NAYLOR
ENVIRONMENTAL

# Sustainable Urban Drainage Systems

## SUDS

## Porous Paving for Grass and Gravel

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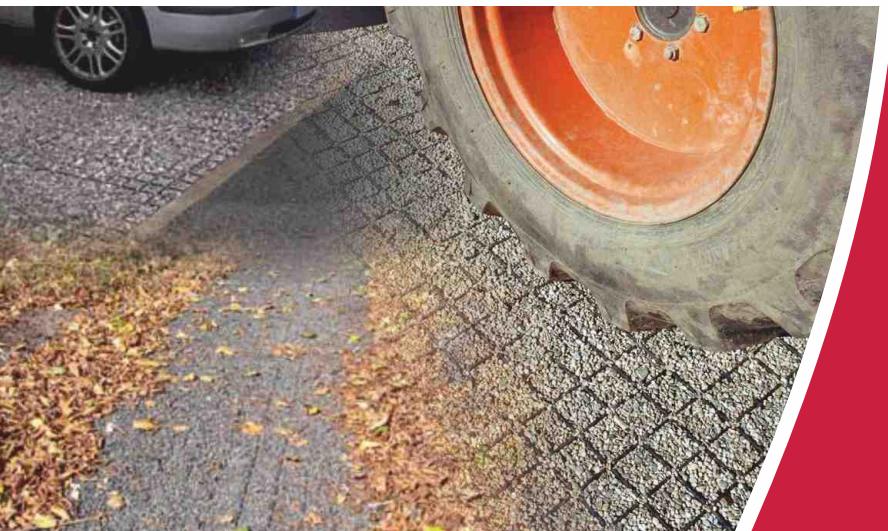

Naylor Integra - Heavy Duty

Naylor Enviroblock - Medium Duty

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# Integra and Enviroblock

## The SUDS Concept

Naylor INTEGRA & ENVIROBLOCK are both key products within a sustainable urban drainage system (SUDS). The porous paving allows the efficient attenuation, infiltration and treatment of stormwater runoff at or near its source, in accordance with current Best Management Practices (BMPs). They are ideal products for grass and gravel reinforcement.

### The Products

Made in the EU from 100% recycled polymers, Naylor INTEGRA & ENVIROBLOCK are modular units which work in conjunction with neighbouring units to create an exceptionally durable, permanently porous, high load bearing structure when infilled with either grass or natural aggregate.

### Applications

Naylor INTEGRA is a Heavy Duty system, whereas Naylor ENVIROBLOCK is a Medium Duty system for grass and gravel reinforcement. These systems are ideal for the typical applications opposite:

## Applications

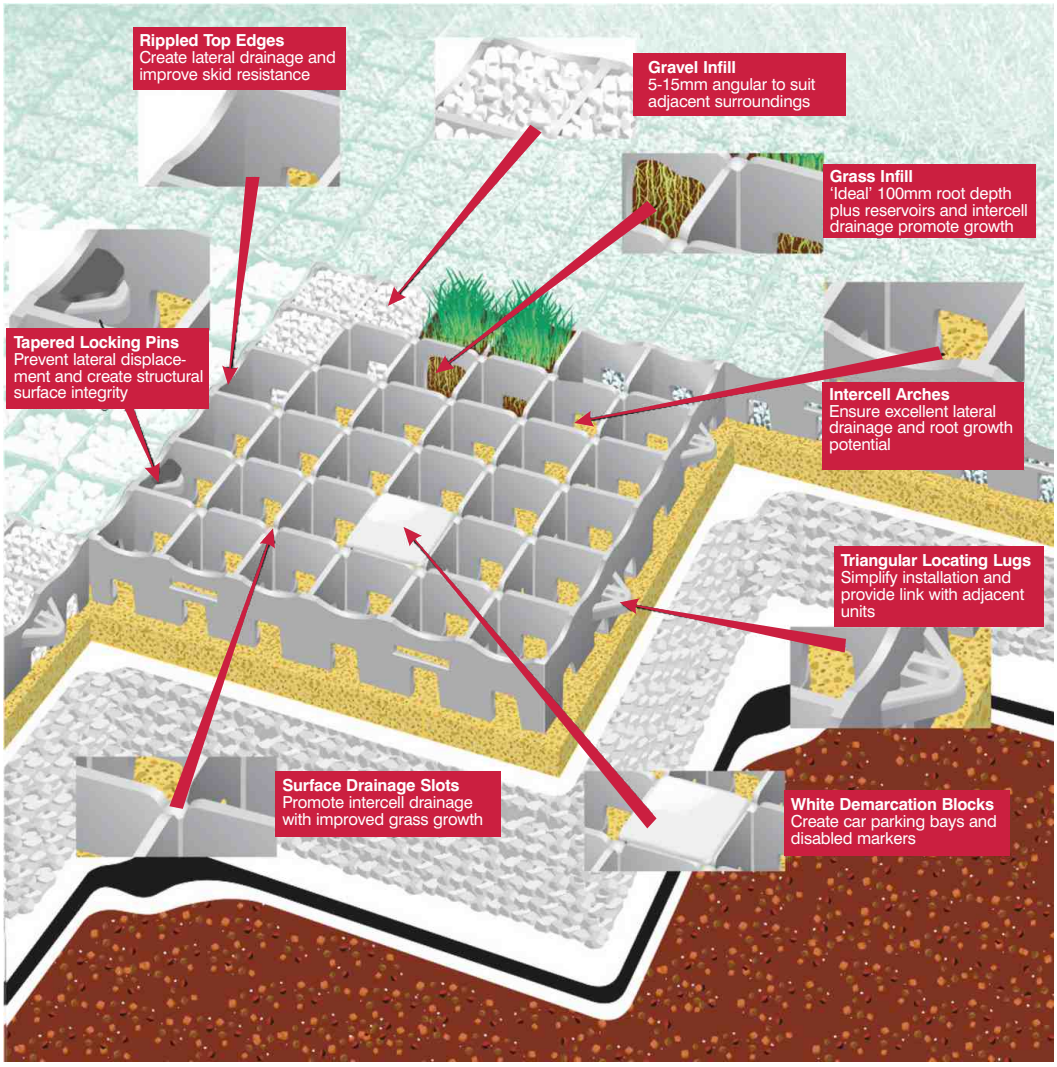
| | INTEGRA | ENVIROBLOCK |
|---|---|---|
| Park & Ride Schemes | ✔ | ✘ |
| Commercial Car Parks | ✔ | ✘ |
| Overflow Car Parks | ✔ | ✔ |
| Helipads | ✔ | ✔ |
| Paths & Bridleways | ✔ | ✔ |
| Light Aircraft Taxiways | ✔ | ✘ |
| Domestic Driveways | ✔ | ✔ |
| Golf Buggy Paths | ✔ | ✔ |
| Caravan Parks | ✔ | ✔ |
| Emergency Access | ✔ | ✘ |
| Verge Reinforcement | ✔ | ✘ |
| Stables | ✔ | ✔ |
| Bank Stabilisation | ✔ | ✔ |
| Under Bridges | ✘ | ✔ |

## Specification Clause:

To assist in the correct specification of the Naylor INTEGRA or ENVIROBLOCK porous paving and grass reinforcement system we would suggest the following clause:

The porous paving system shall be Naylor INTEGRA / Naylor ENVIROBLOCK supplied by Naylor.

The porous paving /grass reinforcement system shall incorporate positive interlocking facility by means of 16 tapered fixing pins per $m_2$ and shall allow both vertical and horizontal hydraulic movement between each individual cell. The system shall be manufactured in the EU from 100% recycled ploymers each unit measuring nominally 500mm x 500mm in plan x 70/40mm in depth and shall have integral water reservoirs built into the system to aid grass growth in dry periods.



## Special Applications

**Slopes**
Naylor INTEGRA and ENVIROBLOCK can be laid on slopes of up to 15 degrees without additional staking. Where Naylor Enviroblock is used on the underside of a bridge abutment (e.g. to comply with the HSE recommended limits) every unit should be staked and the sand bed stabilised with a 12:1 cement mix on the 40 - 45 degree slope.

**Disabled Parking Bays:**
Naylor INTEGRA and Naylor ENVIROBLOCK are suitable for installation in disabled access areas. A disabled bay sign can easily be created using the Demarcation Blocks (please ask for data sheet).

**HGV Areas:**

The Naylor INTEGRA system is able to withstand slow moving HGV's (roadside lay-bys etc) but in common with most plastic grid systems should NOT be used in turning areas or where HGV's will scrub the product by the use of power steering.

## Demarcation Blocks

These are used to delineate parking spaces within car parking areas. Four individual blocks are used to form a simple "T" or alternatively this "T" can be extended to create a series of dotted lines running the length of the parking bay (see photo) requiring eighteen blocks per bay.


## SUDS - The Principle

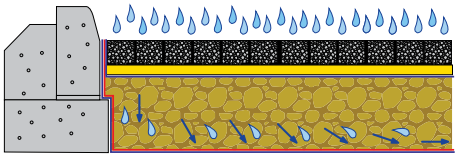
SUDS are physical structures built to receive surface water runoff, normally in the form of infiltration or attenuation solutions. They also provide treatment of surface water by sedimentation, filtration, absorption and bio-degradation. Research shows that up to 80% of sediment; 60% of phosphorous and; 80% of nitrogen can be removed from rainwater through porous paving, together with substantial levels of heavy metals and hydrocarbons.

**Design Details** - **SUDS** Associated with porous paving:

**Attenuation** - Used when direct infiltration is not appropriate and when water storage is required.

This shows Naylor INTEGRA, infilled with grass or natural aggregate, installed on a layer of sand/grit on an Naylor GT geotextile separation/filtration layer. Beneath this is a voided sub-base wrapped in an Naylor GM Geomembrane. Collected runoff is discharged via an appropriate Naylor storage device (Naylor Aquavoid) positioned within or below the sub-base and sealed where it exits the geomembrane storage reservoir.

**Typical Attenuation System**
Rainfall enters porous Integra/ Enviroblock surface



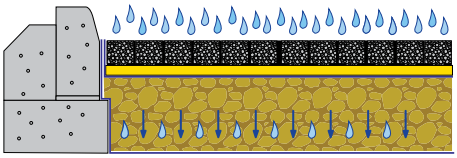
Water passes through porous surface and is directed by the geomembrane to storage or sewer

**Infiltration** - Used whenever possible, subject to appropriate soil conditions and environmental considerations.

This shows Naylor Integra infilled with grass or natural aggregate, installed on a layer of sand/grit on a Naylor GT geotextile separation/filtration layer. Beneath this is a sub-base which is encapsulated within another Naylor GT geotextile separation/filtration layer.

Collected runoff is allowed to permeate naturally, through the geotextile separation/filtration layer, into the subgrade eliminating the need for a positive discharge facility.

**Typical Infiltration System**
Rainfall enters porous Integra/ Enviroblock surface



Water passes through porous surface and is directed by the geomembrane to storage or sewer

## Product Data

| | INTEGRA | ENVIROBLOCK |
|---|---|---|
| Nominal Size | 500mm x 500mm +0/-2% | 500mm x 500mm +0/-2% |
| Thickness of Unit | 70mm | 40mm |
| Unit Weight | 1.8Kg | 1.1Kg |
| Colour | Black | Black |
| Infiltration Rate | >5,000mm/hr | >5,000mm/hr |
| Run Off Coefficient | 0.05 - 0.25 | 0.05 - 0.25 |
| Lateral Drainage Void Ratio | >20% | >12% |
| Infill Surface Area | >90% | >90% |
| Compressive Strength (Filled) | 2,400kN/m2 | 1,780kN/m2 |
| Pallet Size | 1m x 1m x 1.2m | 1m x 1m x 1.2m |
| Pallet Weight | 230Kg | 160Kg |

Helipads & Aircraft Taxiways

Emergency

Equestrian Areas & Stables

## Paving Surfaces - Installation

### Subgrade

Excavate to formation level as indicated on the drawing, providing a minimal (1:30 - 1:100) fall to the drainage system. Compact subgrade, using either a vibrating roller or plate, making good soft spots with suitable material.

### Sub-base for Infiltration Surfaces

Use granular material (crushed gravel, rock or concrete) as specified - for SUDs schemes this must be free draining. Install the designed depth of sub-base as specified, in 200mm layers compacting each layer (vibratory plate, type DVP 75/22"). Overlay the sub-base with the specified Naylor GT 1900 geotextile (essential to prevent migration), overlapping joints by 200mm.

### Bedding Layer

Lay, screed and compact to a 30mm depth of appropriate bedding layer material (sharp sand or 5mm grit). Selection of the bedding layer material is dependant upon the application. For grass reinforcement mix the bedding layer 4:1 with a good quality top soil to ensure good root growth.

### Wearing Course

Naylor INTEGRA & ENVIROBLOCK should be laid on a 45 degree face such that each modular unit abuts its neighbouring units, with the triangular locating lugs fitting within the corresponding slots. As laying progresses each unit should be pinned (4 per unit) together with the pins supplied and the specified root zone/grass seed infill material or natural aggregate should be used to infill each cell such that a continuous, permanently porous, high load bearing structure is created.

### Infill Materials (sand and soil mix/aggregate)

The selected infill material should be specified on a project specific basis based on the application and design, but the following could act as a guide:

**For Sand Bed:** A good quality compacted silica sharp sand should be used, of approximately 30mm thickness after compaction; alternatively a 5mm grit is also suitable if required.

**For Gravel Fill:** Aggregate size should be 5 - 15mm angular gravel and if adjacent to schools should ideally be 10mm single sized crushed rock. The use of an angular gravel rather than a river washed gravel will aid compaction and prevent migration from the units.

**For Grass Fill:** A good quality topsoil should be used to infill the units to the top and allowed to settle; grass seeding followed by a top dressing of a good quality fertiliser to the top of the units should ensure adequate grass growth. Seeded areas must be watered regularly for a period of 6 weeks following installation and traffic kept off the area until grass growth is established.

**Maintenance:** For gravel areas; an occasional sweeping of any overfill back into the units. If gravel appears to be sinking check for the installation of the geotextile.

For grass areas; once grass is established the area can be trafficked and a normal mowing regime resumed. If infill appears to be sinking top up with loam mix and check for presence of geotextile.

Overflow & Temporary Parking

Driveways and Gravel Areas

Park & Rides & General Parking



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