SuDS - SUSTAINABLE URBAN DRAINAGE SYSTEM

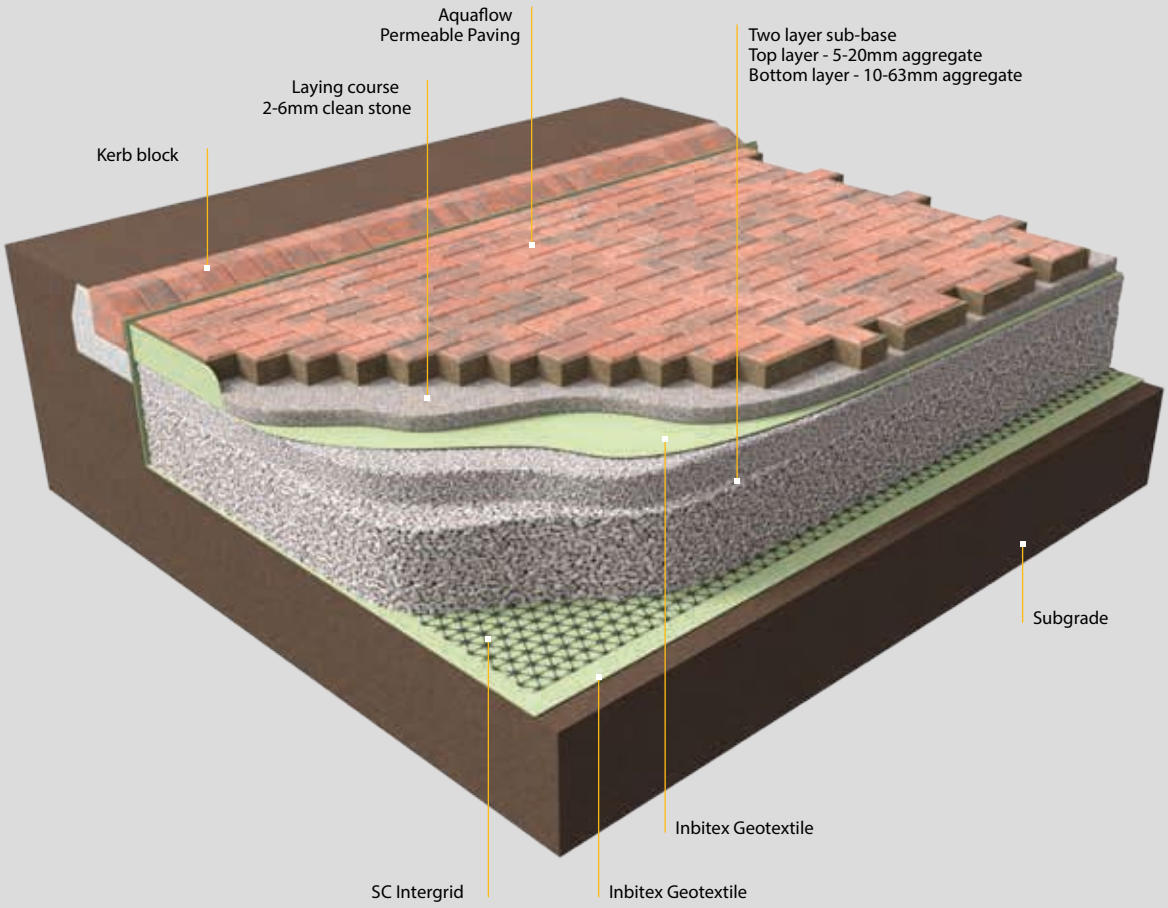
A sustainable urban drainage system (SuDS) is an alternative to the traditional pipes, gullies and culverts approach to a development and its drainage strategy. A SuDS system comprises components and techniques that are deemed to be more sustainable and deal with storm water at source.

Sustainable urban drainage systems (SuDS) mimic natural drainage processes by employing these three key principles: water quality, water quantity and biodiversity/ amenity.

The Roadstone Aquaflow system provides the means to not only achieve but excel in the three key SuDS principles. Through considerate design, careful selection of techniques and materials, the Roadstone Aquaflow blocks and the Roadstone Aquaflow system deliver the following benefits:

- **Reducing water quantity -** Dealing with surface water at the source reduces the effects of urbanisation and the impact of localised flooding
- **Improving water quality -** Roadstone Aquaflow. provides two levels of storm water treatment: removing harmful pollutants and protecting the environment downstream
- **Contributing to the biodiversity -** Contributing to the biodiversity of development by working in conjunction with other SuDS techniques. Roadstone Aquaflow. allows any hard standings, including roads, to be used as drainage, producing a traditional looking surface with many desirable features.

AQUAFLOW® PAVING SOLUTION



AQUAFLOW® system

Roadstone Aquaflow has used research and design to evolve the Roadstone Aquaflow permeable paving system into one of the most cost effective and functional SuDS within the marketplace.

The Roadstone Aquaflow system has a unique sub-base design incorporating SC Intergrid which reduces construction costs whilst giving superior structural performance. Water quality improvement is realised through the use of our tried and tested Inbitex Geotextile which removes the requirement for downstream pollution control. The patented Roadstone Aquaflow system fits neatly within any block paving project, where your paving design becomes your drainage design and vice versa.

Roadstone Aquaflow SuDS can be designed as fully attenuation, fully infiltration or as a partial infiltration system. Attenuation (tanked) systems capture storm water to be collected and released in a controlled manner into sewers and downstream watercourses. Infiltration systems allow rainwater to be infiltrated into the ground mimicking a green field environment. Storm water leaving the Roadstone Aquaflow system is cleaned and filtered through the Inbitex Geotextile layers that promote microbial action. Water quality improvement allows secondary non-potable uses to be carried out such as flushing toilets and watering the garden. The Roadstone Aquaflow system can be designed for use in both trafficked and pedestrianised areas, allowing the collection and treatment of storm water from any paved surface.

Advantages of Roadstone Aquaflow

- Dealing with storm water at source
- Reduces water quantity
- Improves water quality
- Lowers construction costs
- Allows collection of storm water from impermeable surfaces
- Improved maintenance programme.

TYPICAL INFILTRATION SYSTEMS

There are four basic systems designs (see below). Each design can be tailored for infiltration or tanked according to requirements.

Infiltration

The system is underlaid with a pervious geotextile membrane (Inbitex®) and is suitable for use where it is proposed to infiltrate the water directly into a suitable sub-grade.

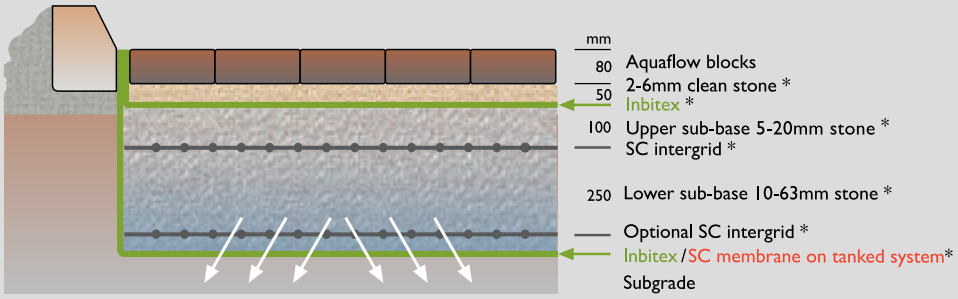
Tanked

The system is underlaid by an impervious plastic membrane (SC membrane) and is suitable for use where it is proposed to attenuate storm water before releasing it in a controlled manner, harvest the water for re-use or where difficult or contaminated sub-grades are encountered.

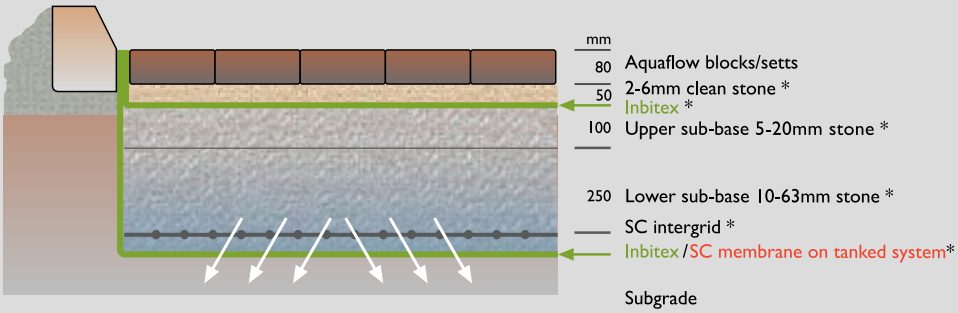
The type of membrane used and the method of sealing will depend upon the application. In some circumstances, the membrane will require additional protection from puncturing and specialist advice should be obtained.

The impervious membrane restricts water entering the sub-grade and preserves sub-grade structural integrity. This is very important where clay subgrades are encountered.

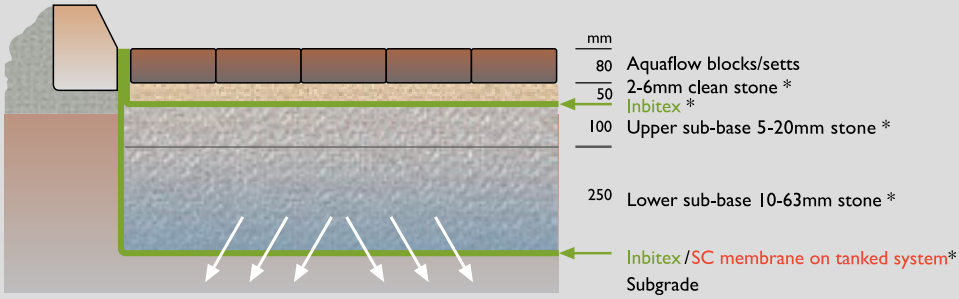
Typical Infiltration system
Areas subject to trafficking by HGV's



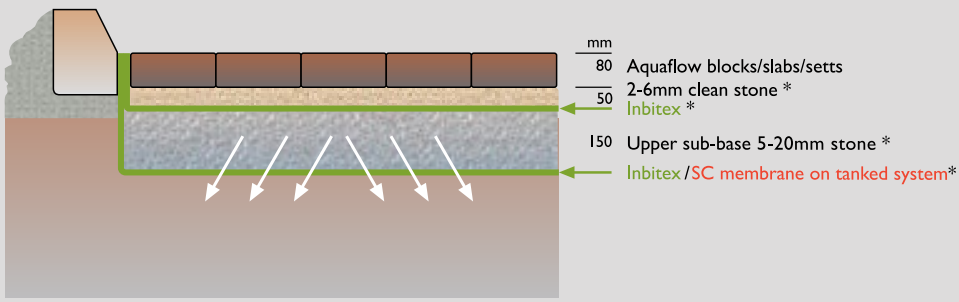
Typical Infiltration system with a sub-grade CBR of between 2-5%
Parking areas subject to trafficking by cars and vans only



Typical Infiltration system with a sub-grade CBR of 5% or greater
Parking areas subject to trafficking by cars and vans only



Typical footpath construction
For Aquaflow



DESIGN SERVICES FROM CONCEPT TO COMPLETION

In conjunction with our permeable paving design consultants Formpave, Roadstone can offer a comprehensive design service to suit individual design requirements.

The team of experienced engineers have designed more than 3,000 permeable paving schemes, both here and in the UK, during the past 20 years.

All designs carried out by the design team are project specific; each individual design is carefully considered and bespoke to the project in mind.

Design Services

- Validation of permeable paving designs
- Full structural and hydraulic permeable paving designs complete with layout drawings and construction details
- Free technical advice
- Access to a range of typical details
- Value engineering service

Contact us

Tel: 01 4041200

Web: www.roadstone.ie

Email: info@roadstone.ie

AQUA CASTLESTONE

Permeable Block Paving

Aqua Castlestone Block Paving® consists a variety of sizes and colours ensuring that Aqua Castlestone paving is suitable for any project.

The Aqua Castlestone Block Paving range is designed to ideally suit driveways, patios and footpaths.

Pedestrian

Light Vehicle

Aqua Castlestone Curragh Blend

Aqua Castlestone 60mm


Natural


Charcoal Grey

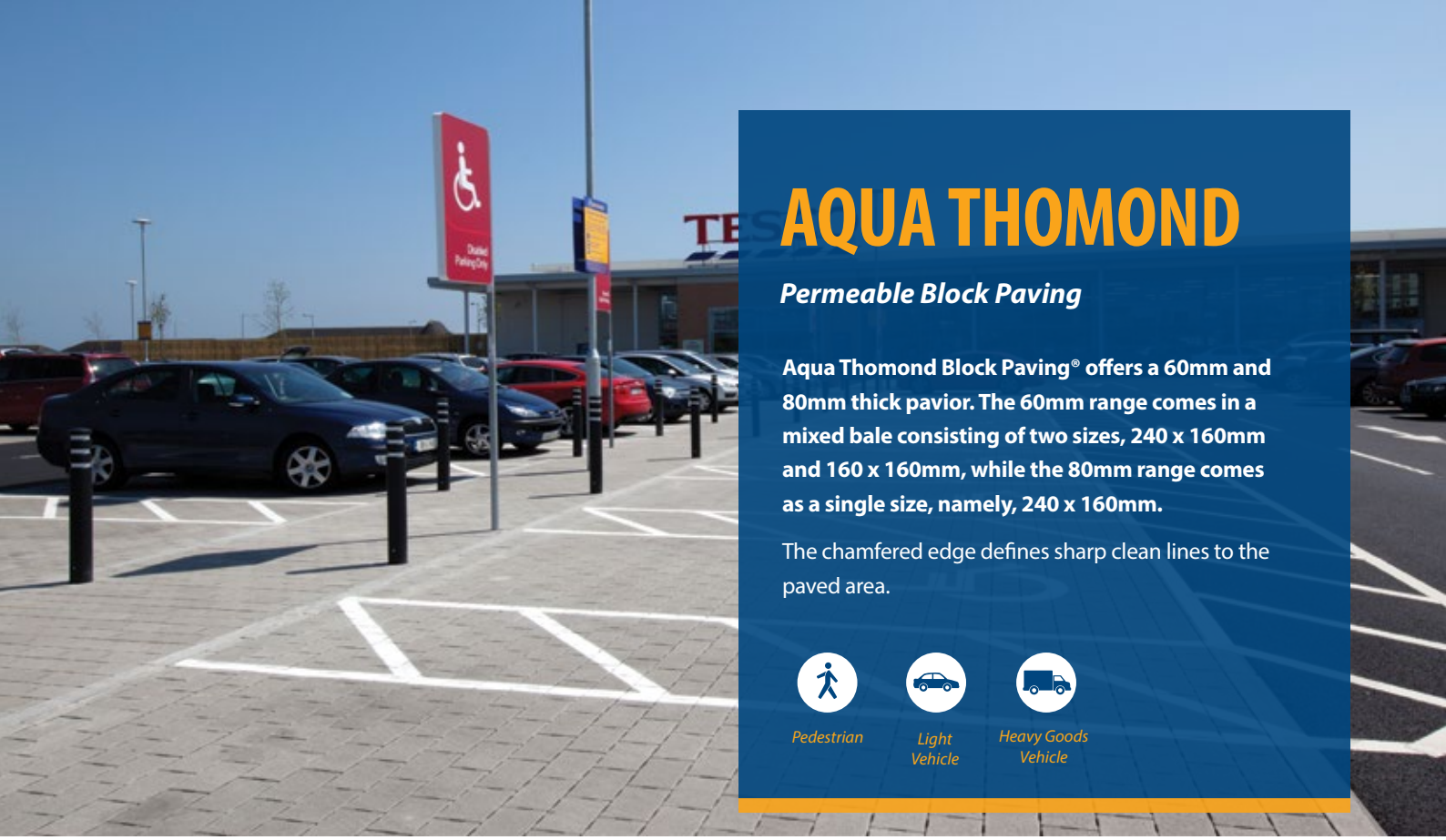

Causeway Blend


Curragh Blend

Product Sizes & Quantities

Size *(mixed bale)*	Depth	Quantity *(per m²)*	Quantity *(per bale)*	Bale size
240 x 160mm & 160 x 160mm	60mm	15.6 units of each size	432	13.82m²

Mixed bales include an equal number of all sizes.



AQUA THOMOND

Permeable Block Paving

Aqua Thomond Block Paving® offers a 60mm and 80mm thick pavior. The 60mm range comes in a mixed bale consisting of two sizes, 240 x 160mm and 160 x 160mm, while the 80mm range comes as a single size, namely, 240 x 160mm.

The chamfered edge defines sharp clean lines to the paved area.

Pedestrian *Light Vehicle* *Heavy Goods Vehicle*

Aqua Thomond 60mm

Product Sizes & Quantities

Size *(mixed bale)*	Depth	Quantity *(per m²)*	Quantity *(per bale)*	Bale size
240 x 160mm & 160 x 160mm	60mm	15.6 units of each size	432	13.82m²

Mixed bales include an equal number of all sizes.

Aqua Thomond Single Sized 80mm

Product Sizes & Quantities

Size	Depth	Quantity *(per m²)*	Quantity *(per bale)*	Bale size
240x160mm	80mm	26	300	11.52m²

AQUA VERONA

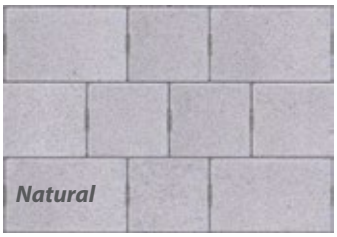
Aqua Verona Block Paving® range is a shot-blasted pavior designed to give the exposed aggregate granite look.

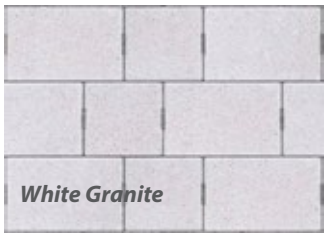
It is a modern styled pavior in three different colours. The 60mm range comes in a two-size mixed bale of 240 x 160mm and 160 x 160mm, while the 80mm range comes in a single size of 240 x 160mm.

Pedestrian *Light Vehicle* *Heavy Goods Vehicle*

Aqua Verona White Granite & Natural

Aqua Verona 60mm





Product Sizes & Quantities

Size *(mixed bale)*	Depth	Quantity *(per m²)*	Quantity *(per bale)*	Bale size
240 x 160mm & 160 x 160mm	60mm	15.6 units of each size	432	13.82m²

Mixed bales include an equal number of all sizes.

Aqua Verona Single Sized 80mm

Product Sizes & Quantities

Size	Depth	Quantity *(per m²)*	Quantity *(per bale)*	Bale size
240x160mm	80mm	26	300	11.52m²

AQUA RIVEN

Permeable Block Paving

Aqua Riven block paving has a surface, modelled on natural stone, available in a 240 x 160 x 80mm single size in two colours: Sandstone and Limestone.

Aqua riven block paving will give a unique textured natural stone appearance.

Pedestrian *Light Vehicle* *Heavy Goods Vehicle*

Aqua Riven Sandstone

Aqua Riven Single Sized 80mm

Product Sizes & Quantities

Size	Depth	Quantity *(per m²)*	Quantity *(per bale)*	Bale size
240x160mm	80mm	26	300	11.52m²

AQUA COBBLESETT®

The Aqua Cobblesett range blends practicality and durability together in this functional pavior. Aqua Cobblesett concrete paviors are manufactured with a silica sand top giving the Aqua Cobblesett range its intense colours and durability.

Aqua Cobblesett block paving is rectangular in shape (200mm x 100mm) with a chamfered top edge. Available as 80mm thickness with a range of six different colours, Aqua Cobblesett is an option for all uses: from driveways and patios, to streetscapes and shopping centers.

Pedestrian *Light Vehicle* *Heavy Goods Vehicle*

Aqua Cobblesett 80mm

Product Sizes & Quantities

Size	Depth	Quantity *(per m²)*	Quantity *(per bale)*	Bale size
200mm x 100mm	80mm	50	500	10.00m²

AQUAFLOW ML

Permeable Block Paving

Aquaflow ML permeable blocks can be laid by hand or by machine, allowing rates of over 600m² per day to be achieved with a three-man crew.

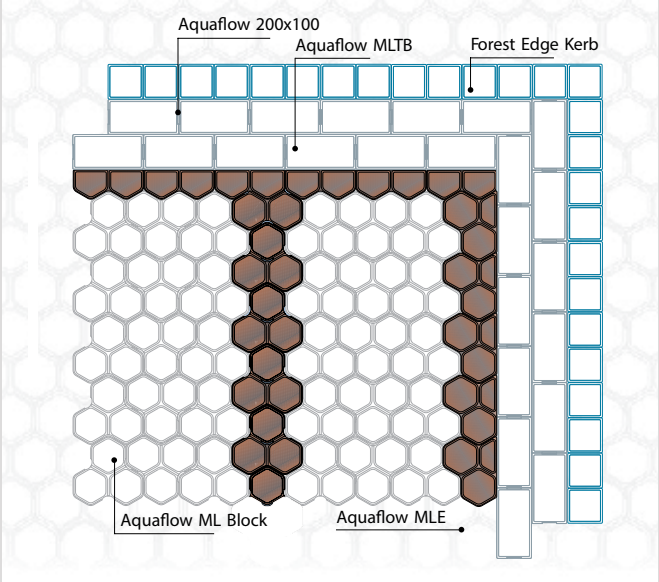
Designed for heavy-duty applications, the Aquaflow ML block system consists of an interlocking block with specialist top, bottom and edge blocks. The Aquaflow ML block can be specified for all sites designed under BS7533-Pt13.

Pedestrian *Light Vehicle* *Heavy Goods Vehicle*

Aquaflow ML

Aquaflow MLTB

Aquaflow MLE

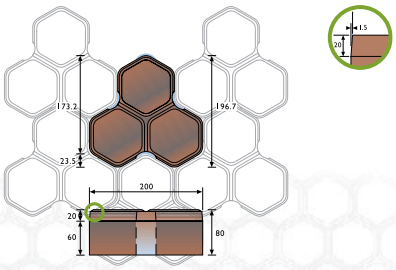


Aquaflow ML block®
For Roads and heavy duty use

Size
80mm

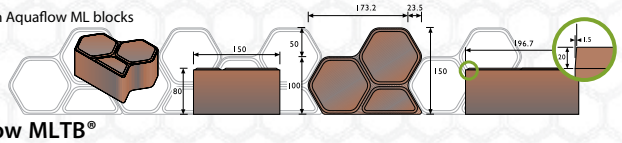
Laying pattern
Include stretcher course around edge in conjunction with MLE and

MLTB



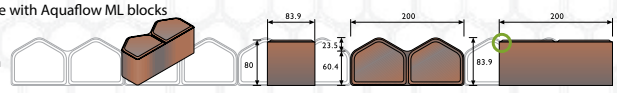
Aquaflow MLE®
Endblock
For use with Aquaflow ML blocks

Size
80mm



Aquaflow MLTB®
Top and bottom block
For use with Aquaflow ML blocks

Size
80mm



STONE SPECIFICATIONS

Lower sub-base layer 10-63mm clean crushed stone

Sieve sizes	% passing
80mm	90-100
63mm	90-100
40mm	60-80
20mm	15-30
10mm	0-5
Reference specification	BS EN 13242:2002

Laying course 2-6mm clean crushed stone

Sieve sizes	% passing
10mm	98-100
6.3mm	80-100
2mm	0-100
1mm	0-5
Reference specification	BS EN 13242:2002

Upper sub-base layer 5-20mm clean crushed stone

Sieve sizes	% passing
40mm	100
20mm	90-100
10mm	25-75*
4mm	0-15
2mm	0-5
Reference specification	BS EN 13242:2002
Material specification	Material supplied shall be referred to as 5-20mm clean crushed stone and conform to the above sieve analysis and aggregate testing.

Surface Dressing 2-4mm clean crushed stone

Sieve sizes	% passing
6.3mm	100
5mm	95-100
3.35mm	66-90
1.18mm	0-20
600 microns	0-8
600 microns	0-1.5
Reference specification	BS EN 1097-2:1998 BS EN 1091-8:2000 Annex A

**Aggregate Testing*

Los Angeles Coefficient (LA) - Determination of resistance to fragmentation = 20 BS EN 13242:2002. Note: Lower values than those specified signifies better resistance to fragmentation and abrasion and is therefore acceptable.

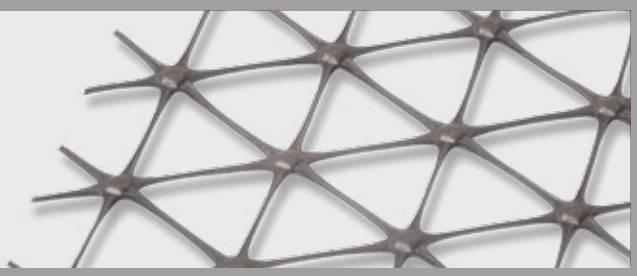
AQUAFLOW® COMPONENTS

Inbitex Geotextile

Exclusive to Roadstone/Formpave Aquaflow system, this non-woven geotextile is used for separation, filtration and pollution control.

SC Intergrid

Exclusive to Roadstone/Formpave and the Aquaflow system this sub-base stabilisation grid improves structural strength, increases design life and reduces construction costs.



SC Membrane

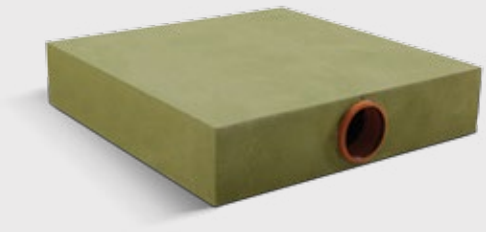
This impermeable membrane allows the storage of collecting storm water. Used for the Aquaflow attenuation system it can be welded or taped dependent on the application. A higher grade SC Membrane GT can be specified when contamination is present.

SC Findrain

This drainage component allows efficient and high flow removal of storm water from the Roadstone Aquaflow system. Wrapped in Inbitex Geotextile which provides further filtration and cleansing.

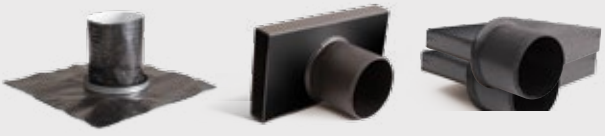
Aquaflow Distribution Tanks

Voided crates that are extremely strong structurally and are wrapped in Inbitex Geotextile, which provides filtration and cleansing. Allows the collection of impermeable surface water catchment, such as roofs to the Aquaflow system.



Top Hats, Tape and Fittings

Roadstone Aquaflow system components.



SuDS SPECIFICATION

Types(s) of Paving
Roadstone Aquaflow permeable concrete block paving range.

Reference
Roadstone Aquaflow paving.

Size
As per Roadstone Ltd.

Colours
Various colours and finishes available.

Setting Out
See page 47/48 of brochure.

Kerbs
See page 30-32.

Laying course
50mm depth of 2-6mm single size clean crushed stone to BS EN 13242: 2002. The crushed stone used for the laying course must have a minimum LA Coefficient of 25.

Inbitex Geotextile
As specification.

Depth of Sub-base
It is recommended that a sub-base depth of 350mm should be used. The depth of sub-base may be varied at the discretion of the engineer.

Sub-base Specification
All granular sub-base material shall comprise crushed rock or concrete possessing well defined edges. It must be sound, clean, non-friable and free from clay or other deleterious matter.

The material must be non-plastic when tested in accordance with BS1377 Test No.4.

The crushed stone used for the sub-base must have a minimum LA Coefficient of 25.

The selected test samples shall not be oven dried and should be soaked in water at room temperature for 48 hours before the test. The 100mm deep upper layer of sub-base material should be graded 5mm-20mm to BS EN 13242: 2002.

Intergrid(s)
SC Intergrid Geogrid.

DBM Running Course
To be 20mm dense base binder course manufactured with 100/150 grade bitumen to BS4987. The DBM shall conform with the Requirements of BS 4987.

SC Membrane Geomembrane
Generally a taped membrane will be suitable for most applications of the tanked system. If a guaranteed watertight system is required a fully welded system should be installed.

Examples of this type of application would be sites with a high water table, methane contamination, areas above basements or retaining walls. Further advice should be sought from the Formpave design team.

Findrain
150/300mm Findrain to BBA Number 95/85.

Top hat seal
Formpave top hat seal.

MAINTENANCE

Operation & maintenance requirements		
Maintenance schedule	Action	Frequency
Regular maintenance	Sweeping surface to remove debris and contamination	1-2 times a year, typically Spring and after leaf fall in
Occasional maintenance	Removal of leaves	As required
Remedial actions	Remediate areas of rutting and depressions	As required
	Replace broken/damaged blocks	As required
	Rehabilitate surface with sweeping and reapplication of 2-4mm clean gritstone	As required
Monitoring	Initial inspection	Within 3 months
	Inspection for poor performance and silting	Annually
	Inspect ancillary drainage components i.e. gullies, outfall pipes etc	Annually