader to evenly distribute the topsoil infill. | 100-150 units/man-hr |
| 3 | Level the infill using rakes and shovels so that the topsoil is flush with the top of the cell wall. | 100-150 units/man-hr |
| 4 | Spread selected grass seed and water. | 300-350 units/man-hr |

**NOTE**: The above four sequences can be in progress at the same time if workspace is adequate.

## <u>Table 4 Approximate Quantities of Infill Material Required for PRATEX Unit</u>

| Depth of unit | Volume of Topsoil Required per unit | Volume of Topsoil Required per 100 m² (1000 ft²) |
|---|---|---|
| 40 mm (1.5 in) | 0.038 m³ (0.0497 yd³) | 3.80 m³ (4.970yd³) |
| **NOTE**: The above quantities are based only on the 40 mm (1.5 in) cell depth PRATEX unit. | | |

## *General Notes*

1. The front-end loader must be sized so it can distribute the fill material per time/productivity requirements.
2. Experience shows that the above installation rates would be considered typical rates of installation
3. As is with all construction operations, placement of material stockpiles, crew productivity, jobsite conditions, special installation requirements such as cutting and custom fitting of the PRATEX units, etc. significantly effect overall productivity, therefore, these recommendations may be either too conservative or too liberal.


## *Total Time and Materials Required*

**Area of installation = length x width of site**

| | | | | |
|---|---|---|---|---|
| **(________) m (ft) long** | **x** | **(________) m (ft) wide** | **=** | **(________) $m^2$ ($ft^2$) Area** |

**PRATEX units required = $m^2$ ($ft^2$) Area ÷ 0.336 $m^2$ (3.62 $ft^2$)/unit [the PRATEX unit is 0.56 m x 0.60 m (22 in x 24 in) nominal]**

| | | | | |
|---|---|---|---|---|
| **(________) $m^2$ ($ft^2$) Area** | **÷** | **0.336 $m^2$ (3.62 $ft^2$)/unit** | **=** | **(________) units** |

**Man-hr required for installation of PRATEX units = PRATEX units ÷ 100 units/man-hr**

| | | | | |
|---|---|---|---|---|
| **(________) units** | **÷** | **100 units/man-hr** | **=** | **(________) man-hr** |

**Infill material quantities = PRATEX units x $m^3$ ($yd^3$)/unit (see Table 4)**

| | | | | |
|---|---|---|---|---|
| **(________) units** | **x** | **(________) $m^3$ ($yd^3$)/unit** | **=** | **(________) $m^3$ ($yd^3$)** |

**Man-hr required for placing infill = PRATEX units ÷ 200 units/man-hr**

| | | | | |
|---|---|---|---|---|
| **(________) units** | **÷** | **200 units/man-hr** | **=** | **(________) man-hr** |

**Man-hr required for leveling of infill = PRATEX units ÷ 200 units/man-hr**

| | | | | |
|---|---|---|---|---|
| **(________) units** | **÷** | **200 units/man-hr** | **=** | **(________) man-hr** |

**Man-hr required for seeding = PRATEX units ÷ 300 units/man-hr**

| | | | | |
|---|---|---|---|---|
| **(________) units** | **÷** | **300 units/man-hr** | **=** | **(________) man-hr** |

## *Total Cost of Time and Materials*

| | | | | | |
|---|---|---|---|---|---|
| PRATEX Unit Cost | $_______/unit | x | ________units | = | $ |
| Cost of Infill | $_______/$m^3$ ($yd^3$) | x | ________$m^3$ ($yd^3$) | = | $ |
| Cost of Labor | $________/man-hr | x | ________man-hr | = | $ |
| Cost of Equip. Operator | $________/man-hr | x | ________man-hr | = | $ |
| Cost of Front-end Loader | $________/hr | x | ________hr | = | $ |
| **APPROXIMATE TOTAL COST** | | | | | $ |

**NOTE**: The above estimate does not include time and materials associated with initial base preparation. The cost of this item would be similar to other pavement systems regardless of type.

## After-Installation Performance Specification

To ensure that the PRATEX® System will function properly after installation, the following procedure shall be completed.

| Item | Required Value |
| --- | --- |
| 1. Select a vehicle that will provide the specified design load. | Vehicle axle load shall be lb with a tire pressure not less than psi. |
| 2. Water the area to be tested with the required rainfall equivalent. | Apply water to the test area to obtain an equivalent of inches rain over a time period of minutes. |
| 3. Move the selected vehicle over the area to be tested immediately after watering. | NOTE: Avoid turning the vehicle on the PRATEX System when moving the vehicle over the test area. Displacement of the PRATEX units may occur until the grass root system develops. |
| 4. Measure the rut depth created by moving the vehicle over the PRATEX system. | The moving-vehicle rut depth shall not be greater than inches when measured from the bottom of a straightedge spanning the width of the rut. Measurements shall be taken at the centers of the individual tire tracks. |
| 5. Leave the vehicle in place for a period of time that is typical of actual use. | The vehicle shall remain static over the test area for a period not less than minutes. |
| 6. After the vehicle remains static for the specified time, carefully remove it from the test area and measure the rut depth. | The static-vehicle rut depth shall not be greater than inches when measured from the bottom of a straightedge spanning the width of the rut. Measurements shall be taken at the centers of the individual tire tracks. |
| 7. Wait for a period of time not less than the time the vehicle was setting over the test area and re-measure the rut depth. | After waiting for minutes, the static-vehicle rut depth shall be measured a second time in the same locations and shall not be greater than inches when measured from the bottom of a straightedge spanning the width of the rut. |
| 8. The surface shall be considered acceptable if … | The surface shall be considered acceptable if percent of the rut-depth measurements exceed the minimum depths specified |

## Warranty

PONTAROLO ENGINEERING INC. ("Pontarolo") warrants each PRATEX unit, which it ships to be free from defects in materials and workmanship at the time of manufacture. Pontarolo Engineering's exclusive liability under this warranty or otherwise will be to furnish without charge to Pontarolo Engineering's customer at the original f.o.b. point a replacement for any unit which proves to be defective under normal use and service during the 3-year period which begins on the date of shipment by Pontarolo. Pontarolo reserves the right to inspect any allegedly defective unit in order to verify the defect and ascertain its cause.

This warranty does not cover defects attributable to causes or occurrences beyond Pontarolo Engineering's control and unrelated to the manufacturing process, including, but not limited to, abuse, misuse, mishandling, neglect, improper storage, improper installation or improper application. Pontarolo Engineering makes no other warranties, express or implied, written or oral, including, but not limited to, any warranties or merchantability or fitness for any particular purpose, in connection with the PRATEX System. In no event shall Pontarolo Engineering be liable for any special, indirect, incidental or consequential damages for the breach of any express or implied warranty or for any other reason, including negligence, in connection with the PRATEX System.

## Disclaimer

This document has been prepared for the benefit of customers interested in the PRATEX System. It was reviewed carefully prior to publication. Pontarolo Engineering Inc. assumes no liability and makes no guarantee or warranty as to its accuracy or completeness. Final determination of the suitability of any information or material for the use contemplated, or for its manner of use, is the sole responsibility of the user.

Pontarolo Engineering- PRATEX Applications:
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PRATEX

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