PAUL MARTIN PLANNING & DESIGN SERVICES

Planning Applications • Surveying & Mapping • Percolation Tests
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Planning Section
South Dublin County Council
County Hall,
Tallaght, Dublin 24,
D24 YNN5

9 April 2024

Re: PL Ref SD23B/0048. Laura Doyle & Paul Boyle
Development at 10 Mountdown Road, Manor Estate, Dublin 12.

Dear Sir / Madam,

With regard to planning condition 2(c) (i) of the above development, please find enclosed a surface water drainage / soakaway design & calculations to the provisions of BRE Digest 365.

Trusting you will find the above satisfactory but if you have any queries, please do not hesitate to contact me

Yours Sincerely

Paul Martin
Arch. Tech.
Site Suitability Assessor Fetac Level 6 Certificate.

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SOAKAWAY DESIGN BRE 365 DIGEST

Client: Laura Doyle and Paul Boyle
Site Location: 10 Mountdown Road, Manor Estate
Dublin 12, Co. Dublin.

Prepared By:
Paul Martin Arch Tech. Fetac level 6 Site Assessor.

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Introduction

This report details the design for a soakaway to cater for development incorporating retention permission for an extension to the rear of a dwelling at 10 Mountdown Road, Manor Estate, Dublin 12 Co. Dublin. As a condition of South Dublin County Council planning register reference SD23B/0048 condition 2 c *"Sustainable Drainage Systems (SuDS) shall be incorporated into the development."*

Herein we have designed a surface water soakaway shall be designed in accordance with BRE Digest 365. The soakaway design will cater surface water run-off from the extension roof area of 60m2 as denoted A & B on the drawing herein. An area of the original roof consisting of 31m2 is to be demolished therefore the post development run-off will only exceed the pre-development run-off by 29m2. A trial pit was excavated indicating a moderately-drained subsoil profile. (See photographs).

Take note that in addition to the soakaway design, source control is to be provided by means of a water butt and draw off tap for external reuse only. This will also reduce the water consumption required.
Any new permeable surfaces should be underlaid with a hydrocarbon geotextile in-order to capture residual hydrocarbons, remove pollutants by biodegradation thus enhancing water quality when used as part of a source control sustainable drainage system.

The site assessment was undertaken on the 01st of February 2024.

The assessment and report have been undertaken in accordance with the following documents.

BRE Digest 365 CIRIA Guidance Documents

Met Eireann rainfall return periods for 10 Mountdown Road, Manor Estate, Dublin 12 Co. Dublin.

The design method for sizing a soakaway is based on the equation of volumes:

S = I – O

S = Soakaway storage volume (m3)

I = Inflow from the impermeable area drained to the soakaway

O= Outflow infiltrating into the soil (m3)

Site Location & Description

The site is located at 10 Mountdown Road, Manor Estate, Dublin 12 Co. Dublin. The topography of the site is gently sloping. Dwellings are served by mains water and the public sewer network.

Trial pit

A trial pit (hand dug) measuring 1.10mL x 1.10mW x 1.2mD was excavated. The effective depth of the soakaway test was 0.6m. The time for water to infiltrate from 75% to 25% of the effective depth was 66 minutes or 4000sec. Some imported soil may contribute to the faster times the expected given the silt-clay soil profile.

Assessment of inflow to the Soakaway

Inflow: $I = A \times R$

A: Impermeable area to be drained to the soakaway (m2)
R: Total rainfall in design (m)

Total Impermeable Area	60.0m2

Met Eireann Rainfall Data

Data for Rath, 10 Mountdown Road, Manor Estate,
Dublin 12, Co. Louth.
30 Return Periods
120min storm Duration (worst case scenario)

A void ratio of 95% or 0.95 was used to in this design to allow for waving storm cells. Granular fill is not viable in this instance. A safety factor was taken as 1.

Inflow:
$I = A \times R$
A: Impermeable area to be drained to the soakaway (m2)
R: Total rainfall in design (m)
Impermeable Area =60m2 @ runoff coefficient 1.0
Rainfall = 46.92mm
60m2 x 46.92mm = 2.82m3 Thus I = 2.82m3

Assessment of outflow to the Soakaway

Outflow: $O = As50 \times F \times D$

As50: Internal surface area of soakaway pit to 50% effective depth (excluding base)
F: Soil infiltration rate (m/s)
D: Storm duration (sec)

The soil infiltration rate F was then obtained using the formula.

$$F = \frac{V_p (75\text{-}25)}{Ap50 \times T_p (75\text{-}25)}$$

Where:

Vp75 - 25 = the effective storage volume of water in the trial pit between 75% and 25% effective depth

Ap50 = the internal surface area of the trial pit up to 50% effective depth and including the base area

tp75 - 25 = the time for the water level to fall from 75% to 25% effective depth

$F = \frac{V_p (75\text{-}25)}{Ap50 \times T_p (75\text{-}25)}$ Thus F calculated at 0.0359mm / sec

Outflow:
O = As50 x F x D
(3.20m2 x 0.0359) x (120 x 60) / 1000 = 0.83m3 Thus outflow (O) = 0.83m3
Storage = I – O = S
(I) 3.20m3– (O) 0.83m3 = 1.99m3 Thus storage (S) = 1.99m3

Soakaway Volume Required:
Void Ratio 0.95 Volume: = 1.99m3 ÷ 0.95 = 2.09m3

Soakaway Volume Provided = 2.16m3 Inc 95% voids

Total Trench Soakaway Total Size **Length :- 3.0m Width 1.0m Depth 0.80m**

Construct 1 Soakaway trench. See enclosed drawing.

Half Empty Time = $Ts50 = \frac{S \times 0.50}{As50 \times f} = \frac{(1.99 \times 0.5)}{(3.20 \times 3.59E\text{-}5 \times 60)}$ = 144mins

The soakaway design is based on the variables as shown in the enclosed calculation sheet. These variables are:

- Impermeable Areas
- Rainfall Data
- Soil infiltration Rates
- Void Ratio

- Factor of safety
- Volumetric Runoff Coefficient

The enclosed designs detail the following:

- Trench soakaway Length x Width x Depth.
- Surface area of exfiltration (As50)
- Half Empty time.
- Precast concrete ring soakaway if preferred.

Soakaway Construction

The soakaway is to be excavated to a depth of approximately 0.8m below ground level then place the 400mm deep aquacell units with a min void ratio of 95%. The aquacells to be wrapped with a suitable geotextile to prevent migration of fines.

The trench should have at least two inspection points, one at each end of a straight trench, with a horizontal porous or perforated distributor pipe linking the ends along the top of the aquacell units.

The inlet pipe at the soakaway pit to be set at 0.5m below Ex'g ground level.

A silt trap is to be incorporated into the soakaway system. Inflow from any permeable paved areas must pass through a suitable geotextile to ensure filtration of fines. An overflow pipe should be incorporated into the soakaway system i.e. from the silt trap back to the surface water drainage network

Any run-off from car parking must pass through hydrocarbon retention geotextile before discharge to the soakaway.

The above design is in accordance with BRE365 24hr maximum limit for half empty time.

The base of the soakaway has not been included in the design calculations.

The soakaway must be maintained on a regular basis, i.e., silt traps / interceptors to be cleaned periodically.

Signed _____

Paul Martin. Arch. Tech. Date: 09th April 2024

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E2404pm/lpdoyle

Height 1.22cm Width 45cm Depth 30cm

The 160 Litre Terracottage Wall Mounted Water Butt is manufactured from 100% recycled plastic and is perfect for gardens where space is limited as it fixes securely to the wall.

The space-saver Terracottage includes three outlet connections at the bottom of the water butt and can be used for the tap supplied or for connecting to another water butt.

TEST HOLE

TEST HOLE ½ EMPTY

SPOIL HEAP

TEST HOLE LOCATED ON SITE

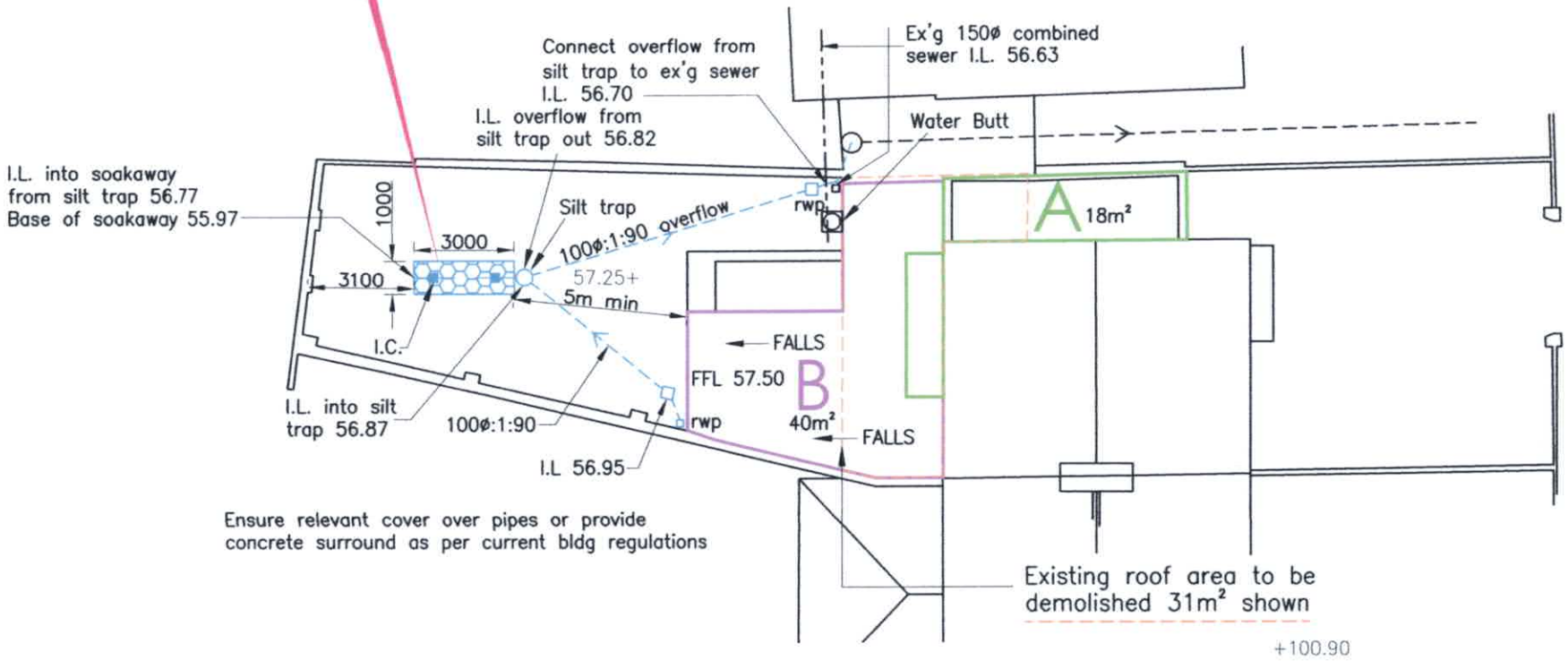
NOTE:
FOR PLANNING PERMISSION ONLY

Approximate drainage lines layout only! Drainage layout as per engineers building control drawings

Soakaway to located a minimum distance of 5.0m to and building foundation

Soakaway to located a minimum distance of 5.0m to any percolation area

Infiltration Trench for areaa denoted A & B. Area drained to soakaway 60m2 Infiltration Trench storage volume required inc voids @95% for area B=1.99m3. Infiltration Trench storage volume provided inc voids for areas A = 2.16m3. Infiltration Trench sized at 3.0m L x 1.0W x 0.8m D Inlet level: Datum 56.77 or 0.5m BGL Soakaway base level: Datum 55.97 1.3m BGL



KEY:
IMPERMEABLE AREAS A SHOWN A B

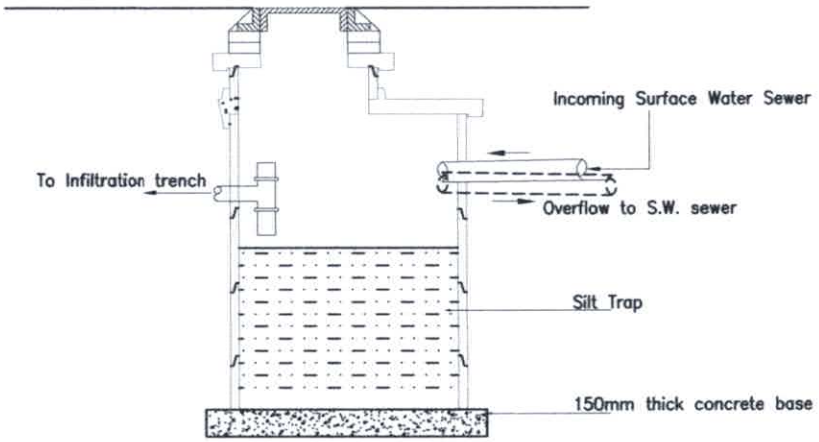
PROJECT:	TITLE:	DWG NO:	DATE:	DWN BY:	
Extension to dwelling at 10 Mountdown road, Manor Estate Dublin 12. Laura Doyle & Paul Boyle	SURFACE WATER SOAKAWAY DETAILS	D2404–01	09–04–2024	PM	Paul Martin Planning & Design Services
		REVISION: –	SCALE: 1:200 ON A4	CHK BY: PM	The Brambles Arthurstown Ardee Co. Louth Ireland Tel/Fax:+353 416855419 Mob +353876390590 Email: pmsurvey.design@gmail.com

NOTE:
FOR PLANNING PERMISSION ONLY

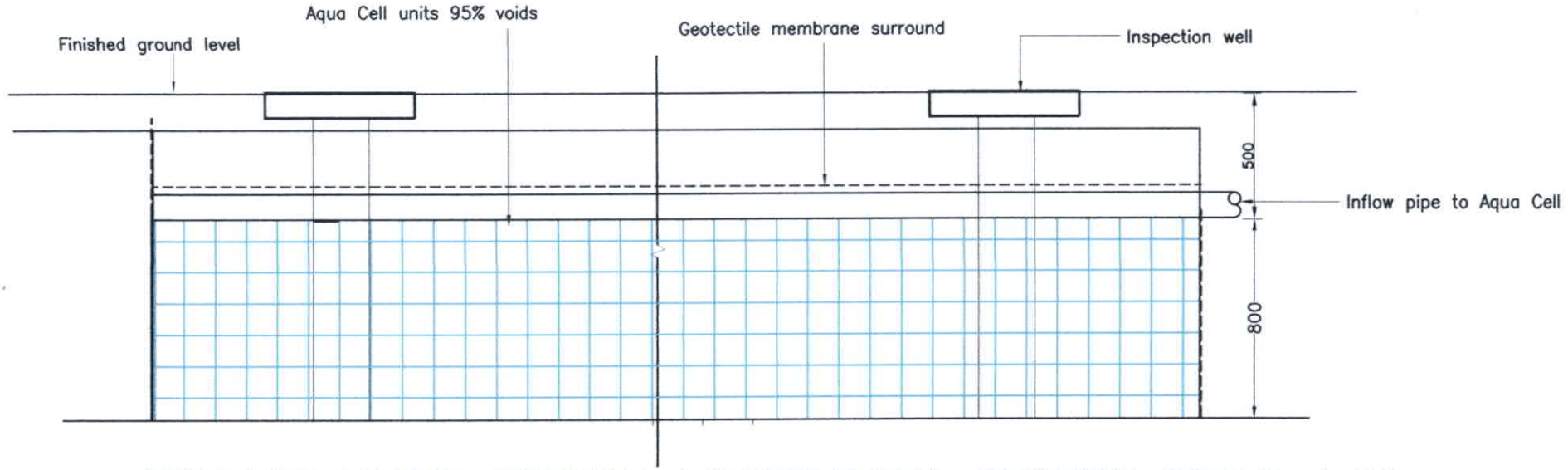
Approximate drainage lines layout only!
Drainage layout as per engineers building control drawings

Soakaway to located a minimum distance of 5.0m to and building foundation

Soakaway to located a minimum distance of 5.0m to any percolation area



TYPICAL SILT TRAP SCALE 1:50



STORAGE FILTER TRENCH LONGITUDINAL SECTION SCALE 1:50

PROJECT:	TITLE:	DWG NO:	DATE:	DWN BY:	Paul Martin Planning & Design Services
Extension to dwelling at 10 Mountdown road, Manor Estate Dublin 12. Laura Doyle & Paul Boyle	SOAKAWAY DETAILS	D2402–02	09–04–2024	PM	The Brambles Arthurstown Ardee Co. Louth Ireland Tel/Fax:+353 416855419 Mob +353876390590 Email: pmsurvey.design@gmail.com
		REVISION: –	SCALE: AS SHOWN	CHK BY: PM	

CALCULATION OF SOAKAWAY FILTER TRENCH BRE DIGEST 365

Trial pit

Length of trial pit m.	Width of trial pit m.	Effective depth of pit m.	75% of Eff. depth of pit m.	25% of Eff. depth of pit m.	Vol. between 75% and 25% cu.m	Area of Wetted surface to 50% depth sq.m. (includes area of base)	Time of drop from 75% to 25% full secs	Soil Infiltration Rate 'f' mm/sec	Infiltration Rate 'f' m./hr
~~1.8~~	~~0.6~~	~~1.8~~	~~1.35~~	~~0.45~~	~~0.972~~	~~5.4~~	~~20700~~	~~0.0087~~	~~0.0313~~
1.1	1.1	0.6	0.45	0.15	0.363	2.53	4000	0.0359	0.1291
~~0.75~~	~~0.6~~	~~0.75~~	~~0.5625~~	~~0.1875~~	~~0.16875~~	~~1.4625~~	~~2380~~	~~0.0485~~	~~0.1745~~
								0.0359	

Cell above used for direct insert for f

Soakaway

Length of Soakaway m.	Width of Soakaway m.	Eff. Depth of Soakaway m.	% Voids	Storage in Soakaway cu.m.	50% of Surface area sq.m.	Outflow Factor cu.m./sec
			0.095			
3	1	0.8	95	**2.28**	3.2	0.0001148

Storm dur. mins.	Area ha	Rainfall mm.	Inc 20% Climate Change Inflow cu.m.	Outflow cu.m.	Storage reqd. cu.m.	Is storage provided = or > vol. reqd. ?	Time to empty 50% minutes	Is time satisfactory i.e. < 24 Hours ?
5	0.006	12.2	0.88	0.03	0.84	Yes	61.27	Yes
10	0.006	16.9	1.22	0.07	1.15	Yes	83.34	Yes
30	0.006	25	1.80	0.21	1.59	Yes	115.68	Yes
60	0.006	31.3	2.25	0.41	1.84	Yes	133.61	Yes
120	0.006	39.1	2.82	0.83	1.99	Yes	144.39	Yes
240	0.006	49	3.53	1.65	1.88	Yes	136.14	Yes
360	0.006	55.9	4.02	2.48	1.55	Yes	112.20	Yes
720	0.006	70	5.04	4.96	0.08	Yes	5.91	Yes
1440	0.006	87.7	6.31	9.92	-3.60	Yes	-261.57	Yes
2880	0.006	99	7.13	19.83	-12.71	Yes	-922.50	Yes

As per the above table 1.99 cu.m. of storage is required based on a 120 minute storm duration. Including 20% in rainfall data for climate change

SOAKAWAY SIZE 3.0m L x 1.0 m W x 0.8m D

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JOB NO. D2404 Laura Doyle & Paul Boyle

DEVELOPMENT: 10 Mountdown Road Manor Estate, Dublin 12

Date: 09/04/2024

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FETAC
Further Education and Training Awards Council
Comhairle na nDámhachtainí Breisoideachais agus Oiliúna

Level 6 Specific Purpose Certificate
Teastas Cuspóra Shainiúil Leibhéal 6

Site Suitability On-Site Wastewater Treatment

Awarded to
Bronnta ar

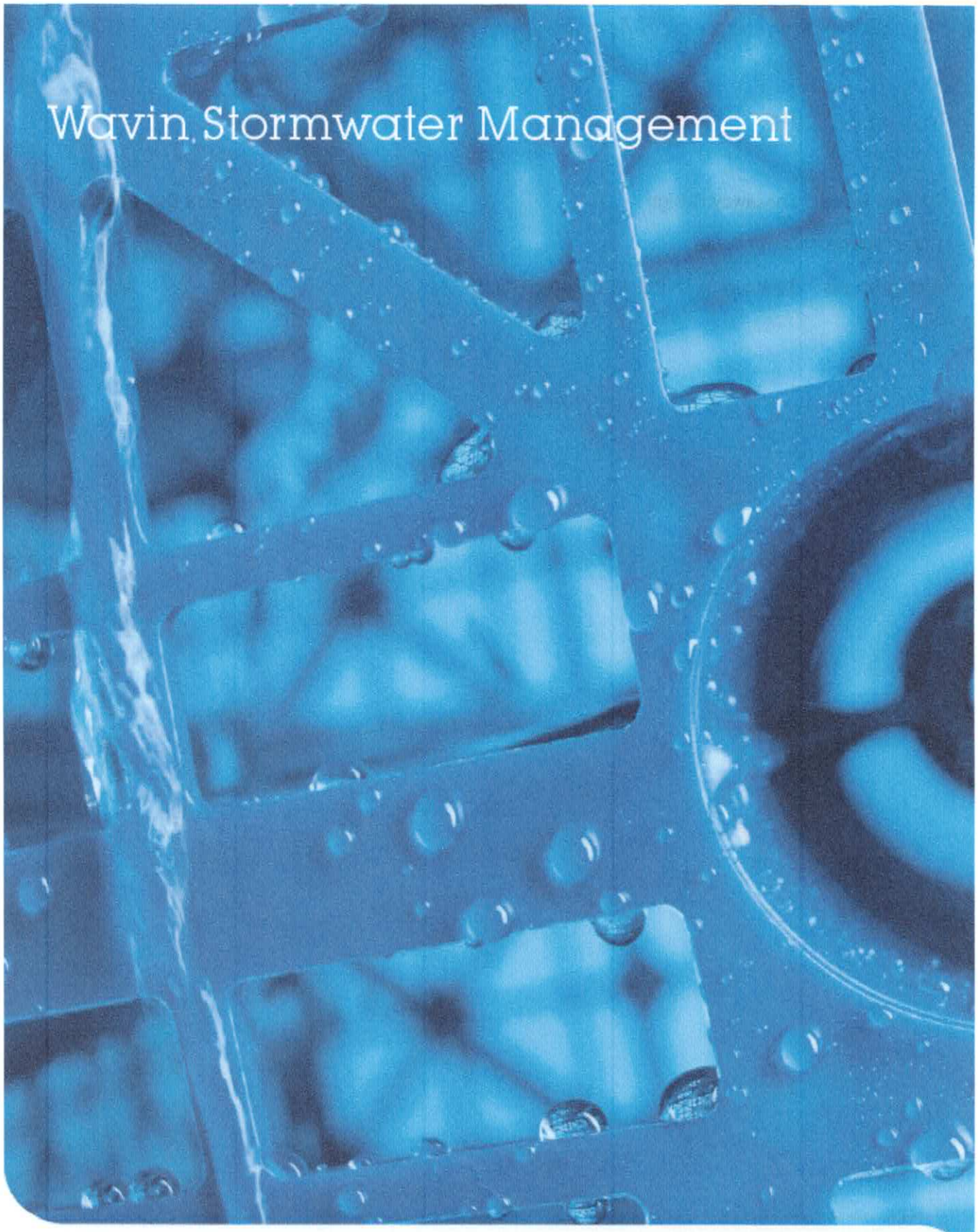
Paul Martin

30/03/2007

EF209550 722383

Chief Executive/Príomhfheidhmeannach, FETAC

Wavin Stormwater Management



wavin

CONNECT TO BETTER

Calculations

Site Details

Area	40m²	**Traffic Loading (Soakaway size based on 1:30 year Storm)**	Non-Trafficked
Soil Type	Dense sand and gravel		
Groundwater Present	No		

Wavin UK (Holdings) Ltd
Crow Edge
Hazlehead
Sheffield
South Yorkshire S36 4HG
Tel: 01709 856300 Fax: 01709 856301
e-mail: info@wavin.co.uk
website: www.intesio.co.uk

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

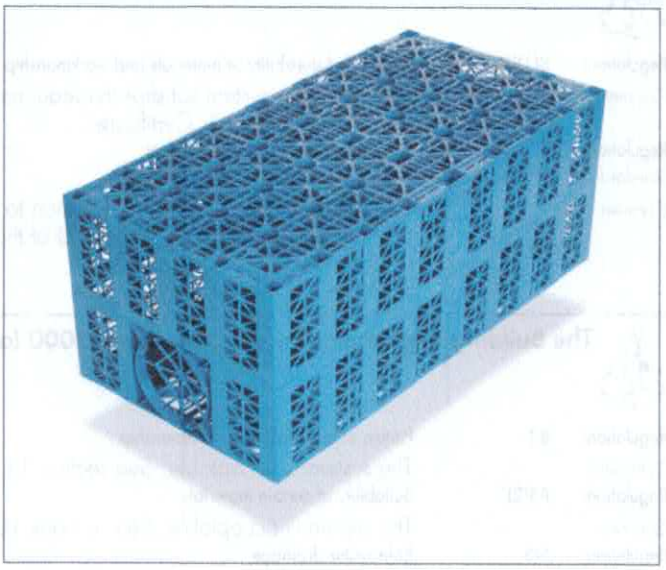
Agrément Certificate
03/4018
Product Sheet 1

INTESIO ATTENUATION AND INFILTRATION SYSTEMS

AQUACELL CORE ATTENUATION AND INFILTRATION SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the AquaCell Core Attenuation and Infiltration System, which can be used either for sub-surface water storage or as a soakaway to manage run-off from impermeable surfaces.



AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

System design — data is provided in the Certificate to assist in the design of a stormwater management system (see section 5).

Structural performance — the system has adequate strength and stiffness to resist long- and short-term loads when used in accordance with this Certificate (see section 6).

Durability — the system will have a service life in excess of 50 years when installed in accordance with this Certificate (see section 11).

The BBA has awarded this Agrément Certificate to the company named above for the system described herein. The system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

B C Chamberlain

Brian Chamberlain
Head of Approvals — Engineering

G N Cooper

Greg Cooper
Chief Executive

Date of First issue: 9 June 2010

Originally certificated on 28 March 2003

Certificate amended on 22 July 2010 to clarify annotation in Figure 5.

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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website: www.bbacerts.co.uk

Technical Specification

1 Description

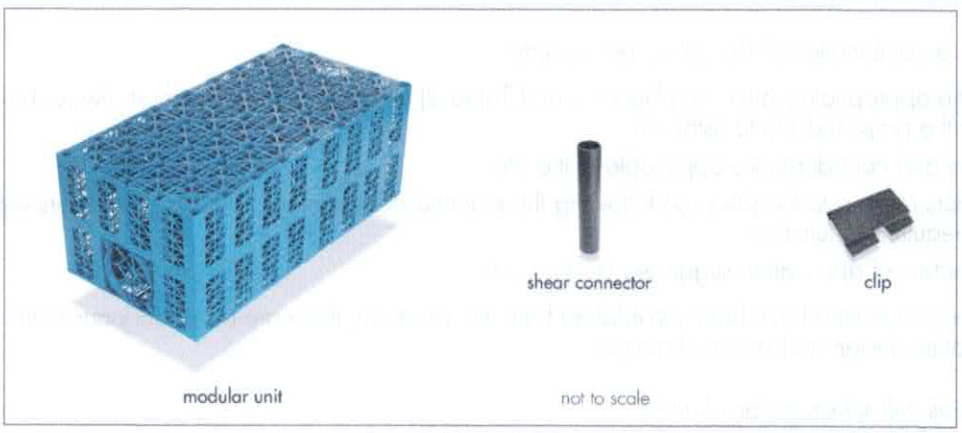
1.1 The AquaCell Core Attenuation and Infiltration System consists of individual, blue polypropylene modular units (see Table 1), black polypropylene shear connectors and black polypropylene clips (see Figure 1).

Table 1 Characteristics of modular unit

Element (Unit)	Value
Dimensions (nominal) (l x w x h) (mm)	1000 x 500 x 400
Volume (nominal) (m^3)	0.20
Storage volume (nominal) (m^3)	0.19
Porosity (void ratio) (%)	95
Ultimate compressive strength at yield ($kN \cdot m^{-2}$)	
– vertical loading on top face	560
– lateral loading on side face	77.5
Short-term deflection (mm per $kN \cdot m^{-2}$)(1)	
– vertical loading on side face	1 per 97
– lateral loading on side face	1 per 7
Estimated long-term deflection(2) (Ln)(3) (mm)	0.4705

(1) Applied load.
(2) At up to 20 years at 20°C at 141 $kN \cdot m^{-2}$ load.
(3) Time in hours.

Figure 1 Components



1.2 The system manages stormwater run-off from impermeable surfaces by:

- infiltration, ie as a soakaway to infiltrate water back into the ground
- attenuation, ie as temporary storage for excess flows and to control outflow to streams and rivers
- a combination of the above methods.

1.3 The polypropylene modular units have pre-formed sockets to enable connection with 160 mm diameter pipework. Alternatively, connection to 150 mm pipework is possible using an adaptor. Connection can also be made, at points other than the pre-formed sockets, to suitable 150 mm pipework using a flange adaptor. Adaptors and connecting pipework for use with this system are outside the scope of this Certificate.

1.4 Each assembly is wrapped in either a permeable geotextile when used for infiltration or an impermeable geomembrane when used for attenuation. Geotextiles and geomembranes for use with the system are outside the scope of this Certificate. Information on their required specification may be obtained from the Certificate holder.

1.5 Adequate venting must be provided to the structure using an air vent. One 110 mm diameter air vent is required per 7500 m^2 of impermeable catchment area to be drained. Air vent connections and pipework for use with this system are outside the scope of this Certificate.

2 Delivery and site handling

2.1 The system is supplied to site in packs of 15 units, secured with straps with plastic feet attached to the underside to enable placing and movement by a fork-lift. Each pack of units carries a label bearing the Aquacell type, part number, operator's initials, individual pallet sequential number and date of manufacture.

2.2 Each unit is supplied with two shear connectors and three clips.

2.3 The packs of the units should be carefully placed on level ground and should not be stacked on site. Loose individual modules should not be stored more than two units high.

Table 2 Design information checklist

Description	Information source
A Existing factors	
Topography	Site survey or inspection
Area of catchment[1]	Site survey
Hydrology of catchment	Site inspection and observations
Soil type[1]	Site investigation
Structural properties of soil – CBR, stiffness	Site investigation and laboratory testing
Infiltration potential of soil	Site investigation
Contamination[1]	Site investigation and desk research
Details of receiving water, watercourse/ aquifer	Environment Agency, Scottish Environment Protection Agency or water and sewerage company
Environmental sensitivity of site	Environment Agency, Scottish Environment Protection Agency or water and sewerage company
Groundwater vulnerability and source protection status	Environment Agency, Scottish Environment Protection Agency or water and sewerage company
B Predicted factors	
Development type and land use	Proposed development plans
Traffic loads	Proposed development plans
Rainfall data[1]	Meteorological Office or Wallingford procedure
Discharge design criteria	
– quantity	Environment Agency, Scottish Environment Protection Agency or water and sewerage company
– quality	Environment Agency, Scottish Environment
Health and safety	Protection Agency or water and sewerage company All affected parties.
C Planned function	
Infiltration	Conclusions from **A** and **B** audit/review
Attenuation	Conclusions from **A** and **B** audit/review.

(1) For individual house soakaways, only the items referenced for this footnote are required.

4 Practicability of installation

The system is designed to be installed by a competent general builder or contractor with experience of this type of system.

5 System design

Infiltration

Calculation principles

5.1 There are two approaches, either of which may be adopted, ie the Construction Industry Research and Information Association (CIRIA) Report 156 *Infiltration Drainage — Manual of Good Practice* or BRE Digest 365 *Soakaway Design*.

5.2 A simplified approximate approach can be used on a very small site (ie a single-house development) where detailed site infiltration rate information may not be required nor available (see Table 3). From Approved Document H of the England and Wales Building Regulations, for areas up to 25 m², a storage volume equal to the area to be drained multiplied by 10 mm may be used. Beyond this size, design should be carried out in accordance with BS EN 752 : 2008 or BRE Digest 365. It is suggested in BS EN 752 : 2008 that a storage volume equal to 20 mm multiplied by the area to be drained may be used. In Scotland, guidance for the design of single-house soakaways is given in Mandatory Standard 3.6, clause 3.6.5[1].

(1) Technical Handbook (Domestic).

Table 3 Design parameters for single-house roof soakaway

Number of units	Storage volume (m³)	Maximum area to be drained (m²)
1	0.19	19[1]
2	0.38	25[1]
3	0.57	28.5[2]
4	0.76	38[2]
5	0.95	47.5[2]
10	1.90	95[2]

(1) In accordance with Approved Document H.

(2) In accordance with BS EN 752 : 2008, clause NA 4.4.8.

Figure 3 Typical inlet connection designs

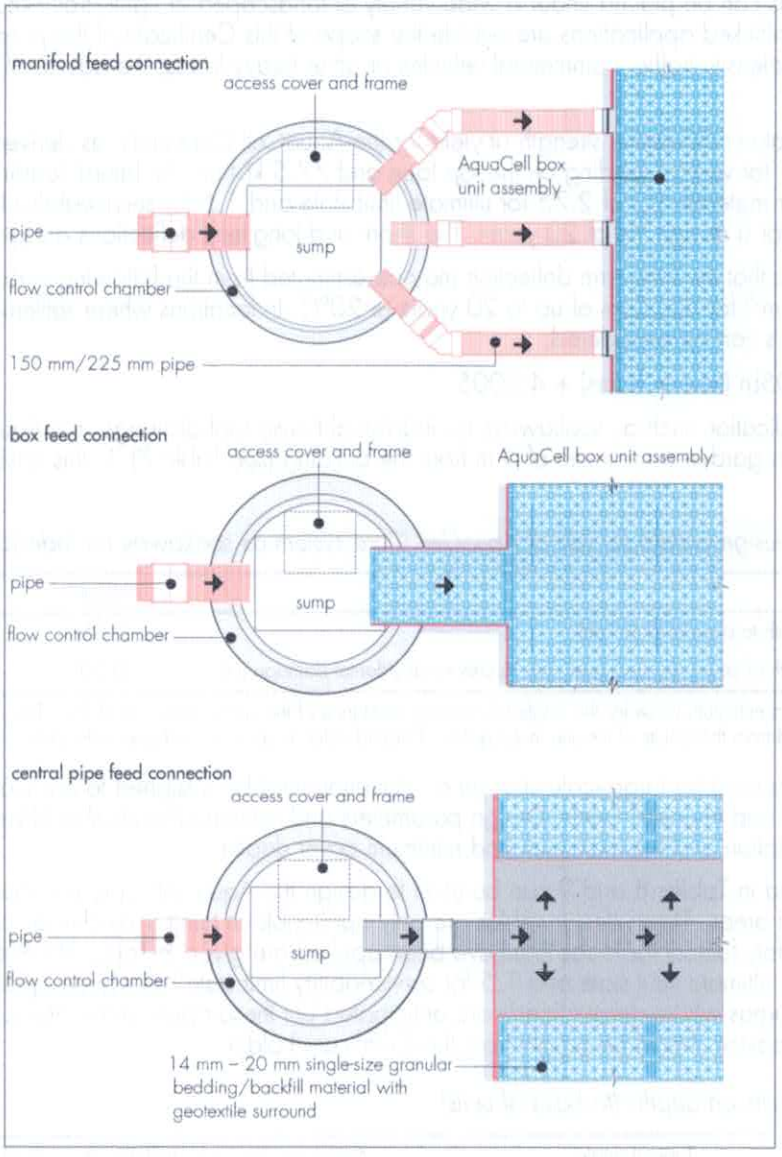


Table 6 Multiple manifolds

Surface type	Drainage area (m^2)					
	Number of inlet pipes					
	1	2	3	4	5	6
Paved area	1110	2220	3330	4440	5550	6660
Roof area(1)	841	1682	2523	3364	4205	5046
Roof area(2)	210	420	630	840	1050	1260

(1) Roofs drained by eaves gutters, close to the attenuation site (within 25 m).

(2) Roofs drained by internal gutters, close to the attenuation site (within 25 m) (especially siphonic roof drainage).

Flow control

5.9 The outflow from the tank must be controlled to comply with the discharge rate consent of the site. There are four main methods to achieve outflow control, ie orifice plate, Garastor, vortex control or small pipe. Comparative features and benefits of these various flow control devices should be considered prior to selection. These devices are outside the scope of this Certificate.

Outflow positioning and head calculations

5.10 The invert level of the outflow pipe should be flush with, or lower than, the bottom of the lowest unit to allow the tank to drain. As the tank fills, a depth of water develops on the upstream side of the outflow control. For a tank with two layers of AquaCell Core units, this depth is 0.8 m when the units are full, creating a driving head to push the flow through the control device. For design purposes, the head used in calculations is taken as that at the centre line of the outflow device.

Table 9 Minimum cover depths over top of AquaCell Core units[1]

Location	Minimum cover depth (m)
Non-trafficked areas (eg landscaping)	0.50
Car parks, vehicles up to 2500 kg gross mass, Aquacall system up to three units wide in trench	0.60
Car parks, vehicles up to 2500 kg gross mass, Aquacell system greater than three units wide	0.75

(1) Assumes 27° load distribution through fill material and overlying surface of asphalt or block paving, and trafficking by occasional refuse collection trucks or similar vehicles (typically one per week).

Table 10 Partial safety factors for loads used for design

Description	Symbol	Ultimate limit state	Serviceability limit state
Vertical dead load	f_{dl}	1.40	1.00
Earth pressure (horizontal) dead load	f_{ep}	1.40	1.00
Imposed live load	f_{ll}	1.60	1.00

6.7 For lightly-loaded applications, the bearing capacity of the underlying soils, typically, should not be exceeded by the AquaCell Core System. Therefore, settlement of the underlying soils should be negligible. On weak or compressible soils, the bearing capacity and settlement characteristics should be confirmed by a geotechnical engineer.

6.8 Care should be taken when the AquaCell Core system is used for infiltration below trafficked areas and close to structures. It is important to ensure that the infiltrating water will not soften the soils or cause loss of fines and settlement.

6.9 When the units are wrapped in an impermeable geomembrane and placed below the groundwater table, flotation may occur. To prevent this, the weight of the soil over the top of the units must be greater than the uplift force caused by the unit's buoyancy in the water. This can be achieved with most types of fill if the depth of cover fill is equal to, or greater than, the depth of penetration of the units below groundwater level.

7 Geotextiles and geomembranes

7.1 In infiltration applications, the geotextile wrapped around the AquaCell Core system prevents soil entering the units and stops the soil which surrounds the unit becoming clogged with silt present in run-off. In attenuation/storage applications, the geotextile serves to protect the geomembrane.

7.2 The selection of an appropriate geotextile for a specific AquaCell Core infiltration installation should be considered carefully, with particular reference to the surrounding soil properties and required performance. Points to consider are:

- the pore size should be designed and specified to assist infiltration and prevent migration of fine soil particles
- the permeability and breakthrough head should not limit the flow of water in the system, and should be similar to or greater than the surrounding materials
- the material must be able to resist the punching stresses caused by loading on sharp points of contact
- its strength should be sufficient to resist the imposed forces (eg from traffic).

7.3 The geotextile should be selected according to specific site conditions. However, typically, a 300 g non-woven material will be suitable for most situations. Specialist advice should be sought if surrounding soil characteristics exhibit a high degree of fines/low infiltration capacity and/or there is risk of damage from ground contaminants.

7.4 In attenuation/storage applications where infiltration is not possible or permitted, an impermeable geomembrane is wrapped around the AquaCell Core system to prevent release of attenuated/stored water into surrounding ground and to prevent inflow of pollutants from contaminated subsoil into the storage reservoir.

7.5 The specification and selection of the impermeable geomembrane must be correct for the installation envisaged, to ensure it performs to the level required. It is essential that the specified material:

- withstands the rigours of installation
- resists puncture
- resists multi-axial elongation stress and strains associated with settlement
- resists environmental stress cracking
- resists damage from ground contaminants
- remains intact for the full design life.

7.6 Geomembranes less than 1 mm thick are unlikely to meet these criteria[1], and are not recommended for use with the AquaCell Core system[2]. A specification for a typical polypropylene geomembrane is shown in Table 11.

(1) Except in shallow, domestic installations.

(2) Further details can be obtained from the Certificate holder.

9 Resistance to chemicals

9.1 An assessment by the BBA indicates that the components of the system are suitable for use in contact with the chemicals likely to be found in rainwater.

9.2 An assessment of the suitability for use of AquaCell Core units on brownfield sites should be made only after a suitable site investigation to determine the possibility for chemical attack. Particular care must be taken where acids and organic solvents are present at high concentrations. Further information can be obtained from the Certificate holder.

10 Maintenance

10.1 The customer is responsible for maintenance. Recommendations for maintenance of SUDS systems are given in CIRIA C697.

10.2 For soakaways to individual houses, the only necessary maintenance is to keep gullies clear of debris such as leaves.

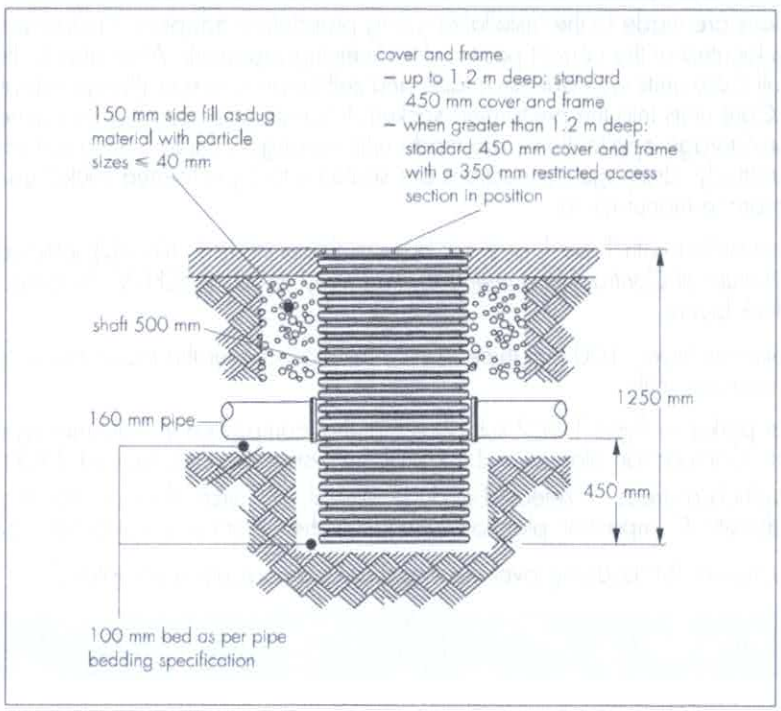
10.3 For large installations or where the receiving waters are environmentally sensitive, a system of regular inspections should be established to prevent the accumulation of silt in the system which, if allowed to develop, would reduce effectiveness. They should also be inspected after every major storm event.

10.4 It is recommended that a silt trap is incorporated into the pipework at the inlet to the tank (see Figure 5). There must be a maintenance plan that ensures regular cleaning of the trap to ensure correct performance. Silt traps for use with this system are outside the scope of this Certificate.

10.5 For all flow control devices it is sensible to incorporate access (via a manhole or similar) to the location of the pipe entry, orifice or vortex control. This will enable easy removal of any blockage. The orifice itself may be protected by a debris screen.

10.6 Paved surface areas above an installation should be inspected at the same time to ensure the units continue to provide the required structural support.

Figure 5 Typical silt trap



11 Durability

The structural properties of polypropylene used in the components of the system will deteriorate with time and should be taken into account at the design stage by the application of suitable safety factors. In the opinion of the BBA, the AquaCell Core Attenuation and Infiltration System, when used in accordance with this Certificate, will have a life in excess of 50 years.

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