

J & J DESIGN

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1a KING EDWARD ROAD
BEDFORD MK41 9SF



DRAINAGE IMPACT ASSESSMENT

PROPOSED CHURCH CAR PARK

17 ELM GROVE SOUTH BARNHAM PO22 0EJ

FOR

CHALCRAFT GOSPEL HALL TRUST

Our ref: 1127/JRS/l
June 2014

1. INTRODUCTION

- 1.1 Chalcraft Gospel Hall Trust propose hardstanding to the front, side and rear of the existing detached building at 17 Elm Grove South Barnham which is in use as a place of worship. In order to demonstrate that satisfactory surface water drainage will be provided, the planning application is supported by full details of the surface water drainage proposals together with this Drainage Impact Assessment.
- 1.2 This Drainage Impact Assessment has had regard to ***The SUDS Manual : CIRIA C697 : 2007; Infiltration Drainage – manual of good practice : CIRIA : Report 156 : 1996 and BRE Digest 365 – Soakaway Design : March 2007 and Wallingford Procedure : Volume 4 Modified Rational Method : 1981.***
- 1.3 Arun District Council Drainage and Coastal Engineers have advised that the drainage system should be designed to contain the volume of water from a 1 in 100 year storm event plus a further 30% to allow for climate change. The design of the drainage system should be supported by soakage testing and groundwater monitoring to ensure that the drainage system drains in a suitable time and also that the drainage system remains effective during period of groundwater inundation.

2. APPLICATION SITE AND SURROUNDINGS

- 2.1 The application site is located on the south-east side of Elm Grove South and 100m south-west of the junction with Barnham Road, within the village of West Barnham. The site area is about 0.02ha. The site adjoins and was formerly part of the St Philip Howard High School. To the east the property is separated from residential development by a public footpath.
- 2.2 The site is situated on the flat coastal plain at about 9m ODN.
- 2.3 A copy of the 1:10,000 scale Landplan is attached to this report at Appendix 1.

3. PROPOSED DEVELOPMENT

- 3.1 The proposed development comprises of the provision of a car park, together with air-conditioning units and enclosure, handrails, ramps and external lighting ancillary to the use of the existing single storey building as a place of worship.
- 3.2 Foul drainage from the site is to be by gravity to the public foul water sewer via the school utilising the existing foul drain.
- 3.3 Existing roof water disposal is to soakaways. It is proposed that the new car park will be formed from block paving. Front and rear car parks will be permeable draining to open void modular crates located above the maximum groundwater level recorded. The driveway between the front and rear car park will be impermeable blockwork draining to channels which discharge to the existing soakaways and/or a sump within the modular crates.

4. SITE INVESTIGATION

- 4.1 A Trial Hole Investigation with percolation tests was undertaken on 4th December 2013. Copies of the Trial Logs are attached to this report together with photographs of the ground investigation.

- 4.2 Soakage tests were undertaken in each trial pit. Infiltration rates recorded were:

1.13 x 10⁻⁵m/s in the front car park;
1.22 x 10⁻⁵m/s in the rear car park.

Standing water was recorded in the trial holes at a depth of 1.7m below surface.

- 4.3 Following the Trial Hole Investigation, a dip pipe was provided to enable monitoring of groundwater levels through the period December 2013 – February 2014. Groundwater levels varied over this period between 1.78m – 0.16m. Notwithstanding the wettest winter recorded since 1766, the groundwater levels remained dynamic reflecting the reasonably good percolation observed, together with the exceptional rainfall and sequence of storms. A copy of groundwater records with rainfall data (weather online records at Thorney Island) is attached as an appendix to this report.

5. DRAINAGE DESIGN PROPOSALS

- 5.1 Spreadsheets have been prepared following the BRE365 methodology for the front and rear car park. Z2-100 growth factors were taken from the Wallingford Procedure : Volume 4 Modified Rational Method Table A1. Inflow has been calculated for M100 storms and increased by 30%. Outflow has been calculated using 50% of the available surface area. The storage required is the difference between inflow and outflow over the critical storm period.

- 5.2 Due to the groundwater inundation recorded during the past winter, storage will only be available above the maximum level recorded.

- 5.3 In order to minimise the need to increase the level of the rear car park above existing ground levels, 150mm deep open void modular crates are specified to provide adequate volume of free storage below the permeable blockwork. Details of the Permavoid system are attached at Appendix 5.

- 5.4 In order to mitigate risks of lateral migration of storm water the areas of modular crates will be lined with an impermeable membrane adjacent to site boundaries. Further containment will be provided through substantial kerbs and concrete beds, with particular reference to the external boundaries of the site.

- 5.5 Detailed spreadsheet calculations have been submitted to Arun District Council Engineers.

6. CONCLUSIONS

- 6.1 Site investigations have included trial pits with soakage testing, supported by subsequent monitoring of groundwater levels through the winter period, which was the wettest winter recorded since 1766.
- 6.2 Soakaway designs for M100 storm events plus 30% have been prepared to allow an assessment of the storage volume required. The design provides for this storage volume above the highest recorded level of groundwater inundation.
- 6.3 The proposals for the use of permeable surfaces together with open void modular crates above groundwater levels will provide on-site infiltration compliant with national and local planning policies which encourage the use of sustainable drainage systems, together with accepted industry standards for infiltration drainage.

John Shephard
June 2014

APPENDIX 1

SITE LOCATION PLANS:

1127/1	1:1250 scale
1127/2A	1:10,000 scale



17 Elm Grove South
Barham
PO22 0HJ



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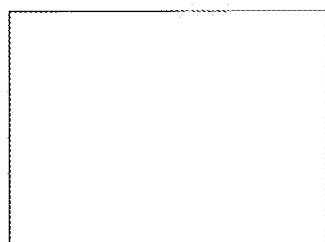
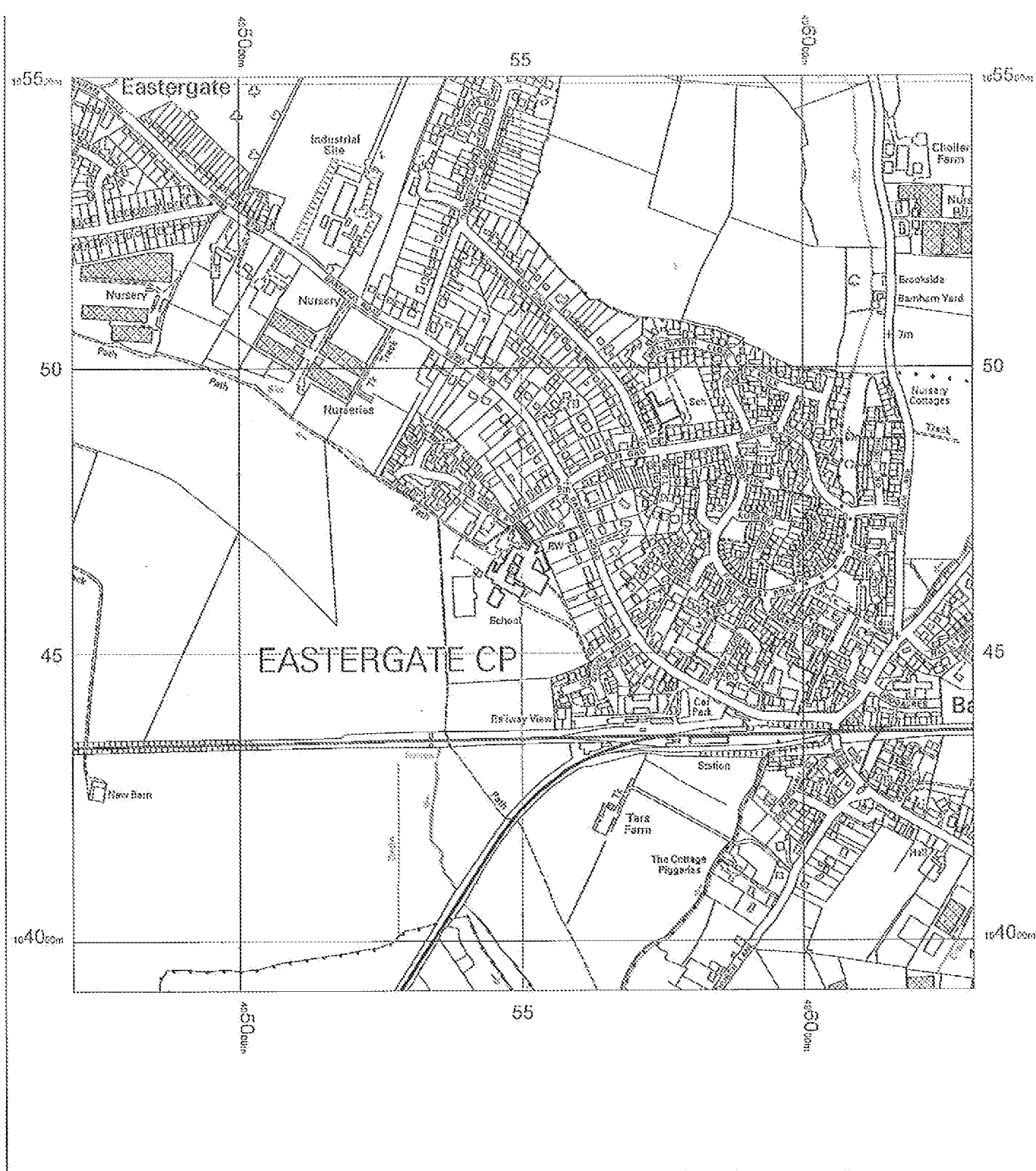
1A King Edward Road BEDFORD MK41 9SF

Date ..20.05.2011.. Dwg No. ..1127/1 .. Scale .. 1:1250 ..

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APPENDIX 2

TRIAL HOLE LOGS
AND
PERCOLATION TEST RESULTS

SOAKAWAY SITE INVESTIGATION

Site: 17 Elm Grove South Barnham PO22 0EJ
Date: 04-Dec-13
Clients: Chalcraft Gospel Hall Trust
Proposal: Car Park for Proposed Gospel Hall

PERCOLATION TEST RESULTS

TH1 Front car park

Size: 450mm x 1650mm x 1700mm to water level
Soil type: Medium brown sandy clay over light brown silty clay with flints

Test One			Test Two		
Time	Time from filling (hrs:mins)	Depth of water below surface (mm)	Time	Time from filling (hrs:mins)	Depth of water below surface (mm)
09:30	0.00	460	11:40	00:00	260
09:50	00:20	700	11:55	00:15	495
10:10	00:40	810	12:40	01:00	775
10:30	01:00	920	13:50	02:10	1060
10:50	01:20	1000	14:20	02:40	1090
11:10	01:40	1060			
11:30	02:00	1100			

TH2 Rear car park

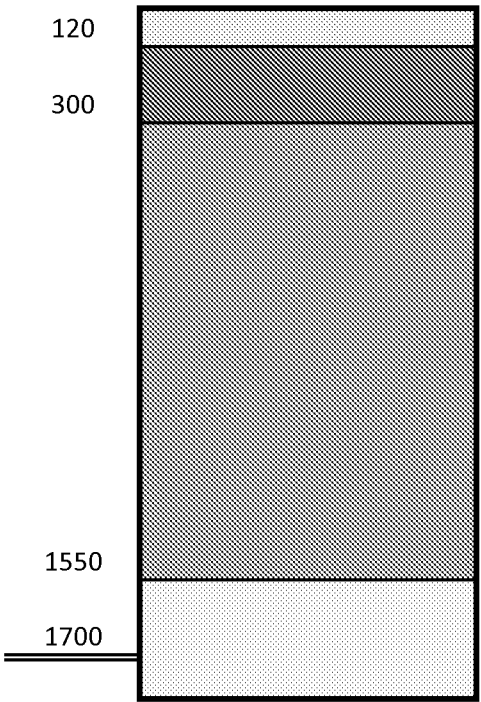
Size: 500mm x 1600mm x 1780 to waterlevel
Soil type Medium brown sandy clay over light brown sandy clay with flints

Test One			Test Two		
Time	Time from filling (hrs:mins)	Depth of water below surface (mm)	Time	Time from filling (hrs:mins)	Depth of water below surface (mm)
09:40	00:00	300	11:45	00:00	270
10:00	00:20	560	12:40	00:55	700
10:20	00:40	720	13:50	02:05	975
10:40	01:00	850	14:20	02:35	1040
11:00	01:20	950			
11:20	01:40	1035			
11:40	02:00	1085			

TRIAL HOLE LOGS

TH 1 Front car park

Depth



Material

DOT type 1 with fine scalpings
over geotextile
Clay - organic with roots

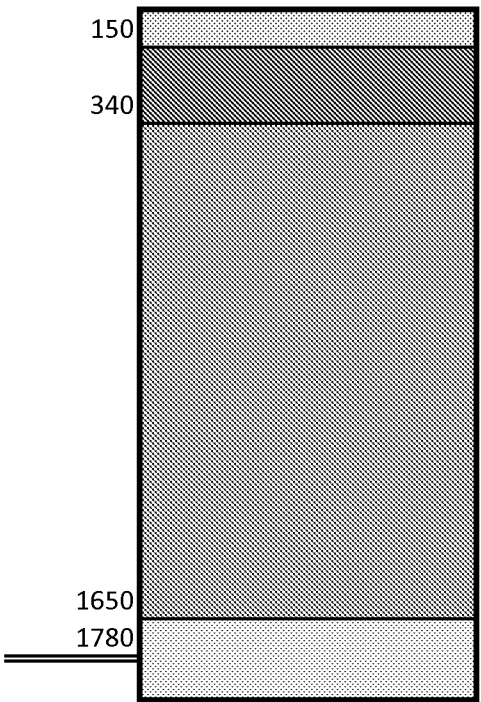
Medium brown sandy clay

Light brown silty clay with flints

Water level settled overnight

TH 2 Rear car park

Depth



Material

Brick rubble over geotextile

Brown organic clay with roots

Medium brown sandy clay

Light brown silty clay with flints

Water level settled overnight

APPENDIX 3

PHOTOGRAPHS OF TRIAL HOLE INVESTIGATION



Plate 1 – TH1 Front Car Park with Percolation Testing

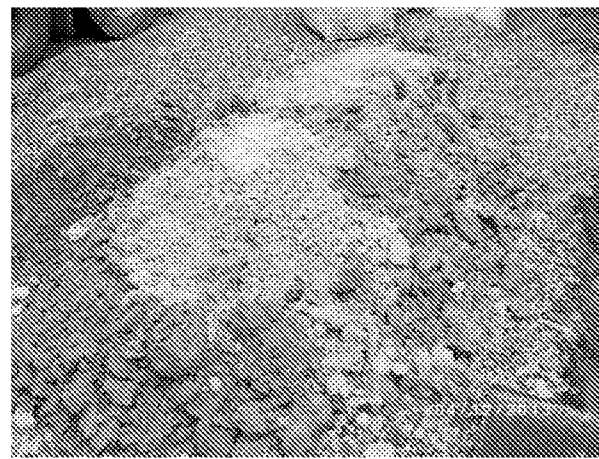


Plate 2 – TH1 Front Car Park Spoil Heap



Plate 3 – TH2 Rear Car Park with Percolation Testing



Plate 4 – TH2 Rear Car Park with Spoil Heap



Plate 5 – Dip Pipe Installation in Rear Car Park



Plate 6 – Water Tanker in Attendance for Percolation Testing

APPENDIX 4

GROUNDWATER RECORDS

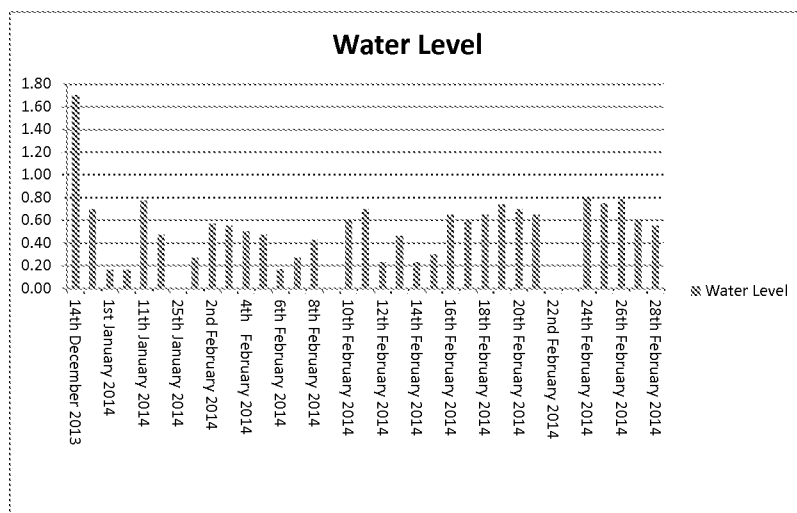
WITH

RAINFALL DATA

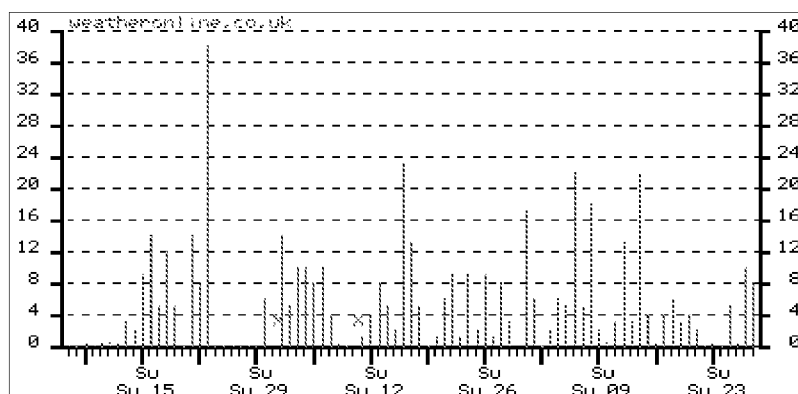
Groundwater Records with Rainfall Data 17 Elm Grove South Barnham

14 th December 2013	1.70
21 st December 2013	0.70
1 st January 2014	0.16
4 th January 2014	0.16
11 th January 2014	0.77
18 th January 2014	0.47
25 th January 2014	-
1 st February 2014	0.27
2 nd February 2014	0.57
3 rd February 2014	0.55
4 th February 2014	0.50
5 th February 2014	0.47
6 th February 2014	0.17
7 th February 2014	0.27
8 th February 2014	0.43
9 th February 2014	omitted
10 th February 2014	0.60
11 th February 2014	0.70
12 th February 2014	0.23
13 th February 2014	0.46
14 th February 2014	0.23
15 th February 2014	0.30
16 th February 2014	0.65
17 th February 2014	0.60
18 th February 2014	0.65
19 th February 2014	0.74
20 th February 2014	0.70
21 st February 2014	0.65
22 nd February 2014	-
23 rd February 2014	-
24 th February 2014	0.80
25 th February 2014	0.75
26 th February 2014	0.78
27 th February 2014	0.60
28 th February 2014	0.55
Average	0.55

(please note water table high in all surrounding areas with emerging water in many locations)



Thorney Island
Precipitation mm 6 December 2013 - 28 February 2014



APPENDIX 5

DETAILS OF PERMAVOID SYSTEM

AGGREGATE INDUSTRIES

Landscaping

Charcon Permavoid


Life
Sustainable
Drainage Systems


The Charcon Permavoid storage units are 150mm thick, modular interlocking plastic systems designed for use as a combined drainage component and sub-base replacement. The system has an exceptionally high compressive strength and bending resistance with a proprietary jointing system to create a horizontal structural 'raft' within the pavement that is ideal for the shallow attenuation of surface water. The system can also be combined in layers using interlocking shear connectors to increase thickness in 150mm increments. This is particularly useful in designing infiltration systems allowing great flexibility in balancing the soil permeability/ infiltration area of the Charcon Permavoid storage units and residual temporary attenuation.

- High strength, high capacity, shallow, subbase replacement system
- Stormwater attenuation and/or infiltration system
- Used as part of a SUDS in conjunction with Charcon Permachannel™ or Charcon Infiltra to offer water storage at shallow construction depths.

Applications

Charcon Permavoid units are suitable for using as stormwater attenuation and/or infiltration system. The system comprises single, interconnected modules which can be installed in the ground as part of subbase formation. Permavoid is suitable for use in a range of applications including residential, industrial estates, car parks, sports pitches, roofs, basements, pedestrian areas and rainwater harvesting. Refer to SUDS technical services for advice on specific applications - tel: [REDACTED]

Element	Value
Physical properties	
Weight	3kg each
Width	364mm
Length	708mm
Height	150mm
Short term compressive strength	
Vertical	715 kN/m
Lateral	156 kN/m
Short term deflection	
Vertical	1mm per 126 kN/m ²
Lateral	1mm per 15 kN/m ²
Tensile strength	
Of a single joint	42.4 kN/m ²
Of a single joint at 1% secant modulus	18.8 kN/m ²
Bending resistance of unit	0.71 kN/m ²
Bending resistance of single joint	0.16 kN/m ²
Volumetric void ratio	95%
Average effective perforated surface area	52%
Other properties	
Intrinsic permeability	minimum 1.0 x 10 ⁻⁶
Ancillary	Permavoid permalla Permavoid shear connector

Charcon Permavoid

Hydraulic performance

3 units wide, 1 unit deep (1.00m x 0.15m)

Free discharge

VG gradient (%)	0	1	2	3	4	5
Flow rate (l/s)	8	13	15	17	19	21

Manufacturing standard

All products manufactured by Aggregate Industries are produced in accordance with ISO 9001 with factory compliance to ISO 14001.

Performance

The structural load bearing capacity of the Charcon Permavoid units have been tested in accordance with the following European Standard: BS EN124: 1994.

The systems structural design life expectancy based upon creep test data (tested according to CIRIA D680 Structural design of modular geocellular drainage tanks, CIRIA London) is minimum 25 years at the highest loadings before maintenance of the overlying surface will be required whilst for lower loadings, a life span of minimum 50 years is predicted. The system has a void ratio in excess of 90%.

Complementary products

Aggregate Industries SUDS range along with block paving, flag paving and kerb, aggregate, asphalt and ready mixed concrete.

Sustainability and local sourcing

Energy use: Aggregate Industries is at the forefront of sustainability and has committed to reduce carbon emissions by 20% by 2016 based on a 2012 base line.

Recyclable: 100% of the product can be recycled thus reducing the amount of material that is sent to landfill.

Manufacturing location: Produced in the UK, with locally sourced materials under strict environmental and social legislation, for local supply.

Responsible sourcing: Aggregate Industries is the first company in the world to achieve accreditation to the BES 6001 Framework Standard for the Responsible Sourcing of Construction Products. Aggregate Industries has achieved an 'Very Good' rating for major product groups. The BES 6001 standard assesses:

- quality management
- environmental management
- health and safety management
- a range of social and environmental issues.

Life

Life is our range of sustainable products and services. For more information please visit www.aggregate.com/life Key aggregates and recycled content

Charcon Permavoid units are manufactured from recycled polypropylene (PP); the recycled polymer content is >90%.

Policies

Aggregate Industries' policies on the environment and community, health and safety and sustainable solutions for different product applications can be viewed on our website www.aggregate.com

Installation standard

All calculations for Charcon Permavoid within pavement designs are based upon site-specific load cases, pavement construction types and thicknesses, soil cover and ground conditions and the suitability must therefore be approved for each project.

For specific guidance refer to the Aggregate Industries SUDS design guide, to www.aggregate.com or SUDS technical services or [REDACTED]

Maintenance and cleaning

For specific guidance refer to the Aggregate Industries SUDS design guide, to www.aggregate.com or SUDS technical services or [REDACTED]

COSHH data

Full COSHH data on Surface Water Solutions products is available on request. Please call SUDS technical services on [REDACTED]

Technical support

Detailed guidance and assistance with the preparation of specifications for Surface Water Solutions products is available. A free SUDS design service is also available.

For further information, please refer to SUDS technical services on [REDACTED]

Huland Ward, Ashbourne,
Derbyshire DE6 3ET

www.aggregate.com



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