

THE PAVING GUIDE

PERMEABLE PAVING BEGAN WITH FORMPAVE

Formpave, a Forterra brand, pioneered what is now commonly referred to as sustainable urban drainage systems (SuDS), utilising permeable paving. The Aquaflow® Permeable Paving System achieved The Queen's Awards for Enterprise: Innovation.



Featured Image:
Quality control of Forterra Formpave permeable paving prior to drying.
Cover Image Project: Worcestershire Parkway
Product Type: Royal Forest in Natural and Charcoal

ADD VALUE

The Formpave range represents a definitive collection of high quality, permeable and conventional concrete block paving products, designed and manufactured in the UK to enhance and add value to your project.

ADD SUSTAINABILITY

As a founding member of the UK Green Building Council, Formpave are at the forefront of 'whole system' design solutions. Innovations including water harvesting, thermal, permeable paving and recycled content positions the Formpave range as a truly sustainable option.

ADD PERSONALITY

With a wide selection of colours, block types and finishes, finding the desired look is effortless. Each product in the range has been selected, refined and evolved to give a distinctive and unique personality to suit even the most exacting requirements.

DESIGNING YOUR SCHEME

Formpave's aim is to provide a quality system and SuDS solution. To assist with this, we have a team of experienced engineers offering a comprehensive free design service which includes technical and professional advice, preparation of draft proposals and validation of the clients own design. All designs are covered by our professional indemnity insurance.

CUSTOMER SERVICE

We take pride in our customer service, our trained staff take care of our customers' needs making sure they are happy with the level of service we provide.

**Contact us now on
01594 836999 for
help with your paving
requirements**

INTRODUCING OUR PRODUCT RANGE

ECOGRANITE PERMEABLE
BLOCK PAVING

With over 60% recycled content, Ecogranite is the sustainable solution for permeable block paving. This premium range of permeable block paving has a textured surface, exposing the sparkling granite while offering excellent skid and slip resistance. The paving blocks incorporate a slot and chamfer which helps to prevent localised flooding by allowing water to disperse at a high rate making them the ideal premium paver to complement the Aquaflow SuDS system.



PERMEABLE
BLOCK PAVING

Designed to disperse water at a high rate, our range of permeable block paving - comprising Aquasett, Aquaslab, Aquaflow and Aquaflow ML - is fully compatible with the Aquaflow SuDS system. With a choice of attractive traditional or contemporary finishes, they are ideal for a variety of commercial and residential projects and for the creation of pedestrian areas. For heavy duty applications, choose Aquaflow ML blocks, which are designed to be laid by hand or machine.



ECOGRANITE
BLOCK PAVING

For a sustainable solution for conventional block paving, Ecogranite has over 60% recycled content. Its textured surface exposes the sparkling granite and offers excellent non-slip resistance properties, which make it ideal for residential and commercial projects, including driveways, access roads and car parks. The range features long setts, boulevard paving, cobbles, slabs and traditional rectangular paving blocks.



BLOCK PAVING

Formpave manufactures a wide range of block paving for both commercial and domestic applications. From contemporary modular or traditional rectangular paving to cobbles and boulevard paving, all available in a variety of sizes, distinctive colours and finishes. Cut to withstand heavy loads, you can be confident that Formpave block paving offers the strength and durability you need.



CONTENTS

Pioneers of Permeable Paving	02-03
Ecogranite Permeable Block Paving	06-13
Ecogranite Aquasett Permeable Block Paving	8-9
Ecogranite Aquaflow Permeable Block Paving	10-11
Ecogranite Aquaslab Permeable Block Paving	12-13
Permeable Block Paving	14-23
Aquasett Permeable Block Paving	16-17
Aquaflow Permeable Block Paving	18-19
Aquaslab Permeable Block Paving	20-21
Aquaflow ML Permeable Block Paving	22-23
Ecogranite Block Paving	24-39
Ecogranite Long Setts Block Paving	26-27
Ecogranite Boulevard Block Paving	28-29
Ecogranite Chartres Block Paving	30-31
Ecogranite Cobbles Block Paving	32-33
Ecogranite Setts Block Paving	34-35
Ecogranite Slab Paving	36-37
Ecogranite Royal Forest Block Paving	38-39
Block Paving	40-53
Chartres Block Paving	42-43
Chartres Linear Block Paving	44-45
Chartres Boulevard Block Paving	46-47
Chartres Cobbles Block Paving	48-49
Royal Forest Block Paving	50-51
Fineline Block Paving	52-53
Kerbs & Accessories	54-61
Standard Kerbs	56
Bullnose Kerbs	57
Ecogranite Kerb, Edging & Centre Stone	58
Chartres & Forest Edging	59
Tactile Block Paving	60
Demarcation Block Paving	61
Technical Guidance & Index	62-91
Important General Information	63
Principles of SuDS	64-65
Aquaflow - The System	66-67
Aquaflow - Hydraulic Performance	68-69
Aquaflow - Structural Performance	68-69
Design Services	70
Water Quality Case Study	71
Q24 Specifications	72-73
Aquaflow Components	74
Stone Specifications	75
Aquaflow Technical Information	76-81
Laying Patterns	82
Kerb Systems	83
How to Lay Block Paving	84-85
Paving Maintenance	86-87
Glossary	88-91



Featured Product:
Ecogranite Aquasett - Victoria

**ECOGRANITE AQUASETT
PERMEABLE BLOCK PAVING**

Pages 8-9



**ECOGRANITE AQUAFLOW
PERMEABLE BLOCK PAVING**

Pages 10-11



**ECOGRANITE AQUASLAB
PERMEABLE BLOCK PAVING**

Pages 12-13



ECOGRANITE

AQUASETT PERMEABLE BLOCK PAVING



Ecogranite Aquasett permeable blocks are specially designed, incorporating a slot and chamfer, to allow water to disperse at a high rate whilst retaining its visual integrity.

Used within residential and commercial projects including driveways, access roads and carparks, Ecogranite Aquasett is available in a wide range of colours, offering an aesthetic appearance for all environments.

Available in mixed packs or large block only. A kerb system is also available to complement the range. The textured surface exposes the sparkling granite offering excellent skid/slip resistance. The Ecogranite Aquasett permeable block can be specified for all sites designed under BS7533-Pt13.

Featured Project: Hurlingham Gate
Client: St James - Berkeley Group
Location: Fulham, London
Sector: Residential Development
Product Type: Ecogranite Aquasett & Ecogranite Standard Kerb - Cornish Silver Grey / Balmoral
Size/Area: 750m²

OVER 60% RECYCLED CONTENT



COLOURS



Cornish Silver Grey



Balmoral



Tintagel †



Truro *



Blend *

SPECIFICATION

Combined Packs		
Block Sizes (Depth)	60mm	80mm
Mixed blocks per pack		
Made up of the following sizes:		
250 x 150mm (Blocks per pack)	140	100
150 x 150mm (Blocks per pack)	196	140
100 x 150mm (Blocks per pack)	98	70
Coverage per pack (m ²)	11.2	8.0
Weight per pack (tonne)	1.47	1.42
Large Block Only †		
Block Sizes (Depth)	60mm	80mm
250 x 150mm (Blocks per pack)	280	200
Coverage per pack (m ²)	10.5	7.5
Weight per pack (tonne)	1.38	1.33
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low	
Finishes	Bush hammered finish	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads.	

The Ecogranite Aquasett permeable blocks are best used in combination with the Formpave Aquaflo[®] System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

* Colour purposes only. Blends to be created on site. † Special order.

ECOGRANITE

AQUAFLOW PERMEABLE BLOCK PAVING



Ecogranite Aquaflow permeable blocks are specially designed, incorporating a slot and chamfer, allowing water to disperse at a high rate. Available in 60mm and 80mm rectangular blocks, they sit effortlessly alongside our conventional Ecogranite Royal Forest paving. The textured surface exposes the sparkling granite offering excellent skid/slip resistance. The Ecogranite Aquaflow permeable block can be specified for all sites designed under BS7533-pt13.

Featured Project: Loughborough Innovation Centre
Client: Loughborough University
Sector: Education
Product Type: Aquaflow Ecogranite -
Cornish Silver Grey / Balmoral
Size/Area: 56m² / 1300m²

OVER 60% RECYCLED CONTENT 

COLOURS



Cornish Silver Grey



Balmoral



Tintagel †



Truro

SPECIFICATION

Block Sizes (Depth)	60mm	80mm
200 x 100mm (Blocks per pack)	560	400
Coverage per pack (m ²)	11.2	8.0
Weight per pack (tonne)	1.47	1.41
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa BBA certificate 97/3373	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low	
Finishes	Bush hammered finish	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads.	

The Ecogranite Aquaflow permeable block is best used in combination with the Formpave Aquaflow® System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke site design service to help you minimise your construction costs.

* Colour purposes only. † Special order.

ECOGRANITE

AQUASLAB PERMEABLE PAVING



Ecogranite Aquaslab is specially designed, incorporating a slot and chamfer, allowing water to disperse at a high rate helping prevent localised flooding.

The striking bush hammered finish exposes sparkling granite, offering excellent skid/slip resistance, ideal for use on non-trafficked pedestrian areas. Ecogranite kerb system and edgings have been specially designed to complement the range.

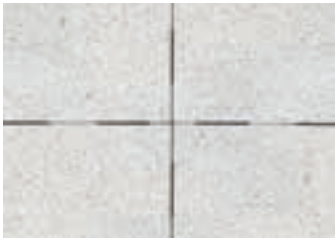
The Ecogranite Aquaslab can be specified for all sites designed under BS7533-Pt13.

Featured Project: Aylesbury Vale Council Offices
Client: Aylesbury Vale District Council
Location: Aylesbury, Buckinghamshire
Sector: Local Government
Product Type: Ecogranite Aquaslab - Truro
Size/Area: Over 1000m²

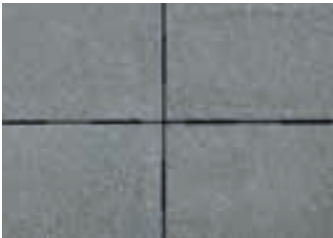
OVER 60% RECYCLED CONTENT 



COLOURS



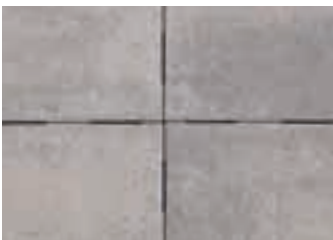
Cornish Silver Grey *



Balmoral



Tintagel †



Truro

SPECIFICATION

Block Sizes (Depth)	60mm
450 x 300mm (Blocks per pack)	84
Coverage per pack (m ²)	11.34
Weight per pack (tonne)	1.49
Precast concrete block paving Manufactured to: BS EN 1339:2003 Tensile splitting strength 3.6 Mpa	Strength durability Class 1 Slip/skid resistance Extremely low
Finishes	Bush hammered finish
Applications	For use on pedestrian areas.

The Ecogranite Aquaslab permeable block is best used in combination with the Formpave Aquaflo® System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

* Colour purposes only. † Special order.



Featured product:
Aquaflow permeable block paving - Charcoal

**AQUASETT
PERMEABLE BLOCK PAVING**

Pages 16-17



**AQUAFLOW
PERMEABLE BLOCK PAVING**

Pages 18-19



**AQUASLAB
PERMEABLE BLOCK PAVING**

Pages 20-21



**AQUAFLOW ML
PERMEABLE BLOCK PAVING**

Pages 22-23



COLOURS



Traditional



Purbeck



Vendage



Pennant



Charcoal

SPECIFICATION

Combined Packs		
Block Sizes (Depth)	60mm	80mm
Mixed blocks per pack	434	310
Made up of the following sizes:		
250 x 150mm (Blocks per pack)	140	100
150 x 150mm (Blocks per pack)	196	140
100 x 150mm (Blocks per pack)	98	70
Coverage per pack (m²)	11.2	8.0
Weight per pack (tonne)	1.47	1.42
Large Block Only †		
Block Sizes (Depth)	60mm	80mm
250 x 150mm (Blocks per pack)	280	200
Coverage per pack (m²)	10.5	7.5
Weight per pack (tonne)	1.38	1.33
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low	
Finishes	Olden finish	
Finishes (Special order)	Plain finish, Bush hammered finish†	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads.	

The Aquasett permeable blocks are best used in combination with the Formpave Aquaflow® System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

† Special order.



AQUASETT

PERMEABLE BLOCK PAVING



The Aquasett permeable block paving has an attractive olden finish for use within residential and commercial projects, and is fully compatible with the Aquaflow SuDS system. The specially shaped block allows water to permeate through to the lower levels, helping to prevent localised flooding. Available in mixed packs or large block only. The Aquasett block can be specified for all sites designed under BS7533-Pt13.

Featured Project: Warwick Gates Retirement Complex
Location: Warwick
Contractor: Westpoint Construction
Sector: Local Government
Product Type: Aquasett - Traditional (laid in stretcher bond) / Pennant (laid in herringbone)
Size/Area: Over 1000m²

AQUAFLOW

PERMEABLE BLOCK PAVING



Aquaflow permeable blocks are specially designed, incorporating a slot and chamfer, allowing water to disperse at a high rate helping to prevent localised flooding.

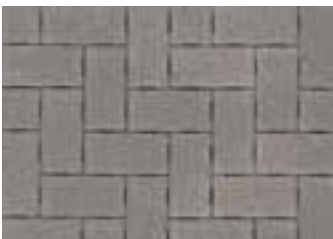
Available in 60mm and 80mm rectangular blocks they sit effortlessly alongside our conventional Royal Forest paving. The Aquaflow block can be specified for all sites designed under BS7533-Pt13.

Featured Project: Access Road, Meadowview Homes
Client: Meadowview Homes
Location: Borrowash, Derbyshire
Sector: Residential
Product Type: Aquaflow 80mm - Charcoal
Size/Area: 750m²

COLOURS



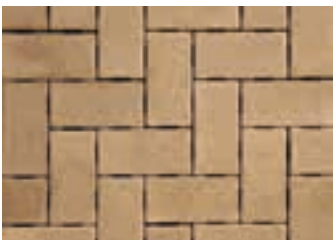
Natural



Charcoal



Red Brindle



Autumn Yellow



Golden Brindle



Vendage



Purbeck



SPECIFICATION

Block Sizes (Depth)	60mm	80mm
200 x 100mm (Blocks per pack)	424	296
Coverage per pack (m ²)	8.48	5.92
Weight per pack (tonne)	1.1	1.04
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa BBA certificate 97/3373	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low	
Finishes	Standard finish, Bush hammered finish†	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads.	

The Aquaflow permeable block is best used in combination with the Formpave Aquaflow® System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

† Special order.

AQUASLAB

PERMEABLE BLOCK PAVING



Aquaslab offers a range of contemporary permeable paving slabs for use in pedestrian areas, they are available in 300mm x 450mm dimension and provide a clean, uncluttered design. The specially shaped block allows water to disperse to the lower levels, helping to prevent localised flooding.

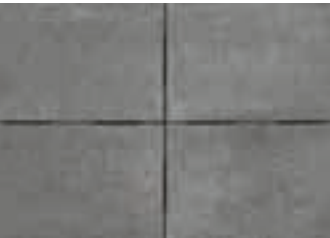
Featured Project: The Farmhouse Inn
Location: Adanac Park, Southampton
Sector: Leisure
Product Type: Aquaslab/Forest Edging - Red Brindle
Size/Area: 220m²



COLOURS



Natural



Charcoal



Red Brindle



Golden Brindle *



Purbeck *

SPECIFICATION

Block Sizes (Depth)	60mm
450 x 300mm (Blocks per pack)	84
Coverage per pack (m ²)	11.34
Weight per pack (tonne)	1.49
Precast concrete block paving Manufactured to: BS EN 1339:2003 Tensile splitting strength 3.6 Mpa	Strength durability class 1 Slip/skid resistance Satisfactory
Finishes	Standard finish
Applications	For use on pedestrian areas.

The Aquaslab permeable block is best used in combination with the Formpave Aquaflow® System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

* Colour purposes only. † Special order.

COLOURS



Natural †



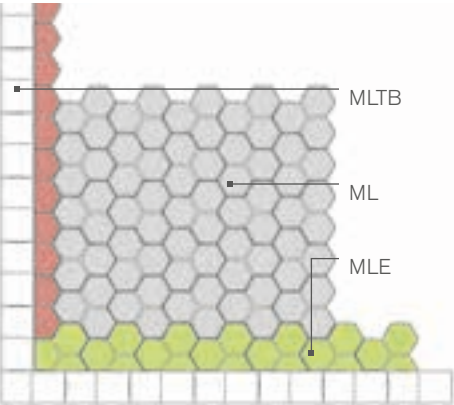
Charcoal †



Red Brindle †



Golden Brindle †



SPECIFICATION

Block Type	ML block 196.7 x 200mm	MLE finishing block 150 x 196.7mm	MLTB finishing block 83.9 x 200mm
Block Sizes (Depth)	80mm	80mm	80mm
Blocks per pack	250	300	400
Coverage per pack	6.5 (m²)	52 (lm)	80 (lm)
Weight per pack (tonne)	1.15	1.22	1.04
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa BBA certificate: 97/3373	Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low		
Finishes	Standard finish		
Applications	Machine layable paving. For roads and heavy duty use.		

The Aquaflow ML permeable block is best used in combination with the Formpave Aquaflow® System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

* Colour purposes only. † Special order.



Product Type:
Aquaflow ML/MLE/MLTB - Charcoal



Product Type:
Aquaflow ML/MLE/MLTB - Charcoal

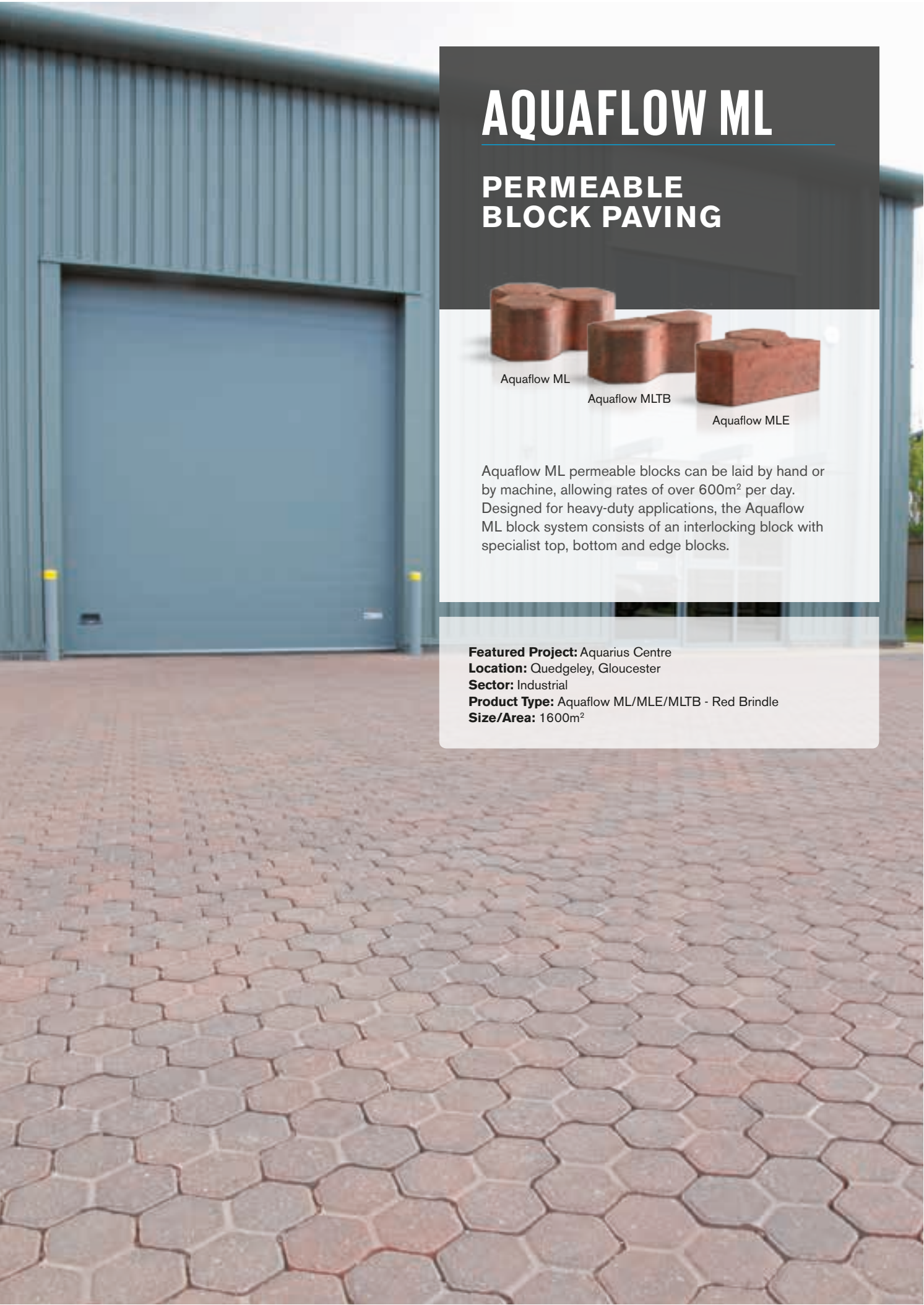
AQUAFLOW ML

PERMEABLE
BLOCK PAVING



Aquaflow ML permeable blocks can be laid by hand or by machine, allowing rates of over 600m² per day. Designed for heavy-duty applications, the Aquaflow ML block system consists of an interlocking block with specialist top, bottom and edge blocks.

Featured Project: Aquarius Centre
Location: Quedgeley, Gloucester
Sector: Industrial
Product Type: Aquaflow ML/MLE/MLTB - Red Brindle
Size/Area: 1600m²



Featured product:
Ecogranite Chartres Block Paving - Cornish Silver Grey



ECOGRANITE LONG SETTS
BLOCK PAVING

Pages 26-27



ECOGRANITE BOULEVARD
BLOCK PAVING

Pages 28-29



ECOGRANITE CHARTRES
BLOCK PAVING

Pages 30-31



ECOGRANITE COBBLES
BLOCK PAVING

Pages 32-33



ECOGRANITE SETTS
BLOCK PAVING

Pages 34-35



ECOGRANITE SLAB
PAVING

Pages 36-37



ECOGRANITE ROYAL FOREST
BLOCK PAVING

Pages 38-39



COLOURS



Cornish Silver Grey



Balmoral



Tintagel †



Truro

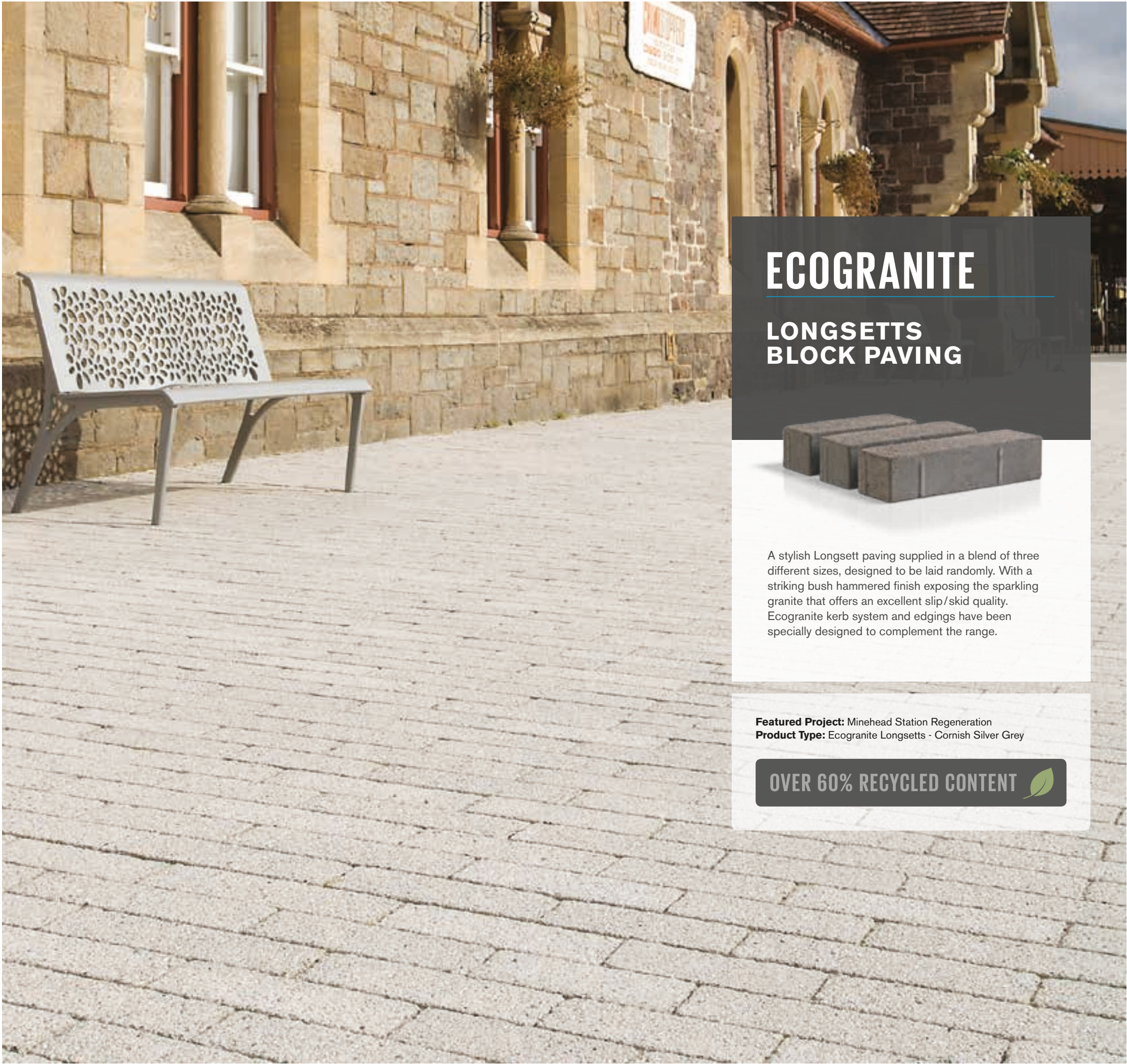


Blend *

SPECIFICATION

Block Sizes (Depth)	80mm
Mixed blocks per pack	240
Made up of the following sizes:	
250 x 100mm (Blocks per pack)	80
300 x 100mm (Blocks per pack)	80
350 x 100mm (Blocks per pack)	80
Coverage per pack (m²)	7.2
Weight per pack (tonne)	1.05
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low
Finishes	Bush hammered finish
Applications	80mm for use on footpaths, drives, commercial sites and roads.

* Colour purposes only. Blends to be created on site. † Special order.



ECOGRANITE

LONGSETTS
BLOCK PAVING



A stylish Longsett paving supplied in a blend of three different sizes, designed to be laid randomly. With a striking bush hammered finish exposing the sparkling granite that offers an excellent slip/skid quality. Ecogranite kerb system and edgings have been specially designed to complement the range.

Featured Project: Minehead Station Regeneration
Product Type: Ecogranite Longsetts - Cornish Silver Grey

OVER 60% RECYCLED CONTENT



ECOGRANITE

BOULEVARD BLOCK PAVING



Ecogranite Boulevard is an impressive large modular paving with a striking bush hammered finish that exposes an attractive sparkling granite. Each layer contains 12 separate paving blocks consisting of seven various sizes which are delivered in a standard laying patterns that can be varied for an individual design.

Featured Project: Industrial Units, Blackford
Product Type: Ecogranite Boulevard - Cornish Silver Grey, Ecogranite Bullnose Kerb - Cornish Silver Grey

OVER 60% RECYCLED CONTENT



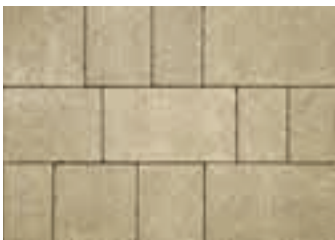
COLOURS



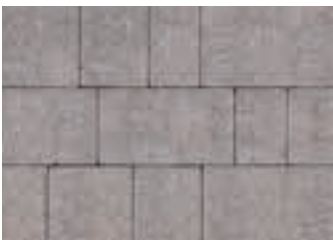
Cornish Silver Grey



Balmoral



Tintagel †



Truro *



Blend *

SPECIFICATION

Block Sizes (Depth)	80mm
Mixed blocks per pack	
Made up of the following sizes:	120
400 x 275mm (Blocks per pack)	20
150 x 275mm (Blocks per pack)	20
200 x 275mm (Blocks per pack)	20
250 x 275mm (Blocks per pack)	20
150 x 225mm (Blocks per pack)	20
300 x 225mm (Blocks per pack)	10
400 x 225mm (Blocks per pack)	10
Coverage per pack (m ²)	7.75
Weight per pack (tonne)	1.31
Note: Ecogranite paving packs contain layers of 12 separate paving blocks of 7 various sizes giving a total quantity of 120 blocks.	
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low
Finishes	Bush hammered finish
Applications	For use on pedestrian areas, shopping precincts and town centres.

* Colour purposes only. Blends to be created on site. † Special order.

COLOURS



Cornish Silver Grey



Balmoral



Tintagel †



Truro



Blend *


SPECIFICATION

Combined Packs		
Block Sizes (Depth)	60mm	80mm
Mixed blocks per pack	434	310
Made up of the following sizes:		
250 x 150mm (Blocks per pack)	140	100
150 x 150mm (Blocks per pack)	196	140
100 x 150mm (Blocks per pack)	98	70
Coverage per pack (m²)	11.2	8.0
Weight per pack (tonne)	1.47	1.42
Large Block Only		
Block Sizes (Depth)	60mm	80mm
250 x 150mm (Blocks per pack)	280	200
Coverage per pack (m²)	10.5	7.5
Weight per pack (tonne)	1.38	1.33
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low	
Finishes	Bush hammered finish	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads.	

* Colour purposes only. Blends to be created on site. † Special order.

ECOGRANITE

CHARTRES BLOCK PAVING




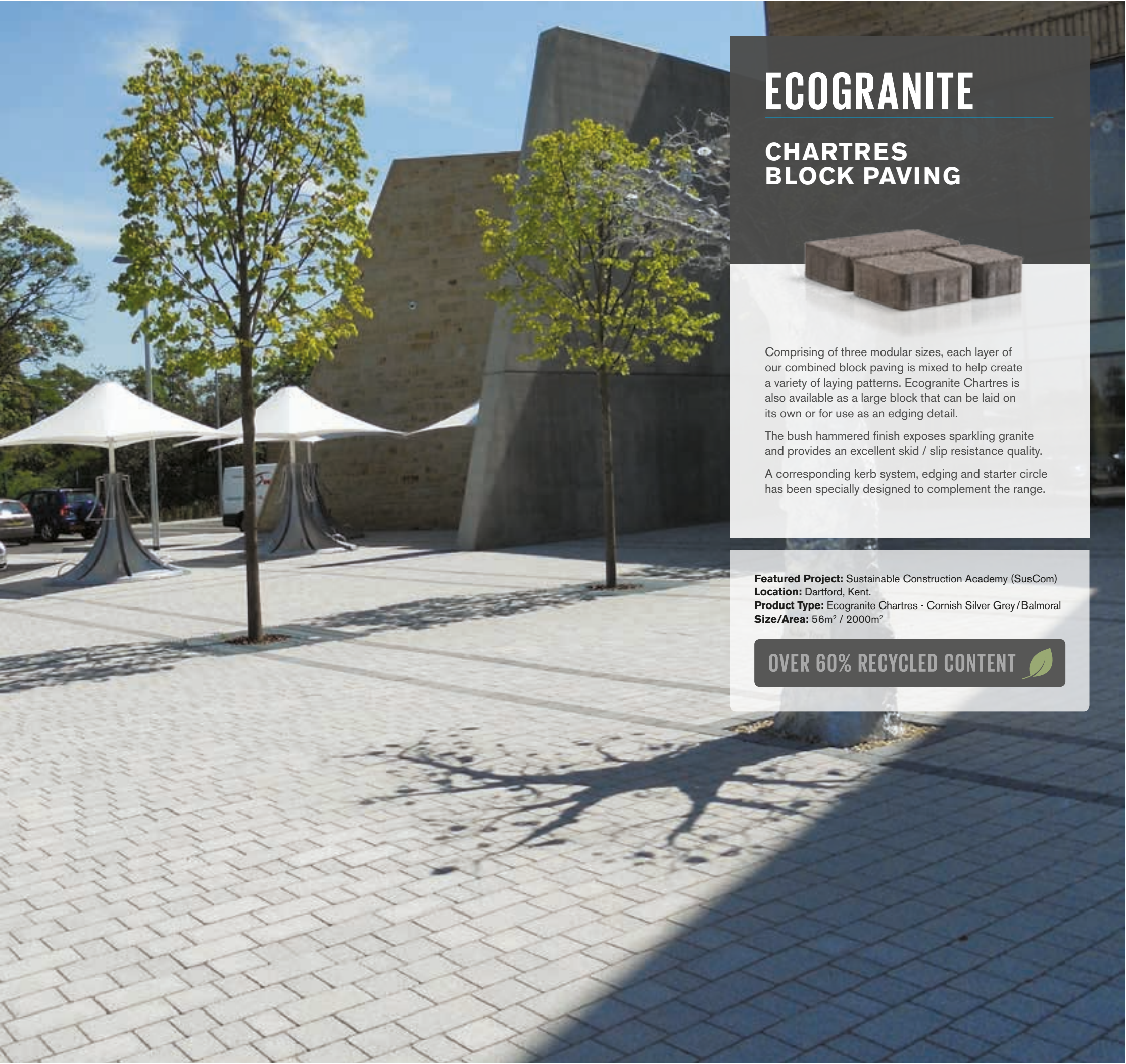
Comprising of three modular sizes, each layer of our combined block paving is mixed to help create a variety of laying patterns. Ecogranite Chartres is also available as a large block that can be laid on its own or for use as an edging detail.

The bush hammered finish exposes sparkling granite and provides an excellent skid / slip resistance quality.

A corresponding kerb system, edging and starter circle has been specially designed to complement the range.

Featured Project: Sustainable Construction Academy (SusCom)
Location: Dartford, Kent.
Product Type: Ecogranite Chartres - Cornish Silver Grey / Balmoral
Size/Area: 56m² / 2000m²

OVER 60% RECYCLED CONTENT



ECOGRANITE

COBBLES BLOCK PAVING



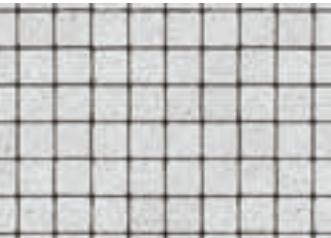
Ecogranite has a textured surface finish with non-slip properties, making it ideal for pavements, paths and driveways. Ecogranite cobbles are available in either 60mm or 80mm depths that can be traditionally coursed or laid in a more unusual pattern such as circles or Flanders fans. Ecogranite kerb system, edging and starter circles have been specially designed to complement the range.

Featured Project: Frimley Business Park
Location: Camberley
Product Type: Ecogranite Cobbles - Cornish Silver Grey, Chartres - Vendage
Size/Area: 560m²

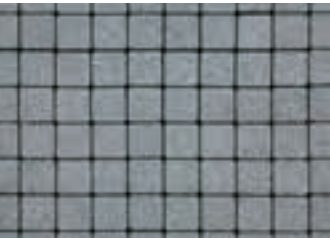
OVER 60% RECYCLED CONTENT 



COLOURS



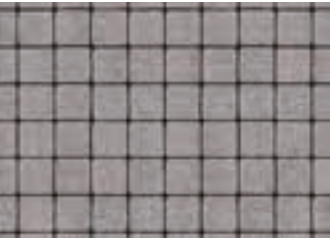
Cornish Silver Grey



Balmoral



Tintagel †



Truro *

SPECIFICATION

Block Sizes (Depth)	60mm	80mm
100 x 100mm (Blocks per pack)	1120	800
Coverage per pack (m ²)	11.2	8.0
Weight per pack (tonne)	1.47	1.41
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low	
Finishes	Bush hammered finish	
Applications	60mm for use on footpaths and domestic drives. 80mm for use on commercial sites and roads.	

* Colour purposes only. † Special order.

COLOURS



Cornish Silver Grey *



Balmoral *



Tintagel †



Truro *

SPECIFICATION

Combined Packs		
Block Sizes (Depth)	60mm	80mm
Mixed blocks per pack Made up of the following sizes:	672	480
150 x 150mm (Blocks per pack)	140	100
150 x 100mm (Blocks per pack)	406	290
100 x 100mm (Blocks per pack)	126	90
Coverage per pack (m ²)	10.5	7.5
Weight per pack (tonne)	1.38	1.31
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low	
Finishes	Bush hammered finish	
Applications	Roads and footpaths, carpark and driveways, commercial and domestic projects.	

* Colour purposes only. † Special order.


ECOGRANITE

SETTS BLOCK PAVING



Ecogranite Setts have a distinct appearance of natural granite setts at a fraction of the price. The striking bush hammered finish exposes sparkling granite and gives an excellent slip/skid resistance. Comprising of three modular sizes that are mixed to create a variety of laying patterns.

Featured Project: Kingston Mill, Bradford on Avon
Product Type: Ecogranite Setts - Victoria
Size/Area: 300m² / 600lm

OVER 60% RECYCLED CONTENT 

ECOGRANITE

SLAB PAVING



Ecogranite offers a sustainable alternative to freshly quarried granite and contains over 60% by-product material. The striking bush hammered finish exposes sparkling granite and provides an excellent skid /slip resistance. They can be laid in conventional square, stepped and diamond patterns, the shades can be mixed to create a stylish bespoke look. Ecogranite kerb system and edgings have been specially designed to complement the range.

Product Type: Ecogranite Slab/Ecogranite Chartres -
Truro, Cornish Silver Grey, Braemar
Size/Area: 1320m² / 1160m²

OVER 60% RECYCLED CONTENT



COLOURS



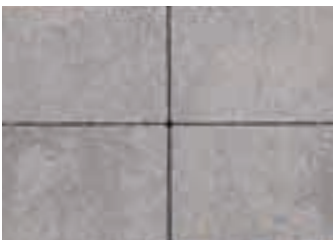
Cornish Silver Grey



Balmoral



Tintagel †



Truro *



Blend *

SPECIFICATION

Block Sizes (Depth)	60mm
450 x 300mm (Blocks per pack)	84
300 x 300mm (Blocks per pack)	126
Coverage per pack (m ²)	11.34
Weight per pack (tonne)	1.49
Precast concrete paving Manufactured to: BS EN 1339:2003 Tensile splitting strength 3.6 Mpa	Strength durability Class 1 Slip/skid resistance Extremely low
Finishes	Bush hammered finish
Applications	For use on pedestrian areas.

The Ecogranite Aquaslab permeable block is best used in combination with the Formpave Aquaflo[®] System, a unique patent protected sub base design which utilises geogrids to reduce sub base depth without effecting structural strength. This system has BBA Accreditation and we offer a free bespoke design service to help you minimise your construction costs.

* Colour purposes only. Blends to be created on site. † Special order.

COLOURS



Cornish Silver Grey



Balmoral



Tintagel †



Truro

SPECIFICATION

Block Sizes (Depth)	60mm	80mm
200 x 100mm (Blocks per pack)	560	400
Coverage per pack (m²)	11.2	8.0
Weight per pack (tonne)	1.47	1.41
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa BBA certificate 97/3373	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Extremely low	
Finishes	Bush hammered finish	
Applications	60mm thick for use on footpaths, domestic drives and 80mm thick for use on roads.	

* Colour purposes only. † Special order.



ECOGRANITE

ROYAL FOREST
BLOCK PAVING



Ecogranite Royal Forest is a classic 200x100mm paving, with an attractive bush hammered finish that exposes a sparkling granite, giving it an excellent slip/skid resistance. Ecogranite kerb system and edgings have been specially designed to complement the range.

Featured Project: Pavilion, Somerdale Sports Centre, Bristol
Product Type: Ecogranite Royal Forest: Cornish Silver Grey
Size/Area: 900m²

OVER 60% RECYCLED CONTENT





Featured product:
Chartres Boulevard - Purbeck

**CHARTRES
BLOCK PAVING**

Pages 42-43



**CHARTRES LINEAR
BLOCK PAVING**

Pages 44-45



**CHARTRES BOULEVARD
BLOCK PAVING**

Pages 46-47



**CHARTRES COBBLES
BLOCK PAVING**

Pages 48-49



**ROYAL FOREST
BLOCK PAVING**

Pages 50-51



**FINELINE
BLOCK PAVING**

Pages 52-53



CHARTRES

BLOCK PAVING



Chartres is a stunning olden finish paving comprising of three modular sizes, each supplied layer is mixed to help create a variety of laying patterns. Chartres is also available in a large format block that can be used as an edging detail or laid in a herringbone pattern which is recommended for trafficked areas. Chartres edging and starter circles have been specifically designed to complement the range.

Featured Project: Lyde Green, Bristol
Product Type: Chartres - Cotswold
Size/Area: 1500m²

COLOURS



Traditional



Purbeck



Vendage



Pennant



Red Brindle



Charcoal

SPECIFICATION

Block Sizes (Depth)	50mm	60mm	80mm
Mixed blocks per pack Made up of the following sizes:	434	434	310
250 x 150mm (Blocks per pack)	140	140	100
150 x 150mm (Blocks per pack)	196	196	140
150 x 100mm (Blocks per pack)	98	98	70
Coverage per pack (m ²)	11.2	11.2	8.0
Weight per pack (tonne)	1.23	1.47	1.42
Large Block Only †			
Block Sizes (Depth)	60mm	80mm	
250 x 150mm (Blocks per pack)	280	200	
Coverage per pack (m ²)	10.5	7.5	
Weight per pack (tonne)	1.38	1.33	
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 50mm Class 1, 60mm Class 2, 80mm block Class 4 Resistance to weathering 50mm Class 2, 60 & 80mm Class 3 Slip/skid resistance Low		
Finishes	Olden finish Bush hammered finish †		
Applications	50mm and 60mm for use on footpaths and domestic drives. 80mm for use on commercial sites and roads.		

† Special order - Bush hammered finish, Large block only and 60mm / 80mm mixed blocks in Red Brindle and Charcoal.

CHARTRES LINEAR

BLOCK PAVING



Chartres Linear is a contemporary modular paving specifically designed to add a modern touch to any project. Comprising of three sizes, each supplied layer is mixed to help create a variety of laying patterns.

Featured Project: The Vale Crematorium, Evesham
Product Type: Chartres Linear - Vendage
Size/Area: 900m²

COLOURS



Traditional



Purbeck *



Vendage



Pennant *



Charcoal

SPECIFICATION

Block Sizes (Depth)	50mm
Mixed blocks per pack	434
Made up of the following sizes:	
250 x 150mm (Blocks per pack)	140
150 x 150mm (Blocks per pack)	196
150 x 100mm (Blocks per pack)	98
Coverage per pack (m ²)	11.2
Weight per pack (tonne)	1.23
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 50mm block Class 1 Resistance to weathering Class 2 Slip/skid resistance Low
Finishes	Standard finish
Applications	50mm for use on footpaths and domestic drives.

* Colour purposes only.

COLOURS



Traditional



Purbeck



Pennant



Charcoal *

SPECIFICATION

Block Sizes (Depth)	80mm
Mixed blocks per pack	120
Made up of the following sizes:	
400 x 275mm (Blocks per pack)	20
150 x 275mm (Blocks per pack)	20
200 x 275mm (Blocks per pack)	20
250 x 275mm (Blocks per pack)	20
150 x 225mm (Blocks per pack)	20
300 x 225mm (Blocks per pack)	10
400 x 225mm (Blocks per pack)	10
Coverage per pack (m²)	7.75
Weight per pack (tonne)	1.37
Note: Chartres Boulevard paving packs contains layers of 12 separate paving blocks of 7 various sizes giving a total quantity of 120 blocks.	
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low
Finishes	Olden finish Bush hammered finish †
Applications	For use in all applications.

* Colour purposes only. † Special order.



CHARTRES
BOULEVARD

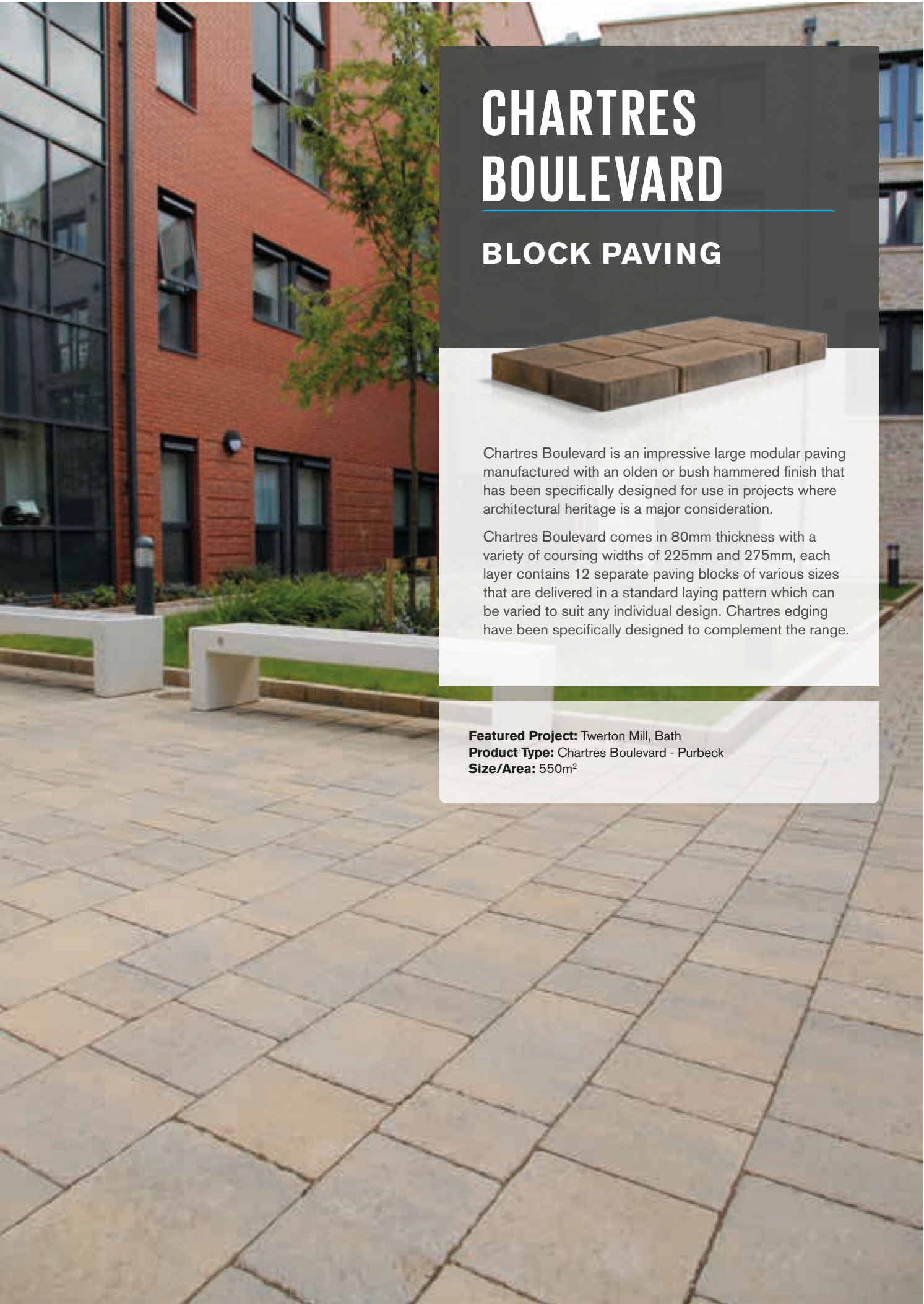
BLOCK PAVING



Chartres Boulevard is an impressive large modular paving manufactured with an olden or bush hammered finish that has been specifically designed for use in projects where architectural heritage is a major consideration.

Chartres Boulevard comes in 80mm thickness with a variety of coursing widths of 225mm and 275mm, each layer contains 12 separate paving blocks of various sizes that are delivered in a standard laying pattern which can be varied to suit any individual design. Chartres edging have been specifically designed to complement the range.

Featured Project: Twerton Mill, Bath
Product Type: Chartres Boulevard - Purbeck
Size/Area: 550m²





CHARTRES COBBLES

BLOCK PAVING



Chartres Cobbles have been created with an olden finish to emulate the old stone that is traditionally used on rural and heritage sites providing a high quality block paver.

Chartres Cobbles can be traditionally coursed or laid in more unusual patterns such as circles or Flanders fans giving an intricate and attractive finish to any project. Chartres edging and starter circles have been specifically designed to complement the range.

Featured Project: Twerton Mill, Bath
Product Type: Chartres Cobbles / Chartres Edging / Chartres - Purbeck
Size/Area: 80m² / 500m²

SPECIFICATION

Block Sizes (Depth)	60mm	80mm
100 x 100mm (Blocks per pack)	1120	800
Coverage per pack (m ²)	11.2	8.0
Weight per pack (tonne)	1.47	1.41
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low	
Finishes	Olden finish Bush hammered finish †	
Applications	60mm for use on footpaths and domestic drives. 80mm for use on commercial sites and roads.	

† Special order.

COLOURS



Cotswold



Traditional



Purbeck



Vendage



Pennant

COLOURS



Natural



Charcoal



Red Brindle



Autumn Yellow



Golden Brindle



Vendage

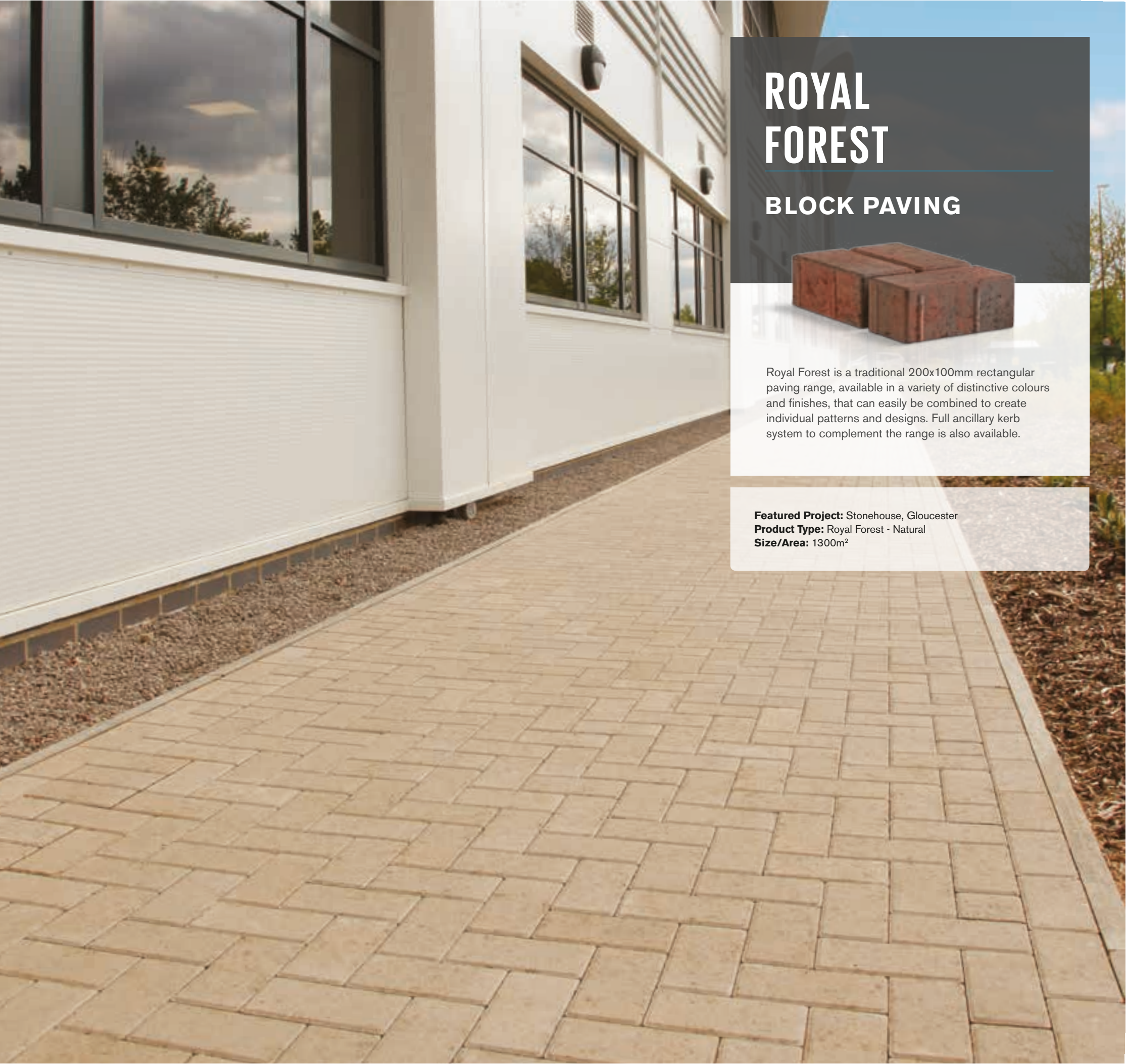


Purbeck

SPECIFICATION

Block Sizes (Depth)	50mm	60mm	80mm
200 x 100mm (Blocks per pack)	424	424	296
Coverage per pack (m²)	8.48	8.48	5.92
Weight per pack (tonne)	0.933	1.1	1.04
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 50mm block Class 1 Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering 50mm block Class 2 60mm & 80mm block Class 3 Slip/skid resistance Low		
Finishes	Standard finish Olden finish † Bush hammered finish †		
Applications	50mm and 60mm for use on footpaths and domestic drives. 80mm for use on commercial sites and roads.		

† Special order.



ROYAL FOREST

BLOCK PAVING



Royal Forest is a traditional 200x100mm rectangular paving range, available in a variety of distinctive colours and finishes, that can easily be combined to create individual patterns and designs. Full ancillary kerb system to complement the range is also available.

Featured Project: Stonehouse, Gloucester
Product Type: Royal Forest - Natural
Size/Area: 1300m²

COLOURS



Natural



Charcoal



Red Brindle

SPECIFICATION

Block Sizes (Depth)	60mm	80mm
200 x 100mm (Blocks per pack)	560	400
Coverage per pack (m²)	11.2	8.0
Weight per pack (tonne)	1.47	1.41
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low	
Finishes	Standard finish	
Applications	Commercial, residential and retail especially if subject to traffic from small wheeled trolleys.	



FINELINE
BLOCK PAVING



Fineline is an attractive and functional rectangular block paving manufactured with a fine chamfer for a smoother running surface. Available in a variety of distinctive colours it is suitable for commercial, residential and especially retail schemes subject to traffic from small wheeled trolleys. Full ancillary kerb system to complement the range is also available.

Featured Project: Lidl, West Bromwich
Product Type: Fineline - Charcoal
Size/Area: 1800m²



**STANDARD
KERBS**

Pages 56



**BULLNOSE
KERBS**

Pages 57



**ECOGRAVITE KERB,
EDGING & CENTRE STONE**

Pages 58



**CHARTRES &
FOREST EDGING**

Pages 59



**TACTILE
BLOCK PAVING**

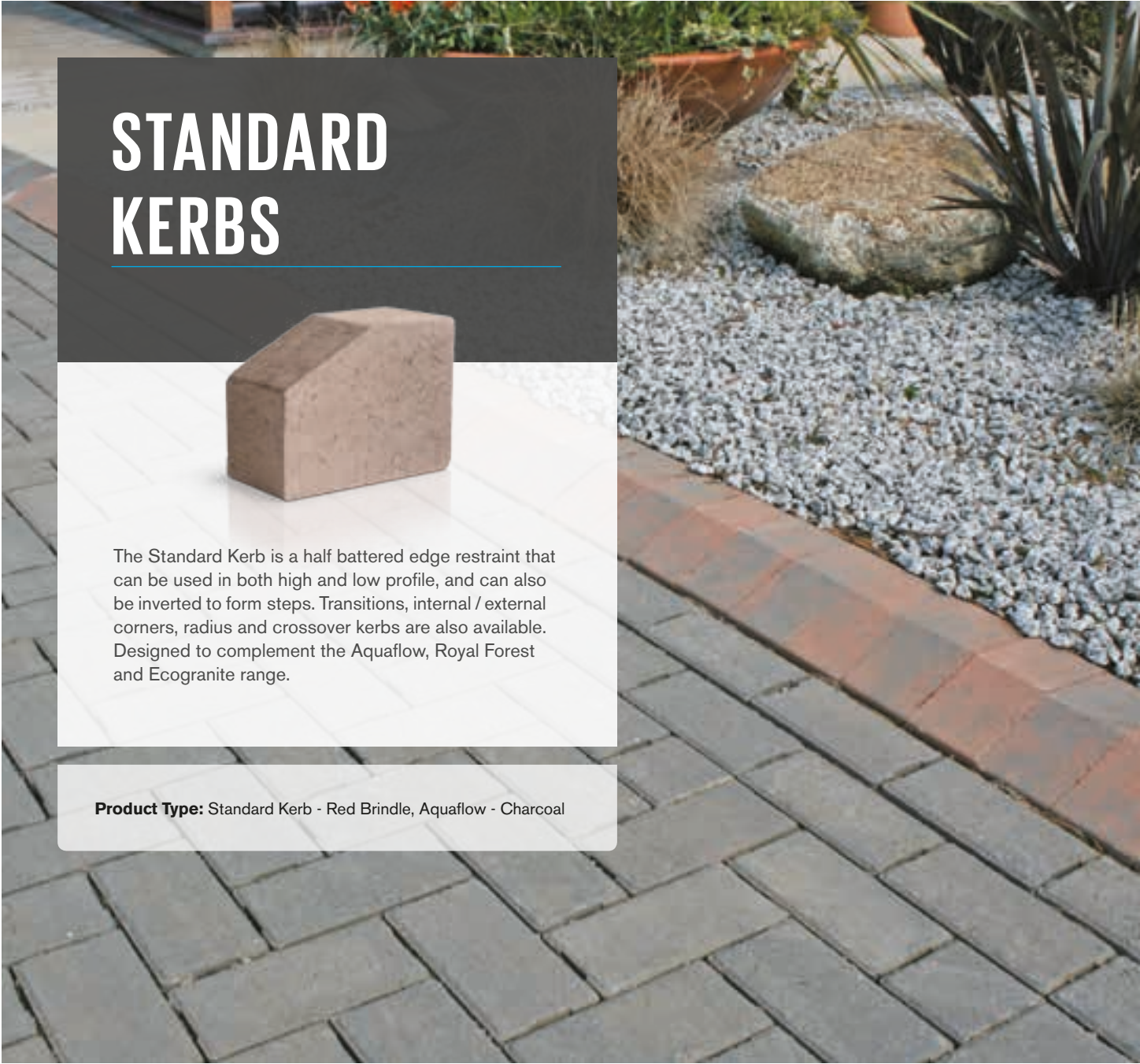
Pages 60



**DEMARCATIION
BLOCK PAVING**

Pages 61



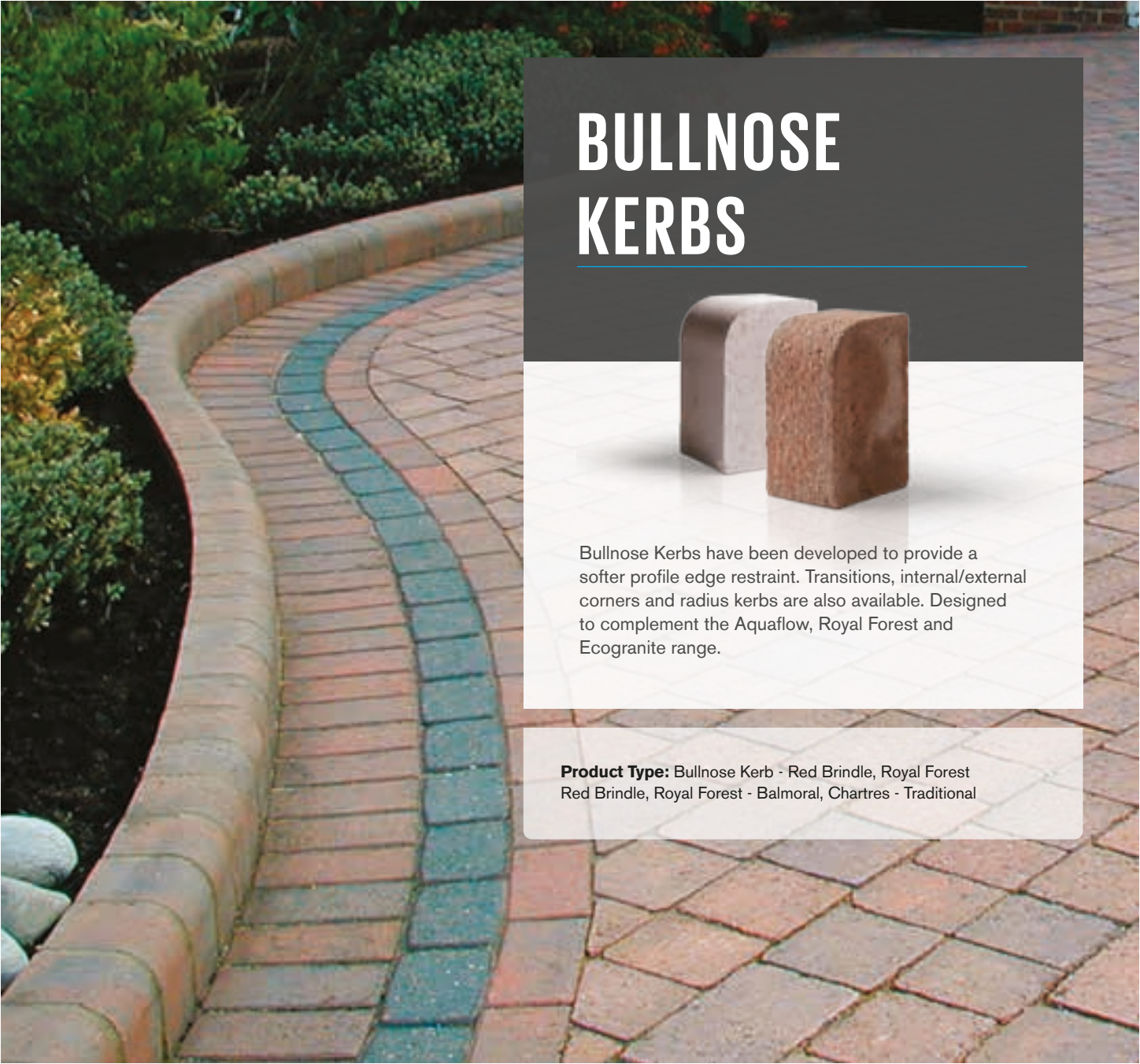


STANDARD KERBS



The Standard Kerb is a half battered edge restraint that can be used in both high and low profile, and can also be inverted to form steps. Transitions, internal / external corners, radius and crossover kerbs are also available. Designed to complement the Aquaflow, Royal Forest and Ecogranite range.

Product Type: Standard Kerb - Red Brindle, Aquaflow - Charcoal



BULLNOSE KERBS



Bullnose Kerbs have been developed to provide a softer profile edge restraint. Transitions, internal/external corners and radius kerbs are also available. Designed to complement the Aquaflow, Royal Forest and Ecogranite range.

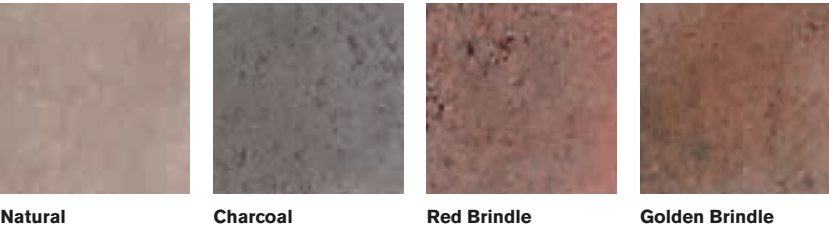
Product Type: Bullnose Kerb - Red Brindle, Royal Forest
Red Brindle, Royal Forest - Balmoral, Chartres - Traditional

SPECIFICATION

Block Sizes	
150x200x100mm (Blocks per pack)	200
Coverage per pack (m)	20m linear
Weight per pack (tonne)	1.22
Finishes	Standard & Textured [†] Ecogranite [†]
Internal & external corners and transitions also available	
Manufactured to BS EN 1340:2003	

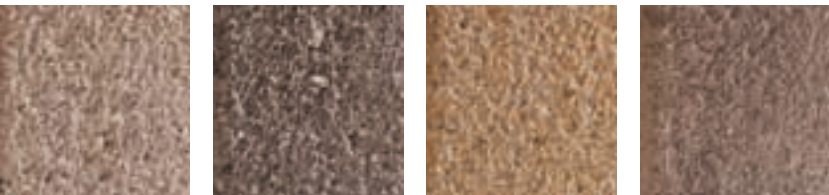
* Colour purposes only. † Special order.

STANDARD KERB COLOURS



Natural Charcoal Red Brindle Golden Brindle

ECOGRANITE KERB COLOURS



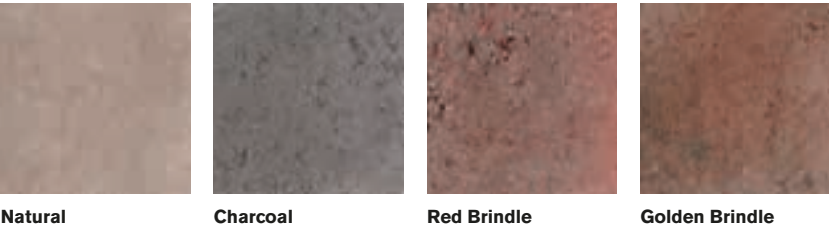
Cornish Silver Grey[†] Balmoral[†] Tintagel[†] Truro[†]

SPECIFICATION

Block Sizes	
125x190x100mm (blocks per pack)	180
Coverage per pack (m)	18m linear
Weight per pack (tonne)	1.14
Finishes	Standard & Textured [†] Ecogranite [†]
Internal & external corners and transitions also available.	
Manufactured to BS EN 1340:2003	

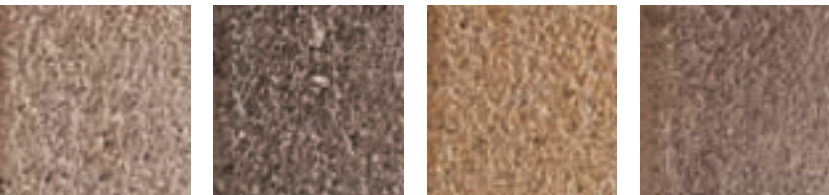
* Colour purposes only. † Special order.

STANDARD BULLNOSE COLOURS



Natural Charcoal Red Brindle Golden Brindle

ECOGRANITE BULLNOSE COLOURS



Cornish Silver Grey[†] Balmoral[†] Tintagel[†] Truro[†]

ECOGRANITE

KERB, EDGING & CENTRE STONE

Kerb

255

125

250

Edging

200

100

250

Centre Stone

145

125

333

Quadrant

255

255

Formpave Ecogranite is an environmental alternative to the use of freshly quarried granite and contains over 60% by-product material. Ecogranite edging has been specially designed to complement the Ecogranite range and are available in a bush hammered finish.

Product Type: Ecogranite Edging Tintagel & Ecogranite Setts Cornish

OVER 60% RECYCLED CONTENT

CHARTRES & FOREST EDGING

Forest Edging

Chartres Edging

Chartres and Forest Edging are substantial all-purpose edge restraints. They are quick and easy to lay and allow surface water to drain easily when laid flush with paved areas.

These robust units that are 200mm in depth are perfectly matched with our paving, offering superb structural restraint and appealing aesthetics.

Featured Project: Ardnac Park, Southampton
Product Type: Forest Edging - Charcoal

SPECIFICATION

Ecogranite Kerb (mm)	255x250x125
Coverage per pack (lm)	12
Weight per pack (tonne)	0.802
Ecogranite Edging (mm)	200x250x100
Coverage per pack (lm)	24
Weight per pack (tonne)	1.07
Ecogranite Centre Stone (mm)	145x333x125
Coverage per pack (lm)	24
Weight per pack (tonne)	0.905
Finishes	Bush Hammered
Manufactured to: BS EN 1340:2003	

* Colour purposes only. † Special order.

58

ECOGRANITE COLOURS

Cornish Silver Grey †

Balmoral †

Tintagel †

Truro †

This image is made up of quadrant, Ecogranite kerb, dropper (4 in set) and centre stone.

Quadrant & Dropper

SPECIFICATION

Forest Edging	
Block Sizes	
200x500x100mm (blocks per pack)	54
Coverage per pack (lm)	27
Weight per pack (tonne)	1.2
Chartres Edging	
Block Sizes	
200x250x100mm (blocks per pack)	96
Coverage per pack (lm)	24
Weight per pack (tonne)	1.07
Finishes Forest Edging	Standard finish
Finishes Chartres Edging	Olden finish
Finishes Chartres Edging	Bush Hammered†
Manufactured to: BS EN 1340:2003	

* Colour purposes only. † Special order.

FOREST EDGING COLOURS

Natural

Charcoal

Red Brindle

Golden Brindle

CHARTRES EDGING COLOURS

Cotswold

Traditional

Purbeck

Vendage

Pennant

59



TACTILE

BLOCK PAVING

Tactile paving provides a warning to visually impaired pedestrians, to differentiate between where the footway ends and the carriageway begins. Our unique sized high strength tactile pavers have been specially designed to overcome the breakage problems caused by accidental overrun experienced by local authorities with larger element tactile paving.

Featured Project: Minehead Station Regeneration
Product Type: Tactile Block - Autumn Yellow



DEMARCATIION

BLOCK PAVING

Demarcation block paving is faced with either a non-reflective epoxy paint, or ballotini glass beads can be integrated to the surface of the painted block to reflect light.

Featured Project: Lidl, West Bromwich
Product Type: Demarcation - White Epoxy

SPECIFICATION

Block Sizes (Depth)	60mm
200 x 133mm (blocks per pack)	300
Coverage per pack (m ²)	7.98
Weight per pack (tonne)	1.1
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Slip/skid resistance Low
Finishes	Standard finish
Applications	Pedestrian Crossings

COLOURS



Autumn Yellow

SPECIFICATION

Block Sizes (Depth)	60mm	80mm
200 x 100mm (Blocks per pack)	560	400
Coverage per pack (m ²)	11.2	8.0
Weight per pack (tonne)	1.47	1.41
Precast concrete block paving Manufactured to: BS EN 1338:2003 Tensile splitting strength 3.6 Mpa	Abrasion 60mm block Class 3 Abrasion 80mm block Class 4 Resistance to weathering Class 3 Slip/skid resistance Low	
Finishes	Standard finish	
Applications	Car parks, loading bays and trafficked environments where enhanced visibility is required.	

* Colour purposes only. † Special order.

COLOURS



White / Ballotini †



Yellow * †

INDEX

Important General Information	63
Principles of SuDS	64-65
Aquaflow - The System	66-67
Aquaflow - Hydraulic Performance	68-69
Aquaflow - Structural Performance	68-69
Design Services	70
Water Quality Case Study	71
Q24 Specifications	72-73
Aquaflow Components	74
Stone Specifications	75
Aquaflow Technical Information	76-81
Laying Patterns	82
Kerb Systems	83
How to Lay Block Paving	84-85
Paving Maintenance	86-87
Glossary	88-90

PRODUCTS

Upon delivery and prior to being laid, all products should be examined for defects or damages.

INSTALLATION

Products should be laid in accordance with the latest British Standard.

JOINT FILLING SAND

Formpave kiln dried sand is recommended for use with all types of concrete block paving with the exception of permeable paving, where Formpave 3mm grit should be used.

COLOUR AND FINISH VARIATIONS

Formpave manufactured concrete block paving products that are made from naturally occurring materials with outstanding density and stability. However as with all concrete products, slight variations in colour and finish may occur.

Formpave makes every effort to ensure consistency with product colour, yet variations between product batches can occur. Formpave strongly recommend that products are mixed from three or more packs.

The colour of new paving block products will inevitably differ compared to products that have been laid for a length of time.

Please note: 'Natural' as used in the Aquaflow, Royal Forest and Kerb range is not coloured with the aid of pigments. The colour is that of the raw materials used and may vary considerably between batches.

EFFLORESCENCE

All concrete products may suffer from efflorescence; a white crystalline deposit occurring naturally on the surface. If efflorescence occurs it may mask the colour of the product for a period of time, but will disappear with use and is in no way detrimental to the performance of the product. No responsibility can be accepted for this natural occurrence.

SURFACE GRAZES

During installation from, for example any plate vibrating process, minor scuffs and marks can occur on the block paving, but over time these will weather.

MANUFACTURING AND QUALITY SYSTEMS

Formpave, a BSI registered company, production plant has the BS EN ISO 9001: 2000 Quality Assurance and BS EN ISO 14001 Environmental Management accreditations. The technology used in the works and the company's quality assurance scheme provides complete works traceability of every block made.

PRODUCT DEVELOPMENT

The designs shown in this brochure are illustrative only. Every effort is made to ensure the accuracy of all textural and pictorial content in this brochure. Formpave reserves the right to change specifications without prior notice. All Formpave paving products are backed by BS EN ISO 9001 certification for product quality and service.

ADVERSE WEATHER

Do not use frozen materials or lay sand bedding on frozen or frost covered sub-bases. Protect stock piled bedding sand to ensure it does not become saturated. Protect un-compacted areas of paving from heavy rainfall.

SAMPLES

Sample blocks are available directly from Formpave - please contact the sales office on 01594 836999.

COLOUR REPRODUCTION

Care has been taken to reproduce the colour of the blocks in this document as accurately as possible. However, we cannot reproduce exact colours and recommend that you examine a sample block.

ADVISORY SERVICE

Forterra Formpave are pleased to offer detailed technical advice on all products.

LOW POTENTIAL FOR SLIP PAVING

All cement and bituminous bound surfaces eventually show a degree of polishing during use. This produces lower slip/skid resistance and can be more dangerous in wet weather.

Formpave have developed low potential for slip blocks and paving, the slip/skid resistance is classified as low for conventional paving and extremely low for all Ecogranite block paving.

Formpave standard products possess excellent wet skid resistance. There are, however, occasions when enhanced skid resistance surfacing is desirable, for example:

- on steps
- on access ramps
- on areas to be used by elderly or infirm people
- on roads with heavy traffic loading
- or in shopping precincts.

The polished skid resistance of Formpave products can be increased by specifying a textured finish where available (to special order only).

This table compares mean skid resistance values obtained on standard, standard bush hammered, gritstone and gritstone bush hammered paving blocks. The results were obtained by independent testing undertaken by Ceram Building Technology, a division of Ceram Research Limited.*

	Unpolished paver value	Polished paver value	Unpolished skid resist value	Polished skid resist value
Product	UPV	PPV	USRV	PSRV
Standard aggregate	76	60	71	57
Standard aggregate, bush hammered	90	74	88	70
Gritstone aggregate	78	68	73	64
Gritstone aggregate bush hammered	92	77	87	73

The texture depth of Formpave bush hammered pavers and slabs can be adjusted to achieve specific depth requirements.

BS technical specification		
Paving blocks Covered by BS EN 1338: 2003	Standard	Gritstone
Minimal tensile splitting strength (average 3.6 Mpa)	2.9 MPa	2.9 MPa
Dimentional tolerances		
Length	+/-2mm	+/-2mm
Width	+/-2mm	+/-2mm
Thickness	+/-3mm	+/-3mm

Small element paving
Comply with BS7263 Part 1-2001

*CERAM Queens Road, Penkhull, Stoke-on-Trent ST4 7LQ

PRINCIPLES OF SuDS

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 of components and techniques that are deemed to be more sustainable and deal with storm water at source.

Featured Project: Kimberley STEM College. Rainwater collected from car park and released into adjoining lake.
Product Type: Aquaflow
Size/Area: 4000m²



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

The Formpave 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 Aquaflow blocks and the Aquaflow system deliver the following benefits:

REDUCING SURFACE WATER

Dealing with surface water at the source reduces the effects of urbanisation and the impact of localised flooding.

IMPROVING WATER QUALITY

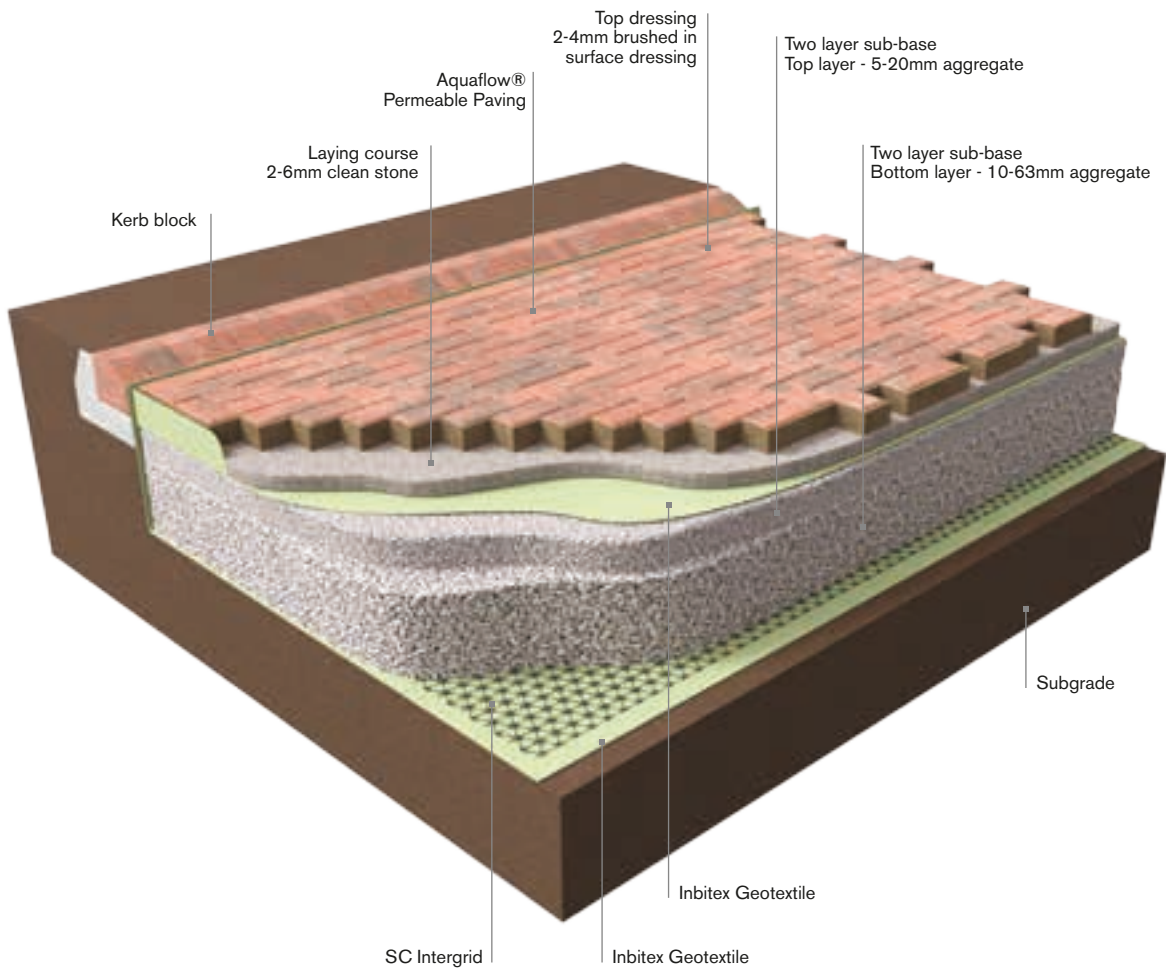
Aquaflow provides two levels of storm water treatment; removing harmful pollutants and protecting the environment downstream.

CONTRIBUTING TO THE BIODIVERSITY

Contributing to the biodiversity of development by working in conjunction with other SuDS techniques. Aquaflow allows any hard standings, including roads, to be used as drainage, producing a traditional looking surface with many desirable features.



FORMPAVE AQUAFLOW® SUSTAINABLE URBAN DRAINAGE SYSTEM



Formpave have used research and design to evolve the Aquaflow permeable paving system into one of the most cost effective and functional SuDS within the marketplace. The 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 Aquaflow system fits neatly within any block paving project, where your paving design becomes your drainage design and vice versa.

Formpave Aquaflow SuDS can be designed as a fully attenuated, fully infiltrated or as a partial infiltrated 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 Aquaflow system is cleaned and filtered through the Inbitex Geotextile layers that promote microbial action. Water quality improvement allows secondary non-potable uses can be carried out such as flushing toilets and watering the garden.

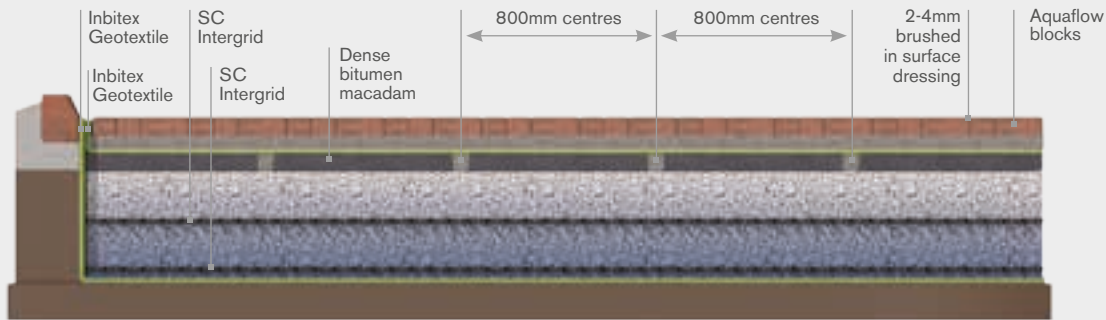
The Aquaflow system can be designed for use in both trafficked and pedestrianised areas, allowing the collection and treatment of storm water from any paved surface.

ADVANTAGES OF AQUAFLOW®

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

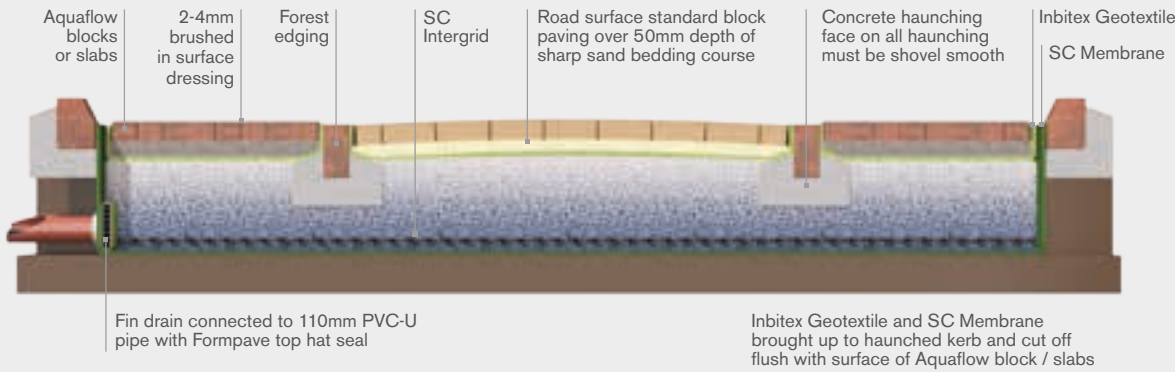
AQUAFLOW PAVING WITH TEMPORARY RUNNING SURFACES

Infiltration system typical adoptable section.



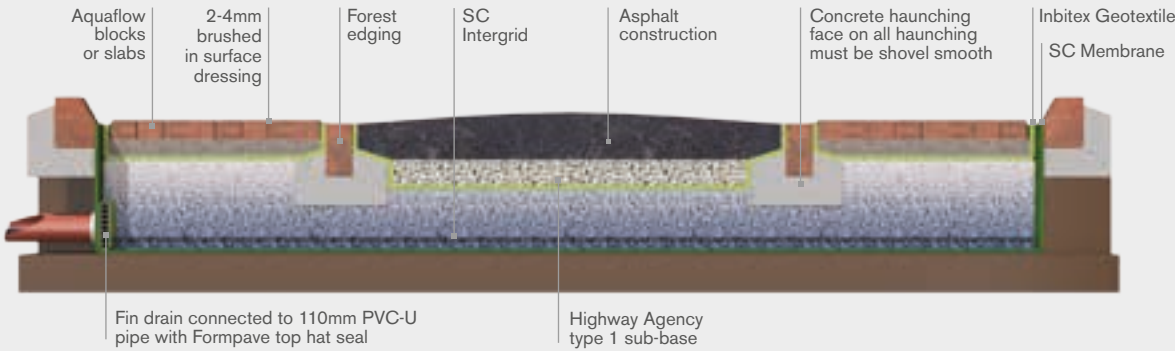
AQUAFLOW PAVING IN CONJUNCTION WITH STANDARD BLOCK PAVED ROAD SURFACES

Tanked system section Aquaflow pavement with undersealing membrane.



AQUAFLOW PAVING IN CONJUNCTION WITH ASPHALT ROAD SURFACES

Tanked system section Aquaflow pavement with undersealing membrane.



AQUAFLOW® HYDRAULIC PERFORMANCE

The advantages of using the Aquaflow® system for collection, treatment and control of storm water is realised on the surface and below ground.



The Aquaflow® blocks and system comply with SuDS principles and improve water quality in the following ways:

WATER QUALITY

- Inbitex Geotextile has proven pollution control benefits, removing the requirement for petrol interceptors and other filtration or treatment systems.
- Sub-base stone provides a second level of storm water treatment; discharge from the system is PH neutral.

QUANTITY BENEFITS REALISED

- Aquaflow block surface eliminates surface water run off
- Storm water is dealt with at source
- Removes the first 5mm of any rainfall event
- Delays and reduces storm water discharge
- Allows collection of impermeable surface and roof water

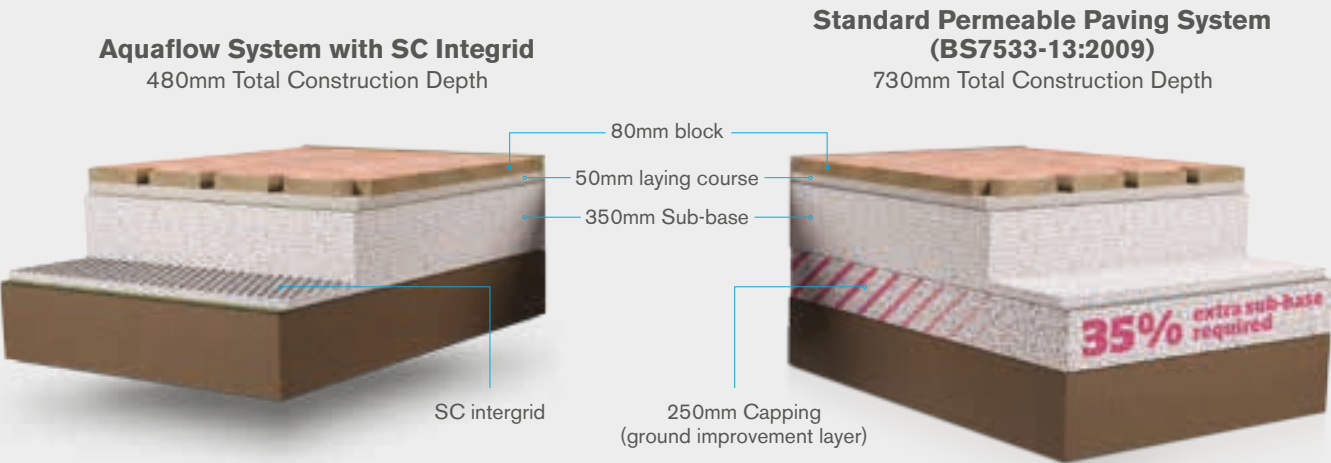
In terms of storm water quality and quantity control, the Aquaflow® system is proven to be very efficient and has been selected for these key principles for a number of schemes.



Inbitex Geotextile. Proven water quality improvement

AQUAFLOW® STRUCTURAL PERFORMANCE

SC Intergrid and Inbitex Geotextile provided us with two component developments that make the Aquaflow system unique.

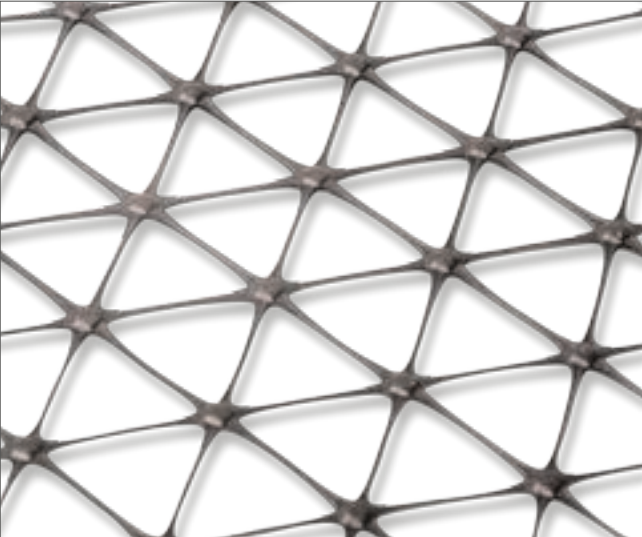


SC Intergrid is introduced into the sub-base design which confines and stabilises the sub-base stone and provides the following benefits.

- Reduced sub-base thickness - minimum 35% reduction
- Increased bearing capacity
- Reduced construction costs
- Reduce environmental impact

SC Intergrid increases the structural performance of the Aquaflow system whilst reducing the depth of sub-base stone. In direct comparison with a British Standard structural permeable paving design there is a difference of 250mm between the systems. This represents 250mm less excavation and disposal of waste materials, saving not only time and costs on any project but also represents a saving of natural resources.

The Formpave technical team have a knowledge base and set of construction details to suit almost all structural applications for the Aquaflow system, ranging from domestic driveways to heavily trafficked distribution yards.



SC Intergrid. Proven structural performance with lower construction cost

DESIGN SERVICE

Formpave offer a comprehensive in-house design service to suit individual site requirements. Our team of experienced engineers have designed over 3000 Aquaflow schemes over 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.



6 YEAR DESIGN WARRANTY AND PROFESSIONAL INDEMNITY INSURANCE

PRE-CONSTRUCTION DESIGN MEETINGS

STRUCTURAL AND HYDRAULIC AQUAFLOW DESIGNS COMPLETE WITH LAYOUT DRAWINGS AND CONSTRUCTION DETAILS

VALIDATION OF PERMEABLE PAVING DESIGNS

FREE TECHNICAL ADVICE

Contact us on 01594 836999 for free technical advice

SEVERN TRENT HQ CASE STUDY

Formpave design service, worked in partnership with Arup, Capita Symonds and main contractors BAM, to produce a SuDS system design.

Formpave supplied Severn Trent Water with a SuDS system for the car park and pedestrian zones of its offices in Shrewsbury, Shropshire.

The 2,000m² car park uses Ecogranite Aquasett permeable paving block, working in conjunction with Formpave's patented Aquaflow system. The remaining 2,500m² of pedestrian zones and hard landscaping areas uses Ecogranite Chartres, a standard block paver offering similar aesthetics.

In addition to discharge restrictions, on-site pollution control was also a key factor for the client, civil and structural engineers - Arup and landscape architects - Capita Symonds, when specifying the paving and SuDS solution.

Aquaflow's unrivalled ability to attenuate and produce clean, pH neutral water for discharge, met all the stringent project requirements.

The Aquaflow system removes oils, hydrocarbons and heavy metals, making it a straightforward surfacing solution for car parking zones and vehicular areas. As part of Formpave's research and development programme, research undertaken at Coventry University on microbial growth has shown that the system is capable of degrading at least 400g of oil per square metre each year.



Featured Project: Severn Trent HQ
Location: Shrewsbury, Shropshire
Product Type: Ecogranite Aquasett
Size/area: 4500m²
Architect: Capita Symonds
Main Contractors: BAM

Q24 SUSTAINABLE URBAN DRAINAGE SYSTEM SPECIFICATIONS

AQUAFLOW PAVING

TYPE(S) OF PAVING
Permeable concrete block Paving

MANUFACTURER:

Formpave
Tufthorn Avenue, Coleford
Gloucestershire, GL16 8PR
t 01594 836999
f 01594 810577
www.forterra.co.uk/formpave

REFERENCE

Aquaflow®, Aquapave®, Aquaflow ML®,
MLE®, MLTB®, Aquasett® or Aquaslab®.

SIZE

As per manufacturer's specification.

COLOURS

Various colours and finishes available.

SETTING OUT

Aquaslab® Staggered stretcher bond.

Aquasett single size® Staggered
stretcher bond or 90o herringbone.

Aquasett combined®
Staggered stretcher bond.

Aquaflow® block/Aquapave®: 90°
herringbone

Aquaflow ML® Include stretcher
course around edge in conjunction
with MLE and MLTB.

KERBS

Standard kerb system or Forest Edging:
both to be haunched with concrete.

LAYING COURSE*

50mm depth of 2-6mm. single size clean
crushed stone to BS EN 13242: 2002.

INBITEX® GEOTEXTILE

As specification.

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 laying
course and 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.

ALTERNATIVE SUB-BASE MATERIALS

Recycled subbase materials such as
concrete and treated rail ballast can
be used but must meet similar grading
and strength specification as the natural
aggregates specification. This material
should be sourced within 30km of the site
to gain maximum BREEAM points.

DEPTH OF SUB-BASE

It is recommended that a subbase depth
of 350mm should be used. The depth of
sub-base may be varied at the discretion
of the Engineer. The subbase should be
compacted in 150mm layers to Clause
802 of the highways specification.

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.

QUARTZITE SURFACE DRESSING

2-4mm Quartzite Gritstone. Material must
be clean, have well defined edges and
conform to BS EN 1097-2:1998
BS EN 1091-8:2000 Annex A.

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.

FIN DRAIN

150/300mm Fin Drain.

AQUAFLOW® COMPONENTS

INBITEX GEOTEXTILE

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



SC INTERGRID

Exclusive to 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 Aquaflow system.



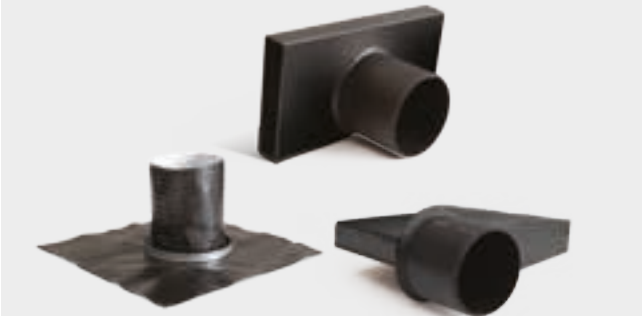
AQUAFLOW DISTRIBUTION TANKS

Used for connecting rainwater downpipes and other impermeable areas for drainage to the Aquaflow system. Can be used in trafficked areas. Available in three different sizes depending on catchment area.



TOP HATS, TAPE AND FITTINGS

Aquaflow attenuation system ancillaries.



STONE SPECIFICATIONS



LOWER SUB-BASE LAYER

10-63mm clean crushed stone	
Sieve sizes	% passing
80mm	100
63mm	90-100
40mm	60-80
20mm	15-30
10mm	0-5
Reference specification	BS EN 13242:2002
Material specification	Material supplied shall be referred to as 10-63mm clean crushed stone and conform to the above sieve analysis and aggregate testing.



LAYING COURSE

2-6mm clean crushed stone	
Sieve sizes	% passing
10mm	98-100
6.3mm	80-100
2mm	0-20
1mm	0-5
Reference specification	BS EN 13242:2002
Material specification	Material supplied shall be referred to as 2-6mm clean crushed stone, typically limestone or granite, gravel is not permitted. This material is to conform to the above sieve analysis and aggregate testing.



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 Quartzite gritstone	
Sieve sizes	% passing
6.3mm	100
5mm	95-100
3.35mm	66-90
1.18mm	0-20
600 microns	0-8
63 microns	0-1.5
Reference specification	BS EN 1097-2:1998 BS EN 1091-8:2000 Annex A
Material specification	Material supplied shall be referred to as 2-4mm clean Quartzite and conform to the above sieve analysis and aggregate testing. This defines the 2-4mm surface dressing to be applied to the surface of Aquaflow pavers and subsequently brushed / vibrated between pavers.

Aggregate Testing
Los Angeles Coefficient (LA) - Determination of resistance to fragmentation = BS EN 1097-2:1998
Note: Lower values than those specified signifies better resistance to fragmentation and abrasion and is therefore acceptable

INBITEX

Thermally bonded nonwoven geotextile developed to optimise the cleansing of water entering the system. Green 70% polypropylene and 30% polyethylene non-woven geotextile manufactured in accordance with a management system which complies with the requirement of BS EN ISO 9001:2008.

Inbitex geotextile is resistant to all naturally occurring soil alkalis and acids (ie to acids of pH2) and shall be non-biodegradable.

Inbitex geotextile should be delivered in polythene wrappers and will only be exposed to sunlight for short periods during installation thereby inhibiting attack by ultra violet light

Mechanical properties	
Wide width strip tensile	EN ISO 10319
Mean peak strength	8.50kN/m
Elongation at peak strength	28%
CBR puncture resistance	EN ISO 12236
Mean peak strength	1575N
Trapezoidal tear resistance	ASTM D4533
Mean peak strength	325N
Hydraulic properties	
Pore size	EN ISO 12956
Mean AOS O ₉₀	0.145mm
Water flow	EN ISO 11058
Mean flow 10-3m.s-1 (l/m ² .s)	80
Water breakthrough	BS 6906: Part 3
Mean head	50mm
Air permeability	ISO 9237
Mean flow 2875	l/m ² .s
Typical physical properties	
Mass EN 965	130g/m ²
Roll width	4.5m
Roll length	100m
Roll weight	58.5kg

SC INTERGRID

The unique structure of the SC intergrid incorporates several characteristics which out-perform conventional biaxial geogrids in traffic applications.

LOAD DISTRIBUTION

Load distribution is 3-dimensional in nature and acts radially at all levels in the aggregate. For a stabilised layer to be effective it must have the ability to distribute load through 360 degrees.

MULTI-DIRECTIONAL PROPERTIES

The SC Intergrid has three principal directions of stiffness, which is further enhanced by their rigid triangular geometry. This produces a significantly different structure than any other geogrid and provides high stiffness through 360 degrees. A truly multi-directional product with near isotropic properties.

JUNCTION INTEGRITY & EFFICIENCY

The SC intergrid is produced from an extruded sheet of polypropylene. This is then punched and stretched to create the unique structure, which coupled with the design of the junctions results in a product with high junction strength and stiffness.

Testing has been conducted in line with each of the three rib directions. The junction strength was found to be essentially equal to the rib strength - giving a junction efficiency of 100%.

Typical physical properties	
Mass	0.24g/m ²
Roll width	4m
Roll length	50m
Roll weight	48.5kg

GREATER INTERLOCK & CONFINEMENT

In a mechanically stabilised layer, aggregate particles interlock within the geogrid and are confined within the apertures, creating an enhanced composite material with improved performance characteristics. The shape and thickness of the geogrid ribs and the overall structure of SC intergrid has a direct influence on the degree of confinement and efficiency of the stabilised layer.

PROVING THE IMPORTANCE OF RIB PROFILE

SC Intergrids have greater rib depth compared with conventional biaxial geogrids. Traffic tests and analytical modelling were undertaken to compare performance advantages between the biaxial and SC Intergrid in a mechanically stabilised layer. The results were conclusive in confirming that an improved structural performance was achieved with the SC Intergrid design.

SUSTAINABLE DESIGN

The improved performance of SC Intergrid enables greater reduction in aggregate layer thickness, further reducing the quantities of natural aggregates used and the volume of material to be excavated. These additional savings in materials and transport will help engineers to meet their sustainability objectives.

A number of tests and trials have been conducted and prove the performance benefits of the SC Intergrids. Tests included traffic trials at the University of Nottingham and, on a large scale, at the Transport Research Laboratory (TRL). Installation damage assessment, bearing capacity and field tests were also conducted as part of the comprehensive and rigorous testing programme.

AQUAFLOW SC MEMBRANE & SC MEMBRANE GT

UK manufactured membranes for use with the Aquaflow Attenuation system.

APPLICATION

Aquaflow SC Membrane and SC Membrane GT are used to line Formpave Aquaflow attenuation systems to create an impermeable containment barrier. Thus, providing the ability to store storm water and stop ingress to the ground. Joints can be taped or welded depending on application.

COVERING

The membrane should be covered as soon as possible after installation. Care should be taken to ensure that the membrane is not punctured, stretched or displaced when applying the sub-base.

STORAGE AND HANDLING

Aquaflow SC Membrane & SC Membrane GT is classified as non-hazardous when used in accordance with the manufacturers' instructions. The membrane is chemically inert and is not affected by acids or alkalis that may be present in the subbase or sub-grade.

The product is not intended for use where it will be exposed for long periods of outdoor weathering.

When the weather is cold, Aquaflow SC double sided jointing tape should be kept in a warm, dry place until needed. Membrane installation is not recommended below 5°C.

TECHNICAL DATA

The values given are indicative and correspond to typical results obtained in laboratories and testing institutes.

SC Membrane Typical physical properties	
Mass	460g/m ²
Roll width	4m (folded to 1m)
Roll length	15m
Roll weight	28kg

SC Membrane GT Typical physical properties		
Thickness	≥ 1mm	
Roll width	2m	
Roll length	25m	50m
Roll weight	45kg	90kg

DISTRIBUTION TANKS FIN DRAIN TOP HAT SEAL

For use in association with additional stormwater catchment.

DISTRIBUTION TANKS

For use in association with down pipe drainage into a tanked system.

Material	Polypropylene, Polyethylene, PVC (connector)	
Volumetric void	92 %	
Effective perforated surface area	59 %	
Compressive strength (1) (unconfined)	715 kN/m ²	
Compressive strength (2) (confined in typical pavement, 130mm cover)	1650 kN/m ²	
Nominal size		
Single	354 x 708 x 150mm	
Double	708 x 708 x 150mm	
Triple	1062 x 708 x 150mm	
Nominal volume		
Single	0.0375m ³	
Double	0.075m ³	
Triple	0.1125m ³	
Weight		
Single	3kg	
Double	6kg	
Triple	9kg	

FIN DRAIN

The Fin Drain has a minimum permeable surface of 75%. This allows rapid removal of water through all faces and the clog resistance of the geotextile ensures that the system remains silt free.

Drainage composite comprising black high density polyethylene cuspated drainage sheet (25mm thick) wrapped in green Inbitex geotextile as described above.

Fin Drain is resistant to all naturally occurring soil alkalis and acids (ie to acids of pH2) and shall be non-biodegradable.

Fin Drain will only be exposed to sunlight for short periods during installation thereby inhibiting attack by ultra violet light.

Fin drain may be considered as a column of air that allows water the shortest, easiest and most effective passage from the surrounding subbase to a dedicated outlet.

Typical physical properties	
Mass	1400g/m ²
Roll width	0.15 & 0.30m
Roll length	50m
Roll weight	10.5 & 21kg
Roll diameter	1.0m

TOP HAT SEAL

Pre-formed seal to be sleeved around the outlet pipe to form a watertight seal with the SC Membrane tanking.

Storm water source control system* Aquaflow permeable paving

CONSTRUCTION

All construction work on pavements should be carried out following completion of general site works. Top soiling must be completed to adjacent areas to prevent wash down of fine materials.

SUB GRADE

- Excavate to sub grade as per the design drawings.
- All soft areas should be removed and filled with suitable replacement material.
- The sub grade should be compacted with a vibrating plate.

KERBS/EDGINGS

- The paved areas must be firmly restrained.
- Kerb haunching must extend to a minimum depth of 150mm below the base of the kerb.
- The kerb/edging must extend with sufficient height above the haunching to accommodate the full laying course depth and block height.

SC MEMBRANE® GEOSYNTHETIC

Where the finished system is not required to be 100% watertight

- SC Membrane® to be laid on formation with 300mm laps between adjoining sheets.
- Joints to be taped using SC Tape.

SC MEMBRANE GT® GEOSYNTHETIC

Where 100% watertight system is required (Contaminated land, water harvesting, construction near basements etc.)

- Lay protection fleece or 75mm sand blinding on formation
- Lay SC Membrane GT® on fleece or blinding.
- Joints should be fully welded in accordance with manufacturer guidelines or by specialist sub-contractor - a taped joint will be insufficient.
- Welding can be completed on site or pre-formed off site and delivered ready for installation.
- Lay protection fleece to internal face of the SC Membrane GT® liner.
- SC Membrane GT® should be brought up to the top of laying course level and cut off.

INBITEX® GEOTEXTILE - INFILTRATION SYSTEMS

- Lay Inbitex® Geotextile instead of SC Membrane® to provide an infiltration system rather than an attenuation system, overlapping joints by 300mm.

SC INTERGRID® GEOGRID

- Laid on the SC Membrane®/Inbitex® Geotextile before placing the sub-base stone.
- Joints should overlap by 300mm.
- Further SC Intergrid® Geogrid layers can be incorporated within the sub-base at 300mm vertical intervals to add stability to thicker sub-base layers.

SUB-BASE

Lower layer of sub-base (10-63mm)

- Placed in layers of approx. max 150mm
- Vibrate each layer to compact
- Final couple passes taken with no vibration
- Compaction should continue until 97% of the compacted bulk density achievable under laboratory conditions has been reached- measured with a nuclear density gauge.
- The specified 350mm depth of sub-base may be varied by the Engineer to suit site requirements.

INBITEX® GEOTEXTILE

- Lay Inbitex® Geotextile on top of the sub-base overlapping joints by 300mm.
- Inbitex should be brought up to the haunched kerb/edging and cut-off flush with the surface of the paving.

LAYING COURSE

- Lay and screed to level approximately 50mm depth of 2-6mm single sized crushed stone to BS EN 13242: 2002.
- Final level of the 2-6mm stone must be accurate - stone will compact down much less than sand when the surface blocks are vibrated.

The particle shape of the 2-6mm stone will also affect the degree of compaction. It is recommended that a small trial area should be laid prior to construction to determine the accuracy of final levels.

BLOCK LAYING

- Pre-set the block level by 6mm to allow for the effects of settlement when laid against fixed edgings.
- The blocks and slabs must be tightly butt jointed ensuring that a good fit is achieved.
- Single or double stretcher course of Aquaflow® blocks must be used around the periphery of the paved areas.
- It is recommended that lateral restraints (such as forest edging) should be installed in areas where vehicles turn and/or brake.
- The lateral restraints should be properly constructed and haunched with concrete.

CUTTING BLOCK

- Cut to a tight fit and none are to be smaller than 30% of the unit block size with three machined edges.
- Cut across the 100mm and not the 200mm dimension.
- Blocks should be cut vertically and not under-scord.
- All block cutting should be carried out with a disc cutter.

SURFACE FINISH

- The blocks should be vibrated with a vibrating plate Type DVP75/22" or similar.
- 2-4mm clean quartzite or gritstone should be applied to the surface and brushed in. The tapers and slots between the blocks should be fully filled. Gritstone should swept from surface prior to second pass of vibration.
- Blocks should again be vibrated, and any debris brushed off.
- Process to be repeated until block paved surface joints are full.
- It is recommended to revisit the surface and inspect within 2 months. Top up of joints may be required which may have settled after initial trafficking.

It is important that access to services in or underneath the Formpave Sustainable urban drainage system is undertaken in a disciplined and progressive way.

PROCEDURE

Uplift Aquaflow blocks 1m either side of the line of relevant underground services.

Take up the laying course stone and cut the underlying geotextile membrane along either side of the line of services and parallel with them. Dispose of the laying course stone and geotextile.

Excavate sub-base stone and place adjacent to the excavation on plastic membrane. The subbase stone can be re-used.

Cut intergrid(s) in the same way as the geotextile and dispose of it.

Cut layer of geotextile or waterproof membrane at reduced level along the line of the services in the same way as the higher layer of geotextile and dispose of it.

Excavate material over and around services and put on plastic membrane ready for re-use.

Carry out repair on services.

Once repairs have been completed replace and fully compact the excavated material around the services.

Cut fresh geotextile or waterproof membrane to size allowing additional 300mm extra width either side of the remaining geotextile membrane. Tape new geotextile/membrane in place.

If a heavy duty welded waterproof membrane is installed due to a high water table or the presence of methane the replacement membrane will need to be rewelded to the existing membrane.

Replace the first 250mm depth of sub-base and thoroughly compact, cut and install fresh intergrid(s) allowing 300mm of extra width either side.

Spread and compact final 100mm depth of sub-base.

Cut fresh geotextile membrane to size again allowing 300mm overlap using double sided tape.

Lay and loose screed to level approximately 50mm depth of 2-6mm crushed stone.

Replace surface blocks, vibrate surface blocks to level and dress the surface with 2-4mm clean gritstone and vibrate again. Brush off and dispose of any debris before final vibration.

The information given in this specification is based on data and knowledge correct at the time of printing.

Statements made are of a general nature and are not intended to apply to any use or application outside any referred to in the specification. As conditions of usage and installation are beyond our control we do not warrant performance obtained but strongly recommend that our installation guidelines and the relevant British Standard Codes of Practice are adhered to. Please contact us if you are in any doubt as to the suitability of application.

Product development The designs shown in this brochure are illustrative only. Every effort is made to ensure the accuracy of all textural and pictorial content in this brochure.

Forterra Formpave reserves the right to change specifications without prior notice. All Forterra Formpave paving products are backed by BS EN ISO 9001 certification for product quality and service.

Many water quality variables have been examined in Aquaflow paving, most produced during independent research by UK and overseas universities funded by Formpave.

This data is vital in determining the safety of the rainwater for use both chemically and microbiologically. The table shows the main chemical and microbiological contaminants that have been screened for in Aquaflow water. Also present is information on the authority producing the data and information on when it was produced.

As can be seen from the data, Aquaflow water quality has been intensively analysed by third party organisations.

Although the water quality variables do not all meet drinking water standards, all are in line with surface water discharge standards. The results also were derived using only a geotextile in the upper layers of paving with no further treatment.

To use the water in washing machines or for other domestic purposes, in line treatment such as filtration is recommended to remove suspended particles and some secondary water treatment such as UV sterilisation.

Research Authority	Contaminant	Concentration	Analysis method
Metals			
Coventry University 2008	Aluminium	0.100 mg/l	ICP-OES
	Aresnic	0.002 mg/l	ICP-OES
	Boron	Not detected	ICP-OES
	Cadmium	Not detected	ICP-OES
	Calcium	26.01 mg/l	ICP-OES
	Copper	0.007 mg/l	ICP-OES
	Iron	0.072 mg/l	ICP-OES
	Lead	0.001 mg/l	ICP-OES
	Lithium	0.008 mg/l	ICP-OES
	Magnesium	1.720 mg/l	ICP-OES
	Molybdenum	0.004 mg/l	ICP-OES
	Nickel	0.002 mg/l	ICP-OES
	Potassium	6.210 mg/l	ICP-OES
	Sodium	26.01 mg/l	ICP-OES
	Vanadium	0.013 mg/l	ICP-OES
	Zinc	0.007 mg/l	ICP-OES
Organics, nutrients and others			
Edinburgh University 2007	Ammonia	≤1.0 mg/l	Palintest kit
Severn Trent Laboratories 2008	Benzene	Undetectable	HPLC
Edinburgh University 2007	BOD	0.4-1.0 mg/l	BOD reactor
	Dissolved oxygen	7.5-7.8 mg/l	O2 meter
Coventry University 2008	Electrical conductivity	≤350µS	EC meter
Severn Trent Laboratories 2008	Ethylbenzene	Undetectable	HPLC
Edinburgh University 2007	Nitrate	≤5.50 mg/l	Palintest kit
	Nitrate and Nitrite	≤10 mg/l	Palintest kit
Coventry University 2008	Oil and grease	≤1.0 mg/l	Solvent extraction
	pH	6.3-8.4	pH meter
Edinburgh University 2007	Phosphates	≤0.42 mg/l	Palintest kit
Coventry University 2008	Sulphates	≤ 5.0 mg/l	Titration
Edinburgh University 2007	Suspended solids	≤100 mg/l	Filtration
Severn Trent Laboratories 2008	Toluene	Undetectable	HPLC
Coventry University 2008	Total dissolved solids	≤200 mg/l	Filtration evaporation
Severn Trent Laboratories 2008	Xylene	Undetectable	HPLC
Microbes			
Concentration (organisms per ml of pavement water)			
Coventry University 2006/08	Acanthamoeba	0-5 /ml	Microscopy
	E. coli	< 1 /ml	Selective media
Edinburgh University 2007	Enterococci	< 1 /ml	Selective media
	Heterotrophs	78 /m	Selective media
Severn Trent Laboratories 2007	Legionellae 3 key species	Undetectable	Selective media
Edinburgh University 2007	Salmonellae & Shigellae	< 1 /ml	Selective media

The field site at the University of Cantabria, Santander, Spain uses 10 full sized tanked car parking bays with different geotextile products and some without a geotextile, with a research aim of comparing the ability of Aquaflow to store the water long term and not lose this precious resource through evaporation.

As can be seen, over several months (August 2008-March 2009) with varying rainfall events, the water stored within the bays is constant and with full or near full capacity (green and blue lines).

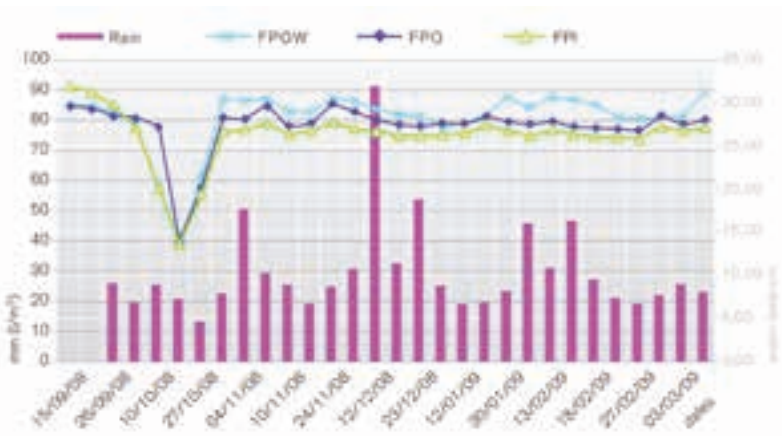
Even when the stored water was artificially drained from the bays, the input from rainfall soon exceeded the evaporation rate and filled the bays.

Each parking bay contains 1.4m³ (1400 litres) of water that could be used for rainwater harvesting including irrigation. This storage volume is more than enough to obtain all the relevant points available for the Code for Sustainable Homes Category of Indoor and Outdoor water use.

This is due to the volume of stored rainfall provided by Aquaflow to help to reduce mains water in domestic use to a total of less than 80 L/person/day. Typical uses for the water indoors would be toilet flushing and for washing machines.

All outdoor irrigation can also be done using Aquaflow rainwater harvesting pavements and all Aquaflow designs are compliant with SUDS for flood prevention, run-off and water quality criteria.

This combination of benefits within one solution is space saving, cost effective and has a long and successful track record of delivering large amounts of high quality water to homes and businesses. An amendment to the CSH has recently integrated the importance of water quality into the assessment process, and Aquaflow meets and in many cases exceeds these standards.



THE PAVEMENT TEST FACILITY
AND TEST PARAMETERS

The pavement test facility (PTF) consisted of a gantry frame spanning a 10m wide, 25m long test pit. The test pit contained the Aquaflow Construction on which a full scale experimental test can be completed. Beneath the gantry frame, a carriage containing a loaded test wheel is mechanically moved backwards and forwards over the pavement construction.

A wheel speed of 10km/h was selected to simulate the slow speed of lorries in a lorry park. A wheel load of 5.75 tonnes was chosen as this is the maximum permitted load on a wheel (equivalent to an axle load of 11.5 tonnes) and representative of a wheel on the drive axle of a heavy goods vehicle.

The simulated traffic was applied to the pavements in a channelized manner, the loaded dual wheel repeatedly passing over the centre line of the pavement.

RESULTS/CONCLUSION

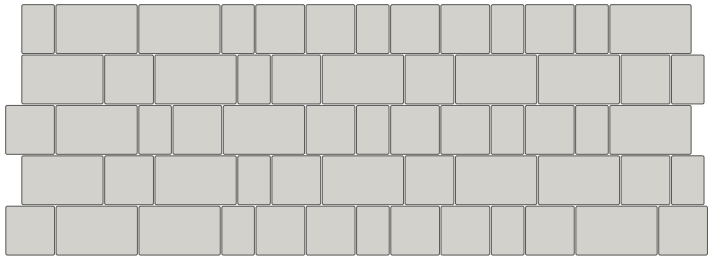
The testing was based on 50,000 standard axles with a dry sub-base and 10,000 standard axles with the sub-base fully saturated with water and from the chart below we can see that after 60,000 standard axles the Aquaflow construction deformed only 12mm which is far within the 25mm allowed within the HAUC specification.

TRL Report summary Project report PR/IP/106/01 Formpave PTF trial. This testing was to obtain data following testing at the University of Nottingham, which showed that deformation under heavy traffic may be within acceptable limits. TRL were commissioned by Formpave to test the Aquaflow System under heavy traffic loading in the TRL's Test Facility(PTF).

The PTF allows full scale pavements to be constructed and tested in a controlled environment under specified loading conditions. The Aquaflow construction was constructed by TRL and measurements were taken throughout to ensure that the sub-base was of appropriate strength. The pavements were then trafficked with a wheel load equivalent to the maximum permissible for the drive axle of a lorry. Deformation of the surface and trip height between blocks was measured. Failure criteria were based on the Highway Authorities and utilities committee (HAUC) Specification for the Reinstatement of openings in highways.

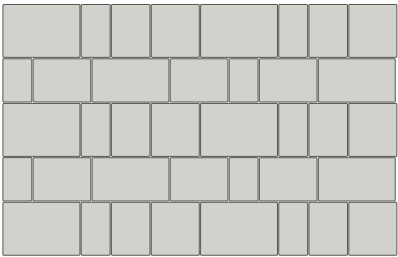
LAYING PATTERNS

Ecogranite and Chartres Classic Combined Paving & Aquasett Permeable Combined Paving



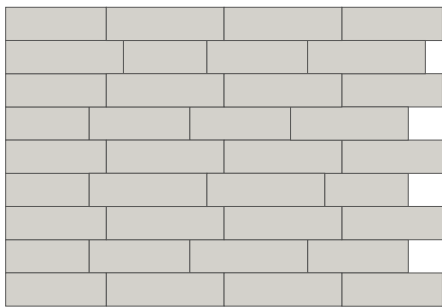
Stretcher Bond arranged to avoid vertical lines

Chartres Boulevard Paving

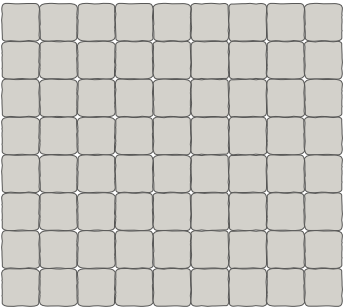


Manufactured format

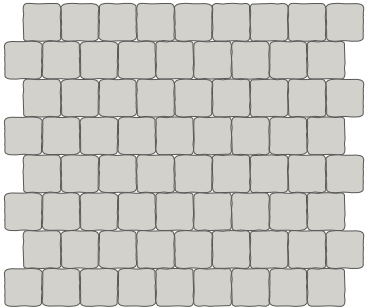
Laying pattern for Ecogranite Longsetts



Ecogranite and Chartres Cobbles

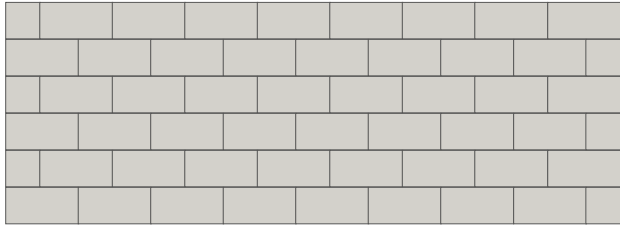


Traditional Cobble laying pattern

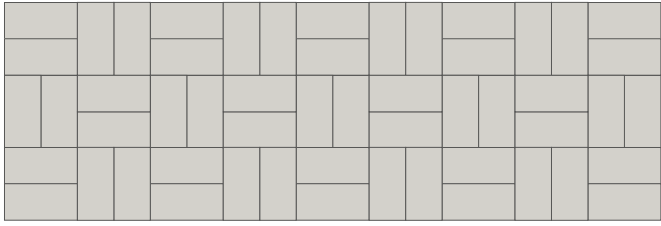


Stretcher Bond

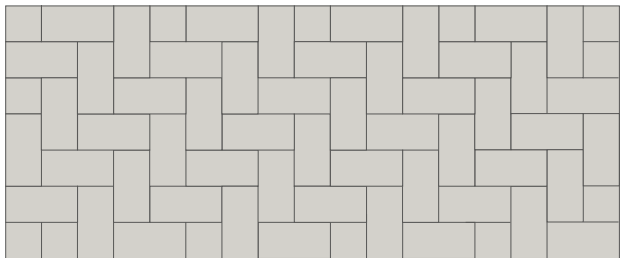
Royal Forest Paving



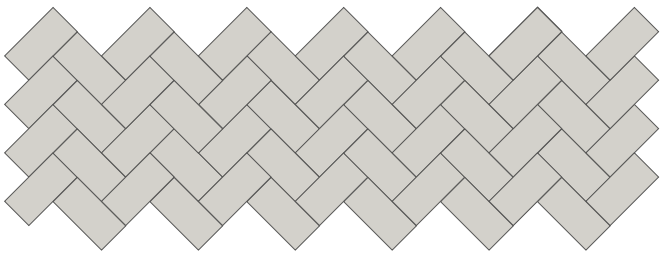
Stretcher Bond



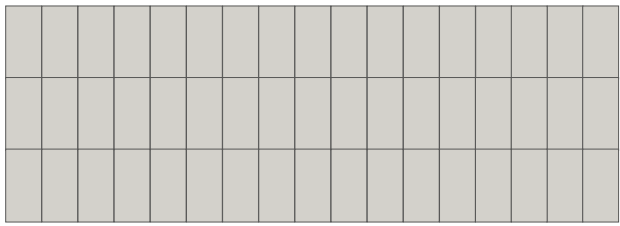
Basket Weave



90° Herringbone



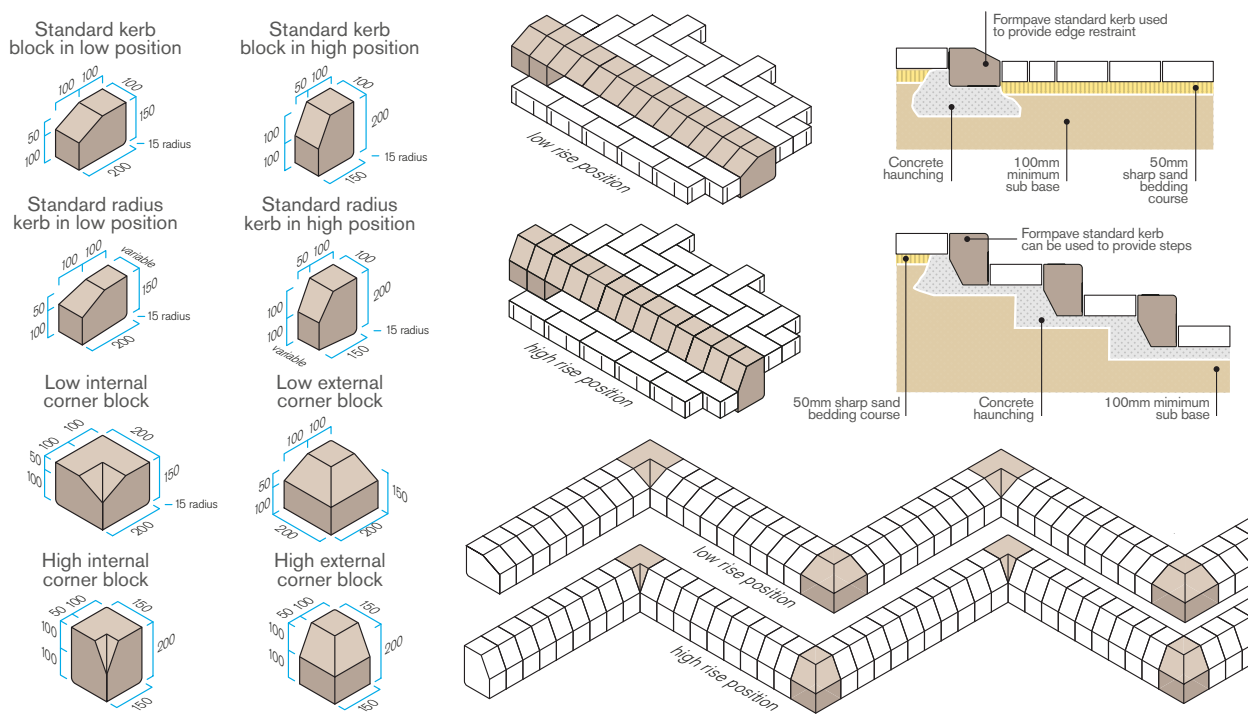
45° Herringbone



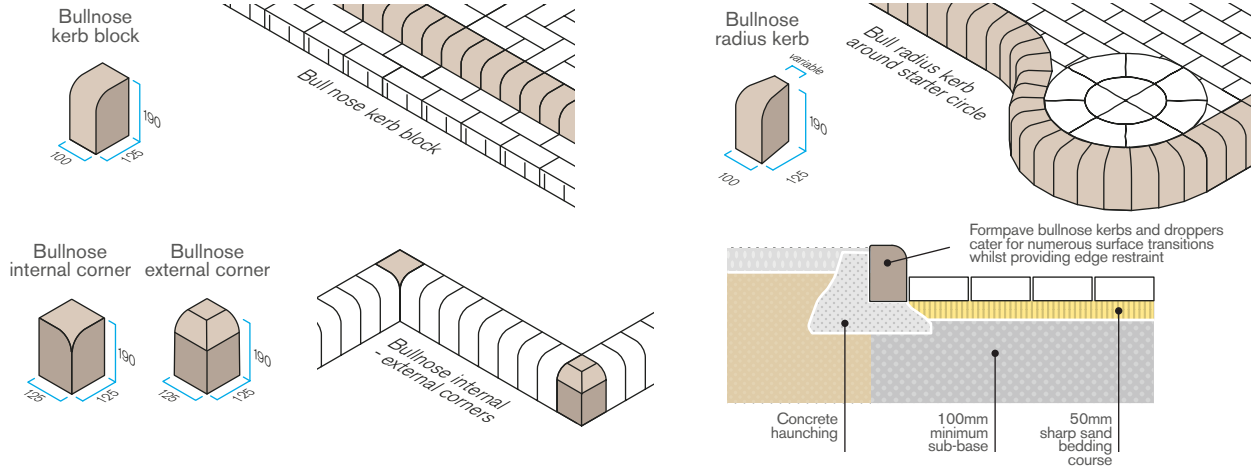
Stack Bond

KERB SYSTEMS

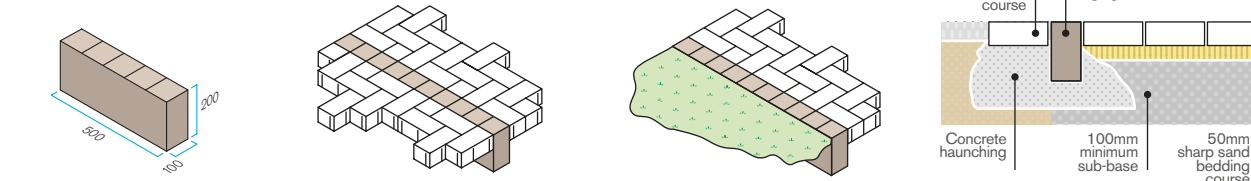
Standard & Transitions System



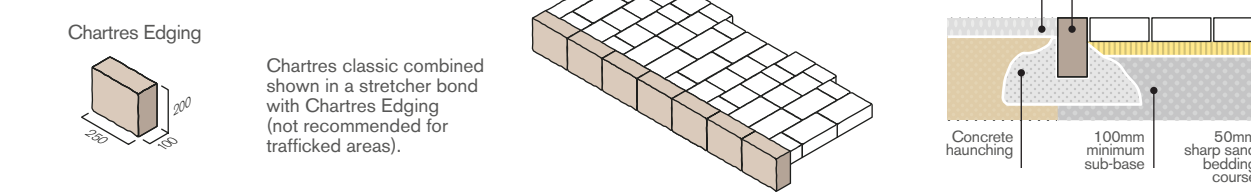
Bullnose System



Forest Edging System



Chartres Edging



HOW TO LAY A BLOCK PAVED DRIVEWAY, PATIO OR PATHWAY



PREPARATION

Remove the existing driveway and sub-base to a depth of approximately 250mm, depending on the ground being excavated. Soft ground may require a greater depth.

Remove all weeds and other unwanted organic matter from the sub-base. Weeds can be treated with a general weed killer (always read manufactures instructions for use) or, a more popular option is a weed control fabric known as geotextile. This can be used to cover the whole area that is to be paved to prevent weeds.

SUB-BASE CONSTRUCTION

The sub-base is the load-bearing layer of a block driveway and should never be absent. The sub-base should be a minimum thickness of 150mm. For paths and patios, this can be reduced.

Any soft spots in the sub-base should be excavated, and filled with a compacted suitable material. Thoroughly compact the sub-base using a vibrating plate compactor.

EDGE RESTRAINT

Edging or kerb restraints must be placed around the whole perimeter. The restraint must be laid on and haunched with concrete in order for it to restrain the body of the paving and prevent it from moving.

INSPECTION CHAMBERS

Inspection chambers (manhole covers) must be set in place. Recommendation should be sought particularly if the inspection chamber is to take the weight of a vehicle. The cover must be set to the correct height and fixed in place with cement or concrete. Using a string line between two finished levels should aid this.

LAYING COURSE

The block paving should be laid directly onto a 25-40mm thick bed of coarse, grit/sharp sand, which should be screed. Prepare a lightly pre-compacted bedding layer and lay the blocks directly on to the bed.

The screeded laying course should be at a level that will leave the paving blocks 4-8mm high, which allows for the blocks to be compacted when laid.

LAYING PAVING

The paving blocks should be laid to a specific pattern, and a fully interlocked herringbone pattern should be used for driveways where possible. To avoid spotting of shades in the paving it is advised that a mix of pavers from a minimum of 2 packs is used.

A fully interlocked 'Herringbone' pattern should be used for areas to be trafficked by vehicles whenever possible or practical. Other patterns are fine for foot-traffic areas such as paths and patios. Ensuring the perimeter edge restraint is set, the blocks can be laid.

Begin laying at the bottom of any slope and work uphill. The pattern should be aligned to the house, to ensure that it is square or parallel.

To lay the blocks, push up against the preceding blocks and then lower down onto the laying course. Do not place blocks onto the bed then push across to adjoin preceding blocks as the sand will become trapped between the block, causing the laying pattern to become distorted.

Full blocks should be laid first and care must be taken to avoid standing on the prepared laying course area. Using a taut string line will ensure the pattern does not glide off line. To prevent problems developing, check the alignment approximately every meter.

CUTTING IN

Once the full blocks have been laid and the alignment of the pattern has been checked, the cutting in can be started. When cutting blocks use a block splitter and avoid any cut pieces less than one-quarter of a full block, and approximately 5mm.

COMPACTION AND JOINTING

After the cutting in of the blocks is completed and the paving checked for alignment, it can be compacted and jointed. Ensure the surface is clean and free from any gravel, dirt or off-cuts. Compact the surface using a vibrating plate compactor.

Following the initial compaction, inspect the paving to ensure no blocks have become damaged or broken, and replace any if so.

JOINT FILLING SAND

Next, the special kiln-dried joint filling sand can be spread. Ensure the surface is dry to avoid the sand not flowing and filling the joints. Depending on the type of block paving used, each 25kg bag of jointing sand will cover approximately 8-10m². Spread the sand using a brush and chase it into the joints, ensuring each joint is correctly filled.

After the joints are full, sweep the access sand to one corner of the driveway to be used later. Use the vibrating plate compactor to compact the surface. Joints formerly filled may now appear empty and will require more joint filling sand.

Ensuring the joints are full, the driveway can now be used. The joint filling sand will tend to settle slightly over a period in time and will therefore require a top up.

PAVING MAINTENANCE

Paving requires regular maintenance to include occasional cleaning. In normal circumstances, regular sweeping will be sufficient to prevent the build up of debris. A visual inspection of the Aquaflow paved surface is the most important element of a maintenance program.

General cleaning of dirt and algae can be carried out using plenty of hot detergent solution, such as washing up liquid, and brushed vigorously using a stiff outdoor brush. Ensure that the paving is then rinsed thoroughly with clean water. A range of specialist cleaning products are also available; contact your local merchant for details.

Cleaning dirt and grime can be done using a light power hose at a medium pressure, with any joint material being replaced. It is strongly advised that high pressure power washers are not used due to the aggressive power washing that can damage the product surface. A trial area should be tested prior to any large scale power washing taking place.

It should be noted that lighter coloured blocks may exhibit tyre marks and will therefore require more cleaning and maintenance when used in certain situations.

Maintenance	Action	Frequency
Regular maintenance	Sweeping surface to remove debris and contamination	1-2 times a year, typically Spring and after leaf fall in Autumn
Occasional aintenance	Removal of weeds	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 of installation
	Inspection for poor performance and silting	Annually
	Inspect ancillary drainage components i.e. gullies, outfall pipes etc.	Annually

WEEDS

Large weeds should be removed by hand and the area then treated with a weed killer. Small weeds can be directly treated with weed killer, and should start to die within a few days. When using any weed killer, the manufacturer’s instructions should always be followed.

ALGAE, MOSS AND LICHEN

When removing thick growths of moss or lichen, scraping out of the joints must be carried out, followed by treatment of the area using a moss killer. Anti-moss paving cleaner is designed to remove moss, algae and lichens and is best applied during dry weather. After the product has been applied, it will take a few days to be fully effective. Having killed the moss and lichens, the remains can be easily brushed off. When using any cleaning agent, the manufacturer’s instructions should always be followed.

BLOCK PAVING SEALER

Block paving can be sealed with a resin based sealer to combat stains and weed growth and enhance the colour and appearance of the paving. When using any resin based sealer always refer to the manufacturer’s instructions.



GLOSSARY

ADOPTING / ADOPTION BODY

The organisation responsible for taking ownership of the SuDS.

AMENITY

The quality of being pleasant, attractive, desirable and/or useful.

APPROVING / APPROVAL BODY

The organisation responsible for approving the SuDS.

ATTENUATION

Reduction of peak flow rate and increased duration of a flow event.

BIODEGRADATION

Decomposition of organic matter by microorganisms and other living things.

BIODIVERSITY

The diversity of plant and animal life in the world, an area or a particular habitat - a high level of which is usually considered to be important or desirable.

BLOCK PAVING

Paving designed to allow rainwater falling onto the surface or runoff discharged over the surface to infiltrate through the joints or voids between the blocks into the underlying pavement structure (see permeable pavements).

CALIFORNIA BEARING RATIO (CBR)

An empirical measure of the stiffness and strength of soils, used in road pavement design.

CATCHMENT

The area contributing surface water flow to a point on a drainage or river system. Can be divided into sub-catchments.

CLIMATE CHANGE

A change in the state of the climate that can be identified (eg by using statistical tests) by changes in the mean and/ or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes, to external forcings or to persistent anthropogenic changes in the composition of the atmosphere, ocean or in land use.

CONTROL STRUCTURE

A structure to control the volume or rate of flow of water through or over it.

CONVENTIONAL DRAINAGE

The method of draining surface water using subsurface pipes and storage tanks.

CONVEYANCE

Movement of water from one location to another.

COST-EFFECTIVE

Something that is value for money. In economic terms, the benefits received and/or services delivered are worth at least what is paid for them.

DESIGN CRITERIA

A set of agreed criteria that the proposed system should be designed to satisfy.

DESIGN EVENT

A synthetic rainfall event of a given duration and return period that has been derived by statistical analysis.

DEVELOPMENT

Any area of land that has been or is being developed (ie land use change that includes construction). This includes new developments, redevelopments, infill and retrofit.

ECOSYSTEM

A biological community and its physical environment.

EVAPOTRANSPIRATION

The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.

EXTREME EVENT

A rainfall or flow event that is relatively rare, generally considered to be an event with a return period of 30 years or more, not to be confused with an exceedance event.

FILTRATION

The act of removing sediment or other contaminants from a fluid by passing it through a filter.

FLOW CONTROL DEVICE

A device used to limit the flow through the outlet from a SuDS component, usually necessary to meet a required discharge rate.

GEOGRID

Plastic grid structure used to increase the strength of soils or aggregates.

GEOMEMBRANE

An impermeable plastic sheet, typically manufactured from polypropylene, high density polyethylene or other geosynthetic material.

GEOSYNTHETICS

Man-made products used to stabilise groundworks. These include geotextiles, geomembranes, geocomposite clay liners and geocomposite drainage products.

GEOTEXTILE

A permeable fabric that can separate, filter, reinforce, protect or drain.

IMPERMEABLE SURFACE

An artificial non-porous surface that generates a surface water runoff after rainfall.

INFILTRATION (TO THE GROUND)

The passage of surface water into the ground.

INFILTRATION COMPONENT

A component specifically designed to aid infiltration of surface water into the ground.

INTERCEPTION

The prevention of runoff from the site for the majority of small (frequent) rainfall events (or for the initial depth of rainfall for larger events).

MAINTAINABILITY

The ease with which a scheme can be safely and effectively maintained.

MASTER PLAN

An overarching planning document and spatial layout that is used to structure future land use and development.

NON-POTABLE WATER

Water not suitable for drinking.

NUTRIENT

A substance providing nourishment for living organisms (such as nitrogen and phosphorus).

ORIFICE PLATE

Structure with a fixed aperture to control the flow of water.

OUTFALL

The point, location or structure where surface water runoff discharges from a drainage system.

OUTLET

A structure or landscape feature that manages the flow out of a SuDS component.

PAVEMENT

The road or car park surface and underlying structure, usually asphalt, concrete or block paving. Note that the path next to the road for pedestrians (the UK colloquial term of pavement) is the footway.

PEAK FLOW

The point at which the flow of water from a given event is at its highest.

PERCOLATION

The passing of water (or other liquid) through a porous substance or small holes (eg soil or geotextile fabric).

PERMEABILITY

A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium. for example grain size. porosity and pore shape.

PERMEABLE PAVEMENT

A surface that is formed of material that is itself impervious to water, but is laid to provide void space through the surface to the sub-base.

PERVIOUS PAVEMENT

A surface that provides a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through tile surface and into tile underlying structural layers.

POROSITY

The percentage of the bulk volume of a rock or soil that is occupied by voids, whether isolated or connected.

GLOSSARY

POTABLE WATER

Water suitable for drinking.

PREVIOUSLY DEVELOPED LAND

Land that is, or was, occupied by a permanent structure (excluding agricultural or forestry buildings) and associated fixed surface infrastructure, including the curtailage of tile development.

PRIORITY SUBSTANCES

Individual pollutants or groups of pollutants posing a significant risk to or via the aquatic environment, including waters used for the abstraction of drinking water.

RAINFALL EVENT

A single occurrence of rainfall before and after which there is a dry period that is sufficient to allow its effect on the drainage system to be defined.

RAINWATER HARVESTING SYSTEM

A system that collects rainwater from where it falls and stores it for use.

RETURN PERIOD

An estimate of the likelihood of a particular event occurring. A 100-year storm refers to the storm that occurs on average once every hundred years. In other words, its annual probability of exceedance is 1% (1:100).

RUNOFF

Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.

SILT

The generic term for waterborne particles with a grain size of 4-63 µm, ie between clay and sand.

SOURCE CONTROL

The control of runoff at or near its source, so that it does not enter the drainage system or is delayed and attenuated before it enters the drainage system.

STORM

An occurrence of rainfall, snow or hail.

SUB-BASE

A layer of material on the subgrade that provides a foundation for a pavement surface.

SUBGRADE

Material, usually natural in situ, but may include capping layer, below formation level of a pavement.

SUDS COMPONENT

An individual element of the drainage system that conveys, stores and/or treats surface water runoff.

TREATMENT

Improving the quality of water by physical, chemical or biological means.

WATER BODY

A body of water forming a physiographical feature. In the WFD this covers: rivers, lakes, transitional waters, coastal waters and groundwater (aquifers).

WATER QUALITY

The chemical, physical and biological characteristics of water with respect to its suitability for a particular purpose.

Glossary acknowledgments:
B. Woods Ballard, S. Wilson, H. Udale-Clarke, S. Illman,
T. Scott, R. Ashley, R. Kellagher, The SuDS Manual CIRIA, London
ISBN: 978-0-86017-759-3
ciria.org

Forterra is a leading manufacturer of a diverse range of clay and concrete building products, used extensively within the construction sector, and employs over 1,900 people across 18 manufacturing facilities in the UK.

It is the second largest brick and aircrete block manufacturer in the country, and the only producer of the iconic London Brick. Other trusted brands from Forterra include Thermalite, Conbloc, Ecostock, Butterley, Cradley, Red Bank, Bison Precast, Jetfloor and Formpave.

forterra.co.uk

Formpave

Tufthorn Avenue
Coleford
Gloucestershire
GL16 8PR

Tel: 01594 836999

Fax: 01594 810577

Email: sales@formpave.co.uk

formpave.co.uk



forterra.co.uk