

DRAINAGE MAINTENANCE PLAN

McDonald's, Horton Road, Devizes (ST2029)



Prepared for: McDonald's Restaurants Ltd
Ref: 004_4240491_SF_DMP_Devizes_Issue 2.docx

Document History

Issue	Date	Description	Prepared By	Checked By
1	04 December 25	First Issue	S Forber	H Gell
2	03 March 26	Updated to revised planning layout.	S Forber	H George
3	22 May 26	Updated to revised planning layout. Additional SuDS features added.	S Forber	H George

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Figure 2: Proposed Drainage Layout

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Appendix B: Cellular Attenuation Tank

Appendix C: Surface Water Treatment & Grease Trap

Appendix D: Maintenance Schedule

1.0 Introduction

- 1.1 This Sustainable Drainage Maintenance Plan has been prepared by Glanville Consultants Ltd on behalf of McDonald's Restaurants Limited.
- 1.2 Devizes is a historic market town and civil parish located in the county of Wiltshire. It lies roughly centrally within Wiltshire, about 16 miles east of Bath, 11 miles northeast of Trowbridge, and 6 miles south of Calne. The proposed site is located in the northeastern part of the town and to the east of the roundabout junction between Horton Road, London Road, and the A361. The development site area itself is currently a petrol filling station, used car sales and car servicing facility with an existing access from Horton Road to the south. It is proposed that access from Horton Road will be utilised for the new restaurant.

2.0 Drainage Maintenance Responsibility & Training

- 2.1 The McDonald's site and all of its drainage is privately owned and maintained by McDonald's. It is the store manager's responsibility to ensure that the drainage system is regularly inspected and maintained, in accordance with this plan. Figure 2 shows the layout of the drainage system including the location of each of the items requiring maintenance, listed in this plan and a summary of the maintenance requirements.
- 2.2 The majority of tasks can be completed by McDonald's staff trained for each specific task. Training should include manual handling, for lifting manhole covers. Manholes & chambers can be dangerous due to trapped harmful gases and should not be entered unless staff are confined space trained and issued with appropriate equipment. Entering confined spaces should not normally be required and should be controlled by a permit to enter system administered by the store manager. It may be appropriate to rely on non-store based, specialist staff, on the rare occasions when confined space entry is required.

3.0 Drainage Inspection and Maintenance Requirements and Frequency

Catchpit Manholes and Gullies (Figure 1 - Ref A & C)

- 3.1 Catchpit manholes and gullies are designed to trap silt, leaves and other debris before it reaches more sensitive parts of the drainage system where it could reduce drainage efficiency. Catchpit manholes are located prior to the cellular storage tank and adjacent to surface drainage channels. Gullies are located throughout the car park and drive through lane, adjacent to kerb-lines.
- 3.2 Catchpit manholes and gullies need to be inspected on a monthly basis except during the autumn leaf fall when they may require inspections to be increased to fortnightly.
- 3.3 Equipment required for inspection includes moveable barriers and cones to guard openings, manhole keys, gloves, and a torch. A minimum of two people is required.
- 3.4 Catchpit manholes and gullies need to be emptied once the sump becomes half full. Emptying should be performed using a gulley emptying vacuum truck or similar device which does not require man entry.

Foul Water Manholes and Inspection Chambers (Figure 1 - Ref B)

- 3.5 Foul water manholes and inspection chambers need to be inspected on a monthly basis or immediately if foul odours are present or there is a suspected blockage.

- 3.6 Equipment required for inspection includes moveable barriers and cones to guard openings, manhole keys, gloves, and a torch. A minimum of two people is required.
- 3.7 If manholes show any signs of blockage, specialist contractors should be called for clearance work, without delay.

Drainage Channel Outlets (Figure 1 - Ref D)

- 3.8 Drainage channel outlets need to be inspected on a monthly basis except during the autumn when leaf fall, may require inspections to be increased to fortnightly.
- 3.9 Equipment required for inspection includes moveable barriers and cones to guard openings, lifting tools, gloves, and a torch. A minimum of two people is required.
- 3.10 Silt, leaves, and debris should be cleared from the channel outlets during each inspection.

Surface Water Treatment (Figure 1 - Ref E)

- 3.11 Catchpit manholes and trapped gullies and kerb drain trapped outlets are located upstream of the petrol interceptor to prolong its life and optimise maintenance visits.
- 3.12 Equipment required for inspection includes moveable barriers and cones to guard openings, manhole keys, gloves, wire ties and cutters and a torch. A minimum of two people are required.
- 3.13 Staff should have appropriate training for these inspections as they involve specialist products. It is recommended that initial training is provided by manufacturers of this equipment.
- 3.14 The Petrol Interceptor is alarmed and has a silt trap and a treatment Coalescer. It is a SPEL ESR 25-C1 unit and shall be maintained and re commissioned strictly as required by the supplier, refer to Appendix A for details. Maintenance is required when the alarm is activated.

Flow Control (Figure 1 - F)

- 3.15 A flow control manhole is present at position F, incorporating complex flow control using Aco-brakes. This chamber should be inspected monthly to look for debris blocking the outlet. Details are shown in Appendix A.

Cellular Attenuation Tank (Figure 1 - G)

- 3.16 The cellular crates are protected by the upstream catchpit manholes. The catchpit manholes adjacent to the crates will allow inspection of the perforated pipe within the attenuation tank. The perforated pipe should be examined when the catchpits are inspected, on a monthly basis. The perforated pipe should also be inspected after every major storm. If there is any evidence of silt within the perforated pipe, jetting can be performed and any silt should be washed into the catchpit manhole, where it can be emptied. See Table 3 for maintenance requirements and frequencies.
- 3.17 Jetting requires specialist equipment and should be carried out by specialist contractors to ensure that damage to the crate storage is avoided. Provided the catchpit manholes are emptied appropriately, jetting should not be required. See also the manufacturer's guidelines in Appendix B and guidance in Table 1.

Table 1 - Operation and Maintenance Requirements for Attenuation Tanks

Maintenance Schedule	Required action	Typical Frequency
Regular maintenance	Inspect & identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
	Remove debris from the catchment surface.	Weekly or as required
	Remove sediment from pre-treatment structures (catchpits) and, or internal forebays.	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required
Monitoring	Inspect all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build up and remove if necessary.	Every 5 years or as required.

Grease Traps (Figure 1 - H)

- 3.18 The Grease Traps should be inspected on a monthly basis, by lifting the inspection cover. Any signs of a malfunction or blockage should be reported immediately to the external specialist maintenance company.
- 3.19 The Grease Trap has an alarm hard wired into the Store Manager's office with a visual and audible warning system. If the alarm is triggered the external specialist maintenance company should be called out immediately. See also the manufacturer's guidelines in Appendix C.
- 3.20 Within the restaurant there is a grease removal unit which connects the dishwasher and the 3 sink. It is above ground and requires cleaning out multiple times a day. Additionally, the dishwasher discharge should wait 1 hour to cool prior to emptying into the grease removal unit.

Permeable Paving (Figure 1 - I)

- 3.21 Maintenance of the permeable paving is essential to preserve hydraulic performance and prevent clogging from sediment, organic matter, or vehicular pollutants. Regular inspections and cleaning help ensure long-term functionality.
- 3.22 Regular monthly maintenance would include visual inspection of the surface and removal of any litter or debris, noting of any excessive ponding for longer than 48 hours.
- 3.23 Quarterly inspections should include removal of any organic material growing between the blocks, and replacement any broken or missing blocks.
- 3.24 Yearly inspections should include Inspect for sediment build-up, weed growth, and structural integrity and Jet-vacuum or sweep with suction sweeper as may be required.
- 3.25 For the long-term efficient use of the permeable paving it would be necessary to carry out inspections of the sub-base and testing of the infiltration every 5 years or when excessive ponding occurs.

Filter Drain (Figure 1 - J)

- 3.26 Regular visual inspections should be carried out at least once a month, particularly during wet periods. These inspections aim to identify any signs of surface ponding, sediment accumulation, vegetation overgrowth, or physical damage to the structure. Early detection of issues can prevent more serious failures and reduce the need for intensive remedial work. Inspectors should walk the length of the filter drain, checking for, surface debris and litter, blockages at inlets or outlets, evidence of erosion or scouring, signs of water bypassing the system, unusual vegetation growth that may indicate waterlogging or nutrient-rich runoff.

Dry Swale (Figure 1 - K)

- 3.27 Regular maintenance of the dry swale should include inspection and removal of any litter and debris, grass cutting, removal of weeds and vegetation which may reduce capacity or impede flows, inspection of inlet and outlet points of connection for large debris blockages. General visual inspection of the base to ensure no prolonged ponding occurs (greater than 48hrs) or excessive build-up of silt etc. Inspection of any connected inspection chambers or access points for silt build up.
- 3.28 Occasional maintenance should include reseeding of any patchy grassed areas or change of planting to a more suitable for conditions, i.e. too dry or too wet etc.
- 3.29 Remedial actions could include repair of any erosion or other damage by re-turfing or reseeding, scarify and spike topsoil layer to improve infiltration performance, break up/removal of any silt build up to prevent over compaction and reduce infiltration performance and removal of any excessive residual oils or petrol from drive through/access road.

4.0 Drainage Inspection and Maintenance Records

- 4.1 Appendix D includes the annual drainage record log sheet. Copies should be taken of the log sheet for use for each year's records. Each inspection should be recorded on the log sheet for that year by the store manager. The log sheet shall be kept with this manual.

Figures



INDICATIVE
NORTH

NOTES:

1. ALL DRAINAGE ALARM SYSTEM COVERING SPEL GREASE TRAPS AND TREATMENT UNITS MUST BE INSTALLED, CONNECTED AND COMMISSIONED SPEL PRIOR TO PRACTICAL HANDOVER OF THE STORE TO MCDONALD'S
2. DRAINAGE SHOWN OUTSIDE OF THE MCDONALDS DEMISE IS TO BE MAINTAINED BY OTHERS

	ITEM	REQUIREMENT	FREQUENCY	MAINTAINED BY
(A)	A - SURFACE WATER CATCHPIT	INSPECT SURFACE WATER MANHOLE / CATCHPIT AND REMOVE SILT IF FULL	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(B)	B - FOUL WATER CHAMBER	VISUALLY ACCESS TO LOOK FOR BLOCKAGES	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(C)	C - GULLIES	INSPECT GULLY, REMOVE DEBRIS	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(D)	D - CHANNEL OUTLETS	INSPECT DRAINAGE OUTLETS, REMOVE DEBRIS	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(E)	E - PETROL INTERCEPTOR	INSPECT AND IF FULL MAINTENANCE BY MANUFACTURER REQUIREMENTS	QUARTERLY OR AFTER POLLUTION SPILL	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(F)	F - FLOW CONTROL CHAMBER	VISUALLY ACCESS TO LOOK FOR BLOCKAGES MAINTENANCE BY MANUFACTURER REQUIREMENTS	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(G)	G - ATTENUATION TANK	INSPECT INLET AT ADJACENT CATCHPIT MANHOLE	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(H)	H - GREASE TRAP	INSPECT AND IF FULL MAINTENANCE BY MANUFACTURER REQUIREMENTS	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(I)	I - PERMEABLE PAVING	INSPECT AND IDENTIFY ANY AREAS WHICH ARE NOT OPERATING CORRECTLY	MONTHLY	TAKE REMEDIAL ACTION
(J)	J - FILTER DRAIN	INSPECT DRAINAGE OUTLETS, REMOVE DEBRIS	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD
(K)	K - DRY SWALE	INSPECT AND IDENTIFY ANY AREAS WHICH ARE NOT OPERATING CORRECTLY	MONTHLY	SPECIALIST CONTRACTOR APPOINTED BY MCDONALD

DRAINAGE MAINTENANCE TABLE

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS, DOCUMENTS AND SPECIFICATIONS. ANY DISCREPANCIES BETWEEN INFORMATION SHOWN ON THIS AND ANY OTHER DRAWING SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
2. DO NOT SCALE FROM THIS DRAWING. WORK TO FIGURED DIMENSIONS ONLY.
3. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNLESS SPECIFICALLY STATED AS 'FOR CONSTRUCTION' IN THE DRAWING STATUS.
4. ALL DRAWING INFORMATION MUST BE READ FROM HARD COPY / PDF FILES ONLY, MARKED CHANGES BEFORE PROCEEDING PLEASE ENSURE THE ISSUE STATUS IS APPROPRIATE FOR THE INTENDED USE. ALL INFORMATION EXTRACTED DIRECTLY FROM DRAWING FILES (E.G. DWG'S) IS DONE SO ENTIRELY AT THE USERS RISK.

KEY:

- | | |
|---|--|
|  | APPLICATION BOUNDARY |
|  | PROPOSED SITE LAYOUT |
|  | TOPOGRAPHICAL SURVEY |
|  | OS MAP |
|  | PROPOSED SURFACE WATER DRAINAGE
PIPEWORK SHOWING LENGTH, PIPE
DIAMETER AND GRADE |
|  | PROPOSED SURFACE WATER DRAINAGE
PIPEWORK WITH GULLY WITH 1500 PIPE |
|  | PROPOSED SURFACE WATER PPIC
CATCHPIT MANHOLE WITH 300mm SUM |
|  | ACO MONO DRAIN PD1000 U.N.O
10.0 DRAINAGE CHANNEL (BLACK) |
|  | SPEL ESR TREATMENT UNIT WITH HARD
WIRED ALARM TO MANAGER'S OFFICE |
|  | LINED IMPERMEABLE HEAVY DUTY CELLULOSE
STORAGE SDS GEOLIGHT OR SIMILAR
APPROVED |
|  | FLOW CONTROL CHAMBER |
|  | ACO 305 KERB DRAIN - DRAINAGE KERB
WITH ACCESS POINTS / OUTLETS |
|  | PROPOSED FOUL WATER DRAINAGE
PIPEWORK SHOWING LENGTH, PIPE
DIAMETER AND GRADE |
|  | PROPOSED BUILDING FOUL WATER
DRAINAGE INSPECTION CHAMBER |
|  | PROPOSED GREASE WATER DRAINAGE
PIPEWORK SHOWING LENGTH, PIPE
DIAMETER AND GRADE |
|  | PROPOSED GREASE WATER DRAINAGE
INSPECTION CHAMBER |
|  | ALARMED 2000L SPEL GREASE TRAP WITH
HARD WIRED ALARM TO MANAGER'S OFF |
|  | 1100 DUCTS FOR GREASE TRAP / CABLES
INCOMING ELECTRICS CUPOBOARD (MUST
BE INSTALLED, CONNECTED AND
COMMISSIONED BY THE GROUNDWORK
CONTRACTOR PRIOR TO PRACTICAL
HANDOVER) |
|  | PROPOSED BIO-RETENTION STRIP |
|  | PROPOSED SHALLOW SWALE |
|  | LINED PERMEABLE PAVING |

FIGURE 1

P3	UPDATED TO REVISED PLANNING LAYOUT. SUDS FEATURES ADDED.	22.05.26	SWF	HB
P2	UPDATED IN ACCORDANCE WITH REVISED PLANNING LAYOUT.	09.01.26	SWF	HB
P1	FIRST ISSUE	02.12.25	SWF	HB
Rev.	Description	Date	By	Chk



-  **Civil Engineering**
 Structural Engineering
 Transport Planning
  Highways Engineering
 Building Surveying
 Geomatics
- Hertfordshire | Oxfordshire | Cambridgeshire | Bristol

Client : 

Project : McDONALD'S RESTAURANT
DEVIZES HORTON ROAD
(ST2029)

Title : **PROPOSED DRAINAGE
MAINTENANCE PLAN**

Engineer : SWF	Date : DEC 2025
Director : HBG	Scale : 1:200 @ A1

Status : PRELIMINARY	
Drawing No. 4240491-1250	Rev P3



- DRAINAGE NOTES:**
1. ALL DRAINAGE ALARM SYSTEM COVERING SPEL GREASE TRAPS AND TREATMENT UNITS MUST BE INSTALLED, CONNECTED AND COMMISSIONED SPEL PRIOR TO PRACTICAL HANDOVER OF THE STORE TO MCDONALD'S.
 2. ALL DRAINAGE TO BE INSTALLED TO BUILDING REGULATIONS PART H AND/ OR SCOTTISH BUILDING REGULATIONS.
 3. ALL DRAINAGE TO BS8582.
 4. BUILDING INSPECTOR TO INSPECT ALL FOUL DRAINAGE INSTALLATION
 5. **ALL DRAINAGE ALARM SYSTEMS COVERING GREASE TRAPS AND TREATMENT UNITS MUST BE INSTALLED, CONNECTED AND COMMISSIONED BY THE GROUNDWORK CONTRACTOR PRIOR TO PRACTICAL HANDOVER OF THE STORE TO MCDONALD'S.**

- NOTES**
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 - 1100 DUCTS FOR GREASE TRAP / CABLES TO INCOMING ELECTRICS CU/BOARD (MUST BE INSTALLED, CONNECTED AND COMMISSIONED BY THE GROUNDWORK CONTRACTOR PRIOR TO PRACTICAL HANDOVER)
 - PROPOSED BIO-RETENTION STRIP
 - PROPOSED SHALLOW ENHANCED SWALE
 - LINED PERMEABLE PAVING

FIGURE 2

P3	UPDATED TO REVISED PLANNING LAYOUT. SUDS FEATURES ADDED.	22.05.26	SWF	HGB
P2	UPDATED IN ACCORDANCE WITH REVISED PLANNING LAYOUT.	09.01.26	SWF	HGB
P1	FIRST ISSUE	02.12.25	SWF	HGB



Survey > Plan > Engineer

 Civil Engineering

 Structural Engineering

 Transport Planning

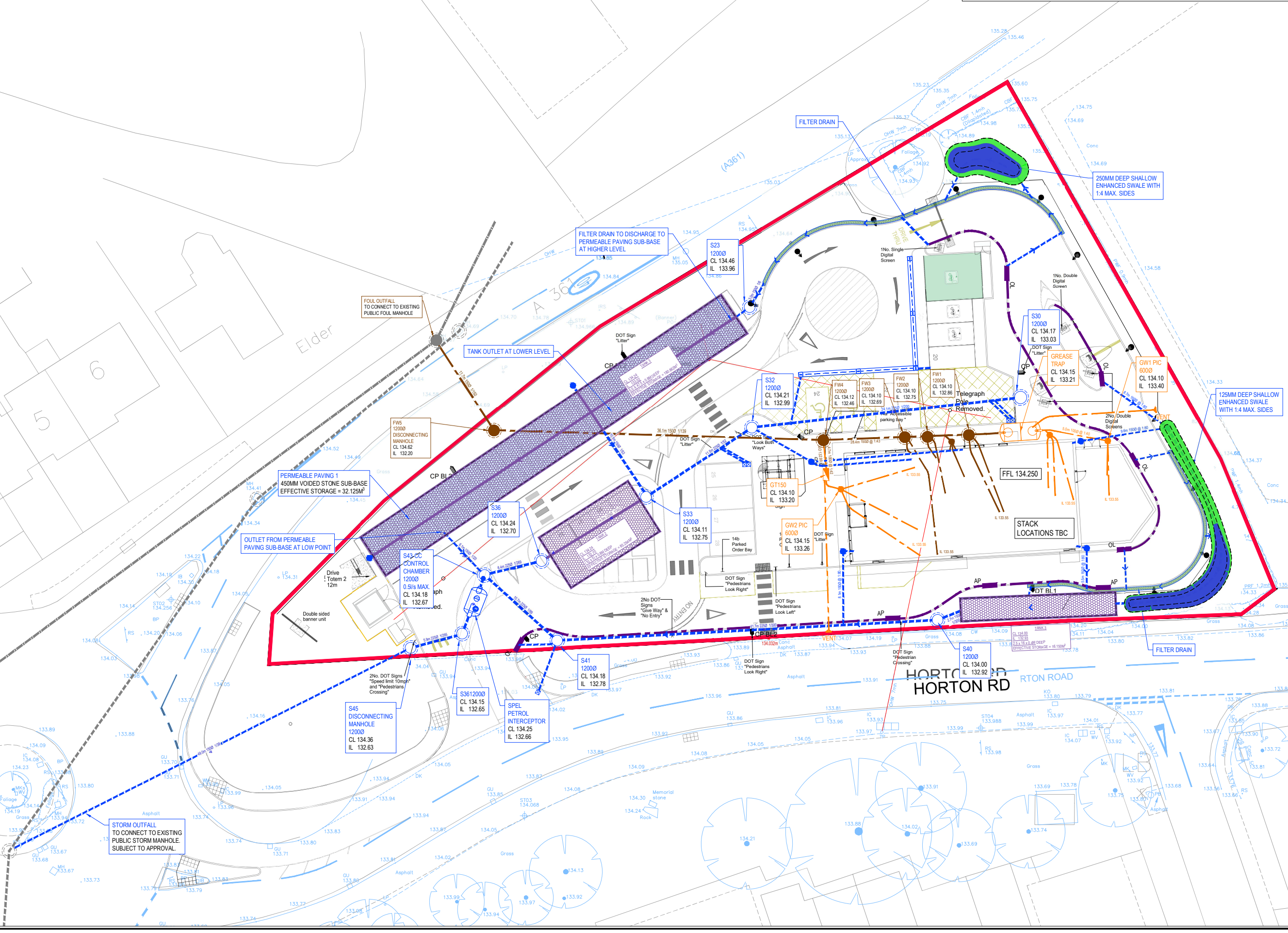
 Highways Engineering

 Building Surveying

 Geomatics

 Hertfordshire |  Oxfordshire |  Cambridgeshire |  Bristol

Client:	
Project:	MCDONALD'S RESTAURANT DEVIZES HORTON ROAD (ST2029)
Title:	PROPOSED DRAINAGE LAYOUT
Engineer:	SWF
Director:	HGB
Status:	PRELIMINARY
Drawing No.	4240491-1200
Rev	P03



Appendices

Appendix A

Surface Water Flow Control

Uniclass JR12/JR23 L731	
CI/SfB (52.7)	



Surface Water Flow Control Systems

ACO Q-Brake Vortex and ACO Q-Plate

Introduction to the ACO Group

Throughout the world ACO branded drainage and surface water management systems are recognised for their innovative design, high quality manufacture, environmental excellence and industry leading performance.

Today the ACO Group has a research and production base that reaches across four continents. This unmatched resource pioneers the development of solutions that are tailored to individual applications, meeting the need for high performance, sustainable products that deliver optimum value throughout their operational life.

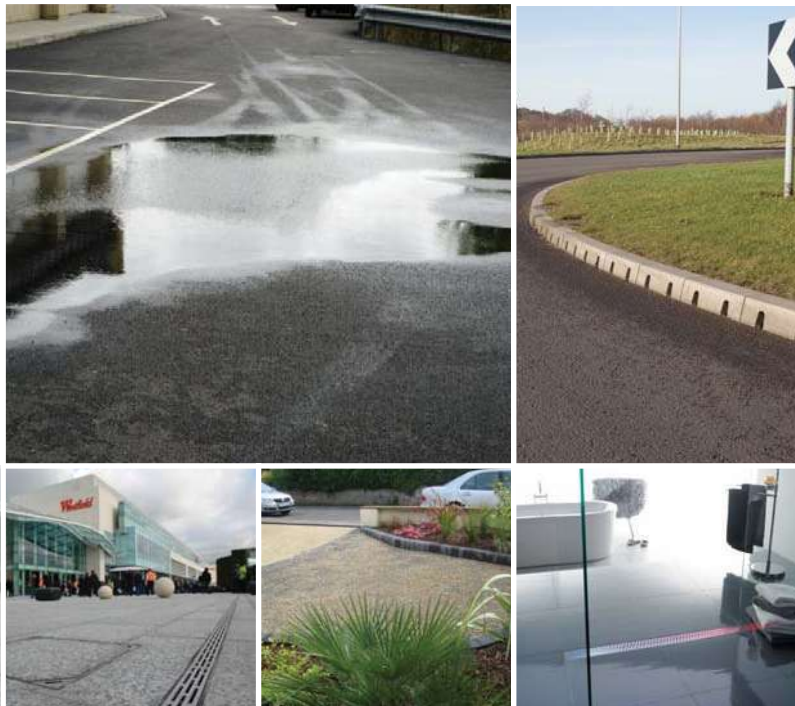
ACO Technologies plc

ACO operates as ACO Technologies plc in the United Kingdom. Founded over 25 years ago, the company has grown quickly on a reputation for design innovation and customer service.

There are 2 core divisions, ACO Water Management and ACO Building Drainage, that serve every sector of the construction industry, providing solutions for applications as diverse as rail, highways, airports, landscaping, retail, distribution centres and environmentally sensitive projects.



To help architects, designers and contractors meet the legal requirements that now tightly control the way surface water is managed, ACO has created its unique 'Surface Water Management Cycle' – Collect, Clean, Hold, Release – the four core processes now required for the complete and sustainable management of surface water drainage.



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ACO Q-Brake Vortex specification and design process	10
ACO Q-Brake Vortex Installation detail	11
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Introduction to ACO's Surface Water Flow Control Systems

ACO's range of flow control systems are designed to regulate storm water flow before it discharges into the watercourse or sewer networks. ACO Q-Brake Vortex flow controls and ACO Q-Plate orifice plates are capable of regulating any flow for surface water applications and can be used in conjunction with retention and attenuation systems, such as ACO StormBrixx, as an integrated sustainable urban drainage (SuDS) scheme.

What is ACO Q-Brake Vortex?

ACO Q-Brake Vortex is a horizontal vortex flow control designed to regulate storm water flows from 1-100 litres per second. Manufactured from grade 304 stainless steel, each ACO Q-Brake Vortex is individually configured to suit specific performance criteria.

The design of a vortex flow control is based on the fluid mechanics principle of the forced vortex, which permits flow regulation without any moving parts.

ACO Q-Brake Vortex utilises the upstream head and discharge to generate a 'vortex' within the structure of the unit. The water is then released at a pre-determined controlled rate preventing downstream flooding.

Unlike more conventional methods, ACO Q-Brake Vortex is less prone to blockage, and permits higher flow at a lower head of water, as a vortex control allows an outlet 4-6 times larger in cross sectional area to be used.

ACO Q-Brake Vortex can form part of the design of any integrated drainage scheme for a wide range of infrastructure, industrial and other SuDS applications.



What is ACO Q-Plate?

ACO Q-Plate orifice plates are designed for use where an ACO Q-Brake vortex is not the most effective solution.

To suit application requirements, the range is available with or without remote bypass and drain down and is designed to match a variety of manhole configurations.

Information regarding the specification of ACO Q-Plates can be found on page 14.



ACO Q-Plates with and without draindown

Why choose ACO Q-Brake Vortex?



► Planning and connection

ACO Q-Brake Vortex addresses the planning and connection requirements set out in the Floods and Water Management Act. Where a discharge restriction is in place, ACO Q-Brake Vortex regulates the surface water flow to the specified rate.

► Tailored performance

Each ACO Q-Brake Vortex is tailored to the specific performance requirements of the application providing optimum efficiency within the system.

► Optimum hydraulic efficiency

The mechanism employed within ACO Q-Brake Vortex provides superior hydraulic performance in comparison to traditional flow control systems.

► Water Authority Approval

ACO Q-Brake Vortex has been approved for use by a number of water authorities including Severn Trent, Anglian and Scottish Water.

► Proven performance

ACO Q-Brake Vortex is UK manufactured and has been independently laboratory tested to verified discharge rates.

► Simplified access and maintenance

ACO Q-Brake Vortex has large clear openings making it less prone to blockage. The absence of any loose parts also reduces maintenance requirements.

The patented bypass door and emergency drain down facility allows ACO Q-Brake Vortex to be remotely accessed from the surface to allow the upstream system to be independently drained, completely bypassing the inlet. Building Regulations 2000 Section H discourages direct man access to sewer manholes.

► Reduces total installed cost

ACO Q-Brake Vortex allows more flow at lower heads, reducing the need for on-site storage volume requirements lowering installation costs.

► Ease of installation

Each ACO Q-Brake Vortex unit is custom built to suit the profile of the chamber. Radius fixing options remove the need for additional benching - simplifying installation and reducing cost.

► WinDes

ACO Q-Brake Vortex can be sized and modelled on the latest version of the design software and can be incorporated into the overall hydraulic drainage design.



Benefits of using a surface water flow control system

Storage and the controlled release of clean water into the natural environment is an important aspect of managing surface water in the SuDS approach. The Floods and Water Management Act now gives overall responsibility to the local regulatory body to impose, where appropriate, the discharge rate of a surface water flow control system.

ACO's range of flow control systems can be used in conjunction with ACO's award-winning attenuation and infiltration system, ACO StormBrixx, to provide a fully integrated storm water control system meeting the requirements of the regulations.

This diagram simulates how the ACO StormBrixx system is used to provide storm water attenuation, whilst the ACO Q-Brake Vortex is used to regulate the rate of discharge from the development into the watercourse or sewer network.

Compared to the use of traditional flow control systems, the combination of ACO StormBrixx and ACO Q-Brake Vortex can reduce the need for additional upstream storage lowering overall installation and maintenance costs.

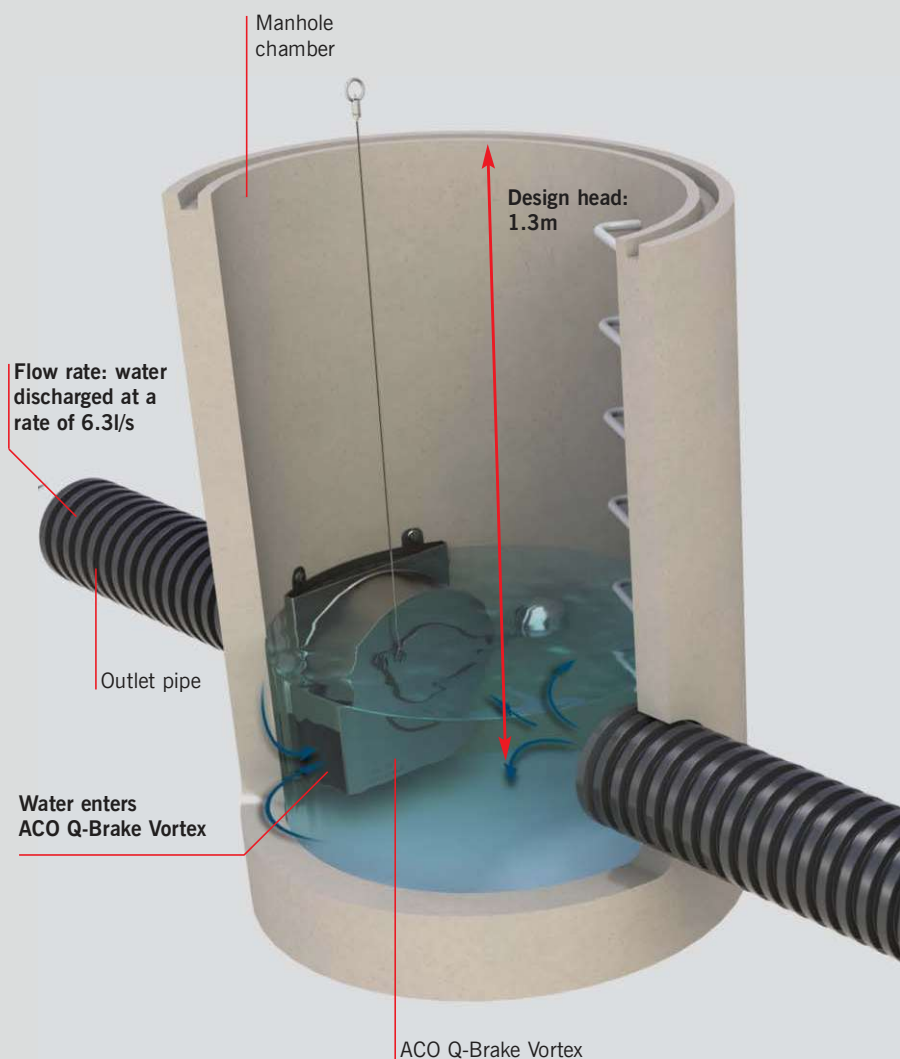
This benefit is best demonstrated in the example opposite. The conclusion of the example means that upstream storage can be reduced by 11m^3 compared to using a traditional flow control system.



For more information on ACO's award winning attenuation and infiltration system, ACO StormBrixx, please go to www.stormbrixx.co.uk.

Example:

There is a project in Bedford, England with a catchment area of $13,000\text{m}^2$. The project has design criteria of a 1 in 30 year storm and the runoff from the site must not exceed 6.3l/s at a design head of 1.3m .

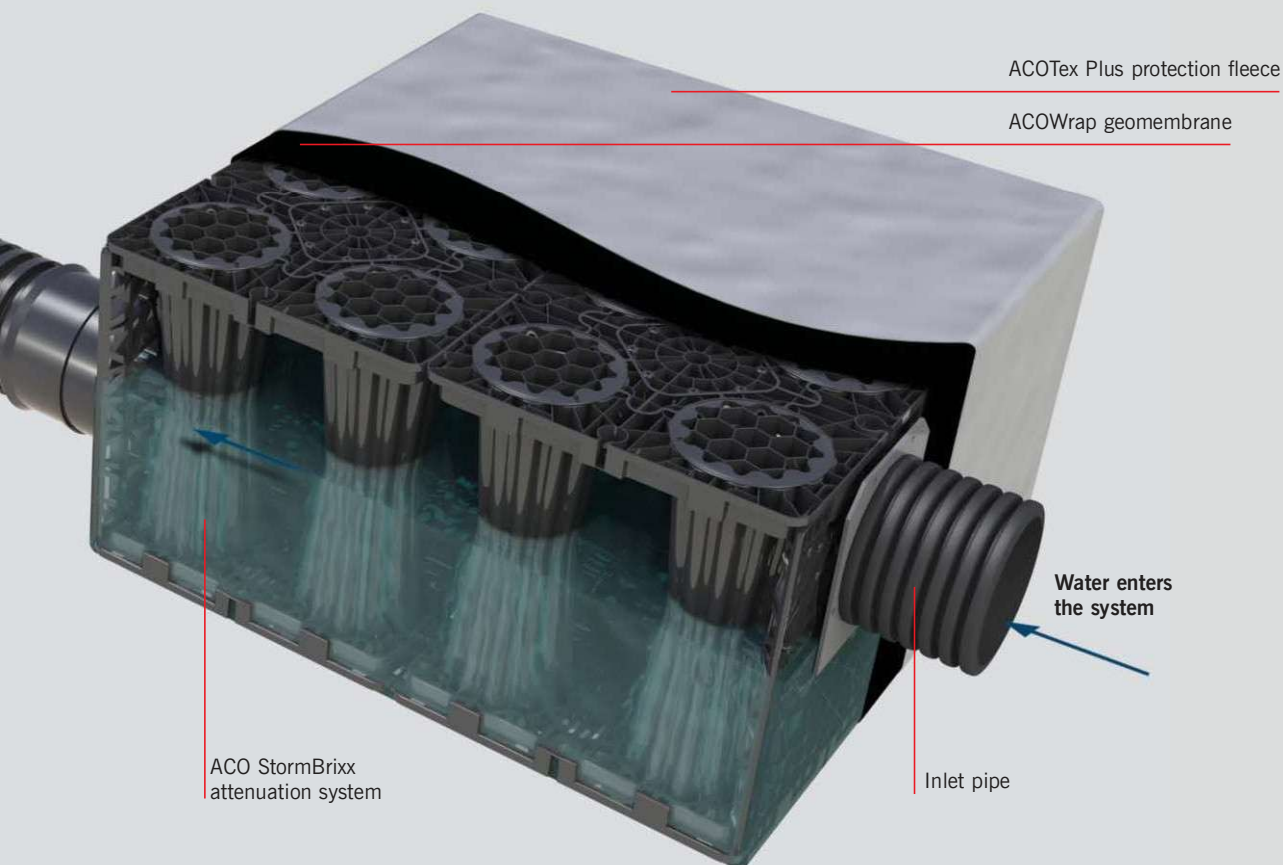
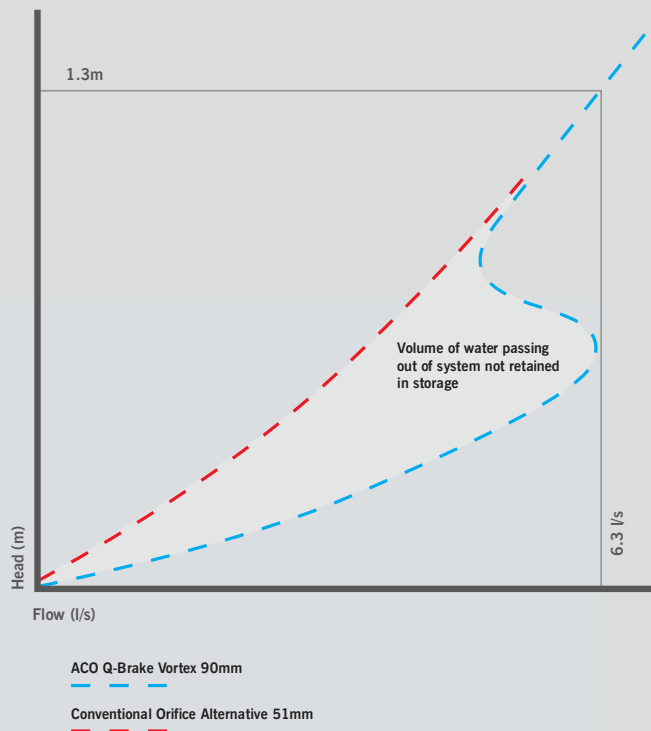


Results:

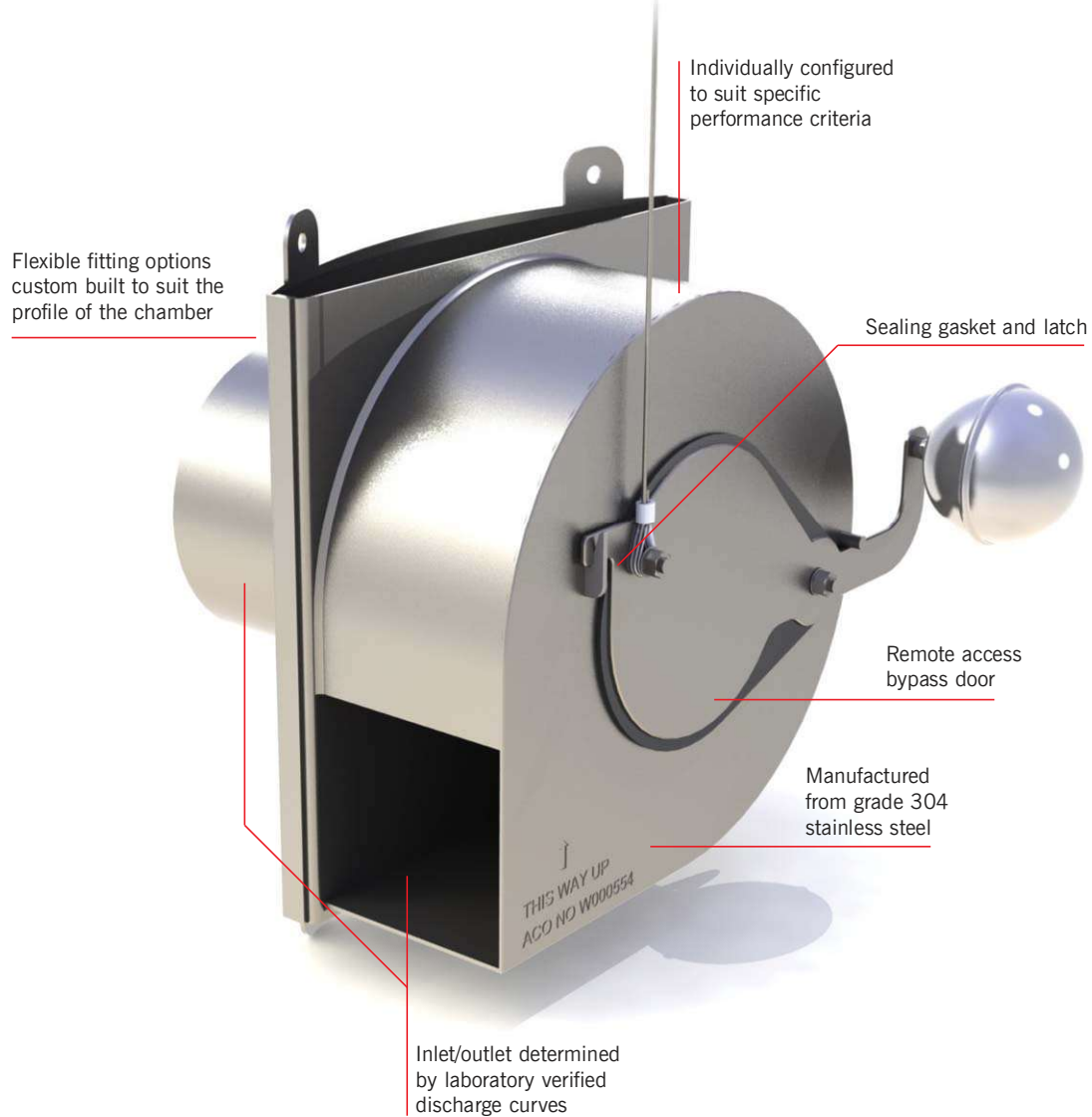
Using MicroDrainage® software, ACO has compared the upstream storage requirements using ACO Q-Brake Vortex and a traditional orifice plate. The results are summarised below:

- ▶ ACO Q-Brake Vortex required Ø90mm. Upstream attenuation required 402m³.
- ▶ Orifice plate size required Ø 51mm. Upstream attenuation required 413m³. ACO Q-Brake Vortex reduces upstream attenuation by 11m³ whilst having an orifice over three times the area of the traditional orifice plate and making ACO Q-Brake Vortex more efficient and far less prone to blockage.

Discharge characteristics

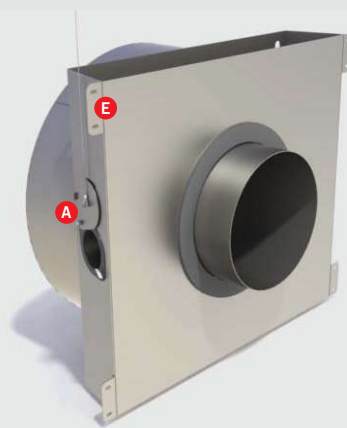


ACO Q-BRAKE FLOW CONTROL FEATURES OVERVIEW



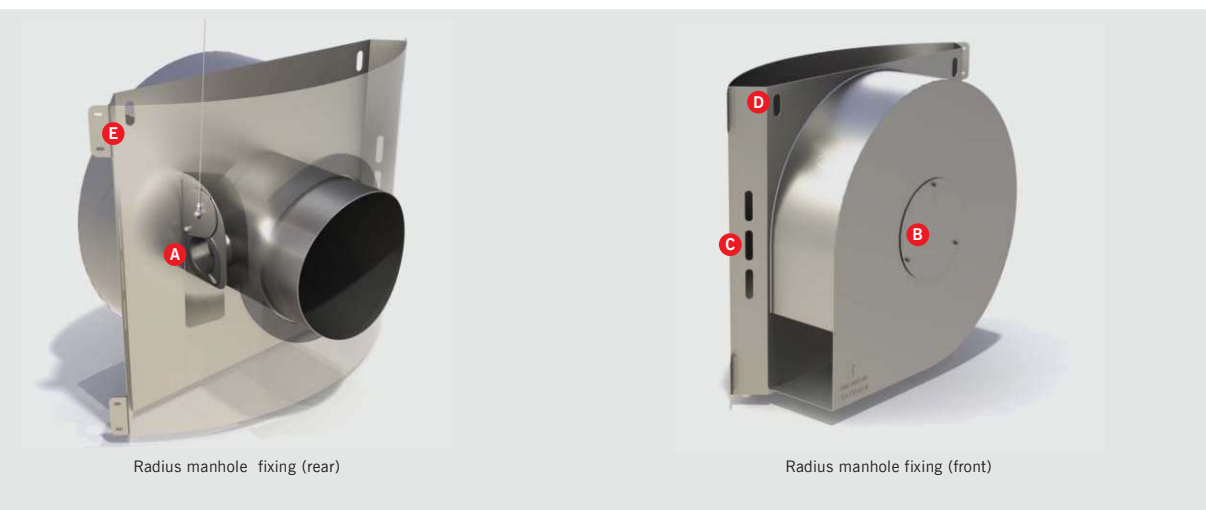
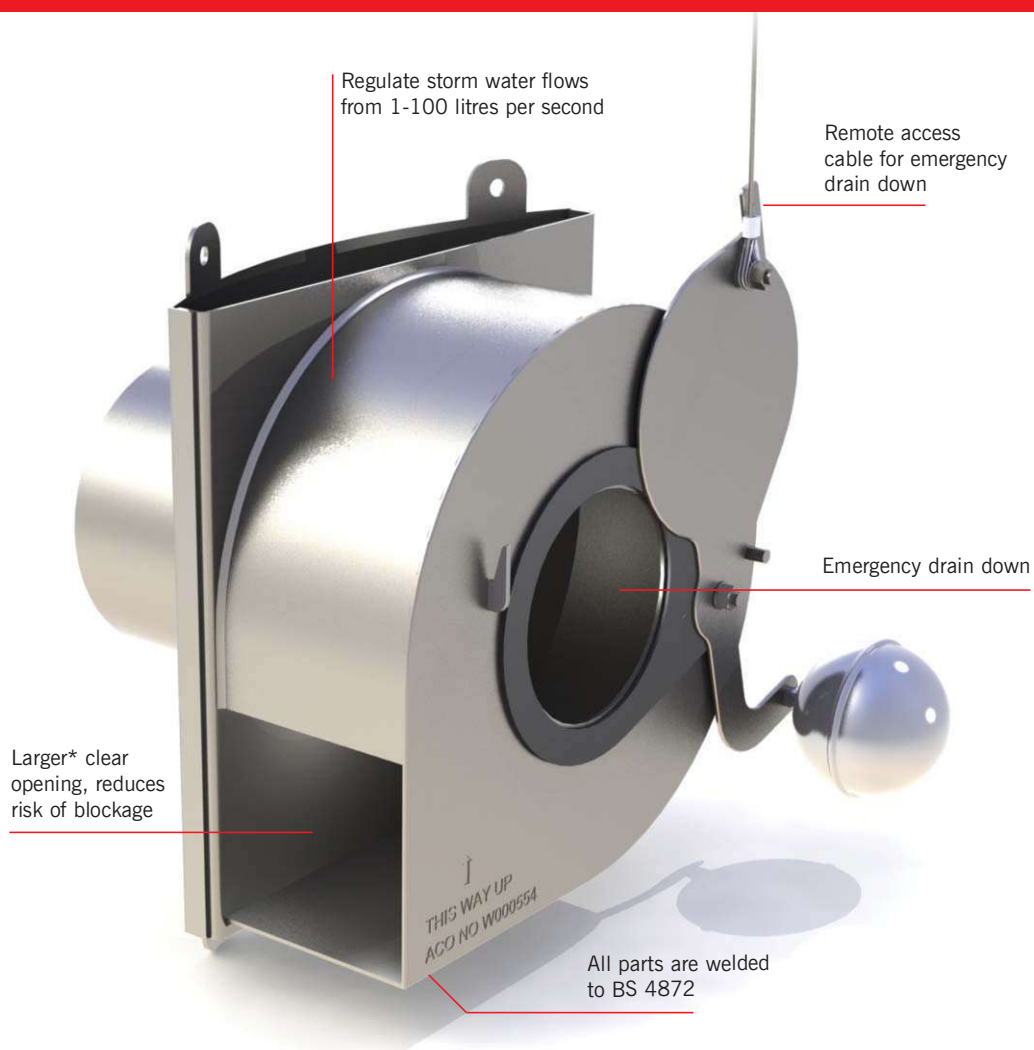
Additional and varying features for ACO Q-Brake Vortex >40l/s

- A** Remote access bypass door and emergency draindown. Located in a different position to ACO Q-Brake Vortex units <40l/s
- B** Removable maintenance cover
- C** Side vents to aid draindown on units with radius fixing
- D** Lifting eyes
- E** Fixing locators



Square manhole fixing (rear)

*Larger than traditional orifice plates



ACO Q-Brake Vortex specification and design process

Manufactured from grade 304 stainless steel, each ACO Q-Brake Vortex is individually configured to suit specific performance criteria. Our engineers will use industry standard drainage software and hydraulic design calculations to ensure the system is correctly sized for any project requirement.

In order to complete this process and deliver the product options available, please provide the ACO engineers with the following information:

- ▶ The proposed design flow – maximum allowable discharge
- ▶ The proposed design head – invert of outlet pipe to top water level
- ▶ The proposed outlet pipe diameter
- ▶ The proposed type and size of outlet manhole

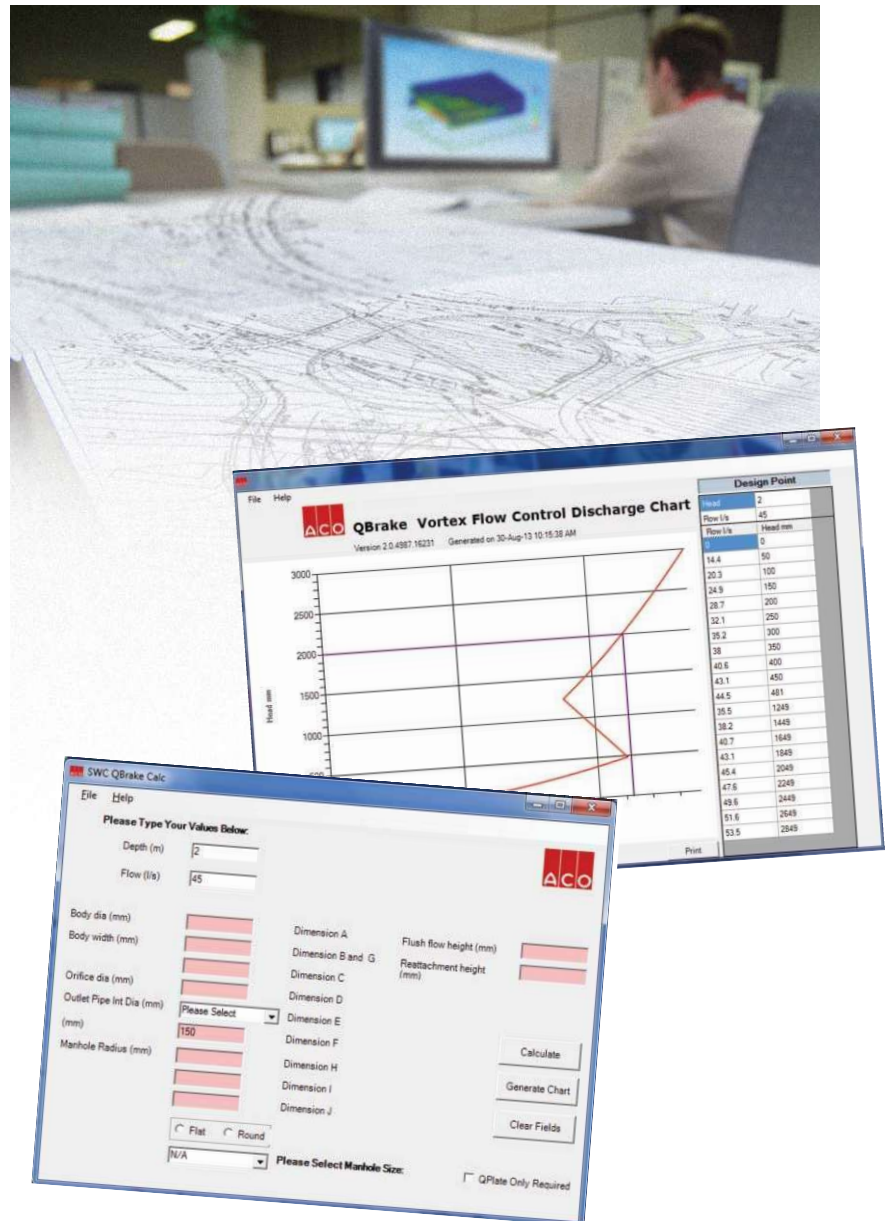
Before production can commence, ALL of the above information must be verified on ACO's Contract Review Document issued at the time of order placement.

Finished product

From this information ACO will size and design the ACO Q-Brake Vortex to meet the design criteria and to suit the proposed surface water application.

ACO will supply:

- ▶ Head discharge table & graph
- ▶ ACO Q-Brake Vortex installation details
- ▶ Information for manhole sizing



ACO Water Management Design Services Team

ACO has embraced the concept of 'value engineering' – a totally new approach to on-site construction that saves both time and money. ACO will review any design to minimise the total scheme and life cost of a proposal.

By utilising ACO's portfolio of products, it is often possible to remove the need for conventional underground drainage.

ACO Water Management Design Services Team

Tel: 01462 816666

Email: technical@aco.co.uk

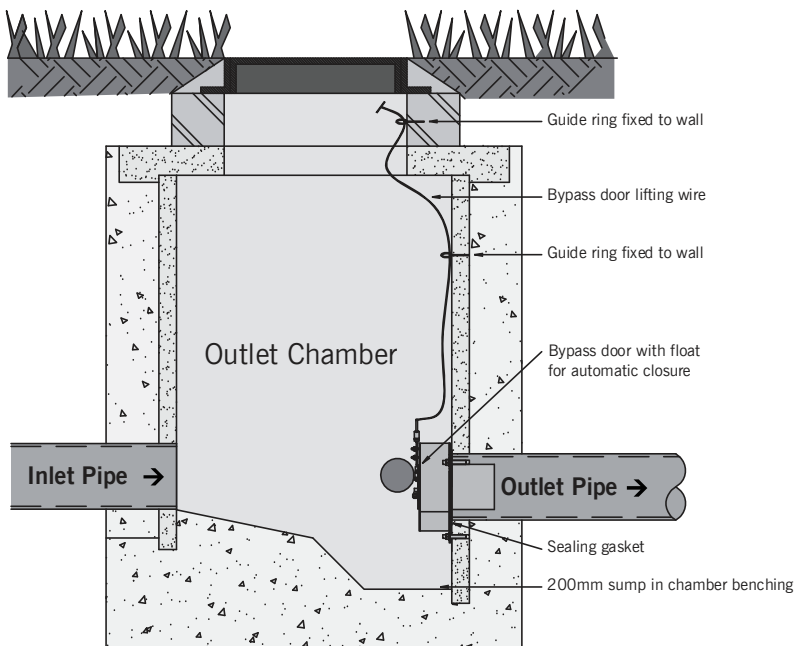


Micro Drainage Modelling

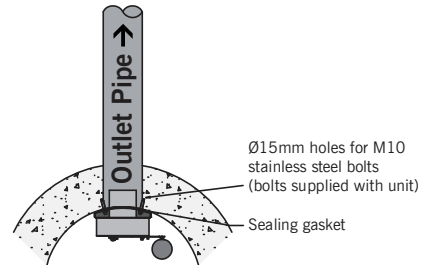
ACO Q-Brake Vortex can be sized and modelled on the latest version of Micro Drainage.



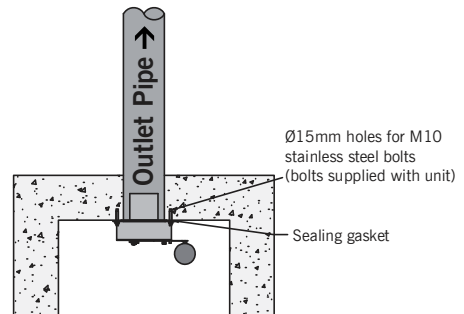
Installation detail



Fixing installation detail for round manhole chambers



Fixing installation detail for flat sided manhole chambers



Guide to installing ACO Q-Brake Vortex flow control regulator

Step 1:

Construct the chamber that is to house the ACO Q-Brake Vortex flow control. Note that if the chamber has a curved wall (e.g. a concrete ring manhole), the diameter of the chamber should be specified on the order and Contract Review Document for the ACO Q-Brake Vortex flow control unit.

Step 2:

The base of the chamber must be at a level 200mm below the bottom of the ACO Q-Brake Vortex flow control. When the chamber base is benched, there must be a 200mm deep sump below the bottom of the unit as shown on the sketch.

Step 3:

Offer the ACO Q-Brake Vortex flow control unit up to the outlet pipe using the lifting eyes where appropriate. Ensure the unit is upright (arrow pointing vertically up). Mark the position of the fixing holes on the chamber wall. Remove the unit and drill fixing holes to suit the M10 bolts supplied with the unit. (Note bolts are Rawlbolt R-XPT-S stainless steel M10 bolts requiring a hole 15mm diameter).

Step 4:

Place bolts into the drilled holes. Locate the ACO Q-Brake Vortex flow control onto the bolts (again check it is upright). Ensure that the gasket is flat against the wall. Fit the nuts and tighten them to pull the unit against the gasket and seal it against the wall.

Step 5:

Fix the two wire guide rings (supplied) to the chamber wall, one approx mid height and one just under the access cover. Thread the bypass door lifting wire through the rings. Adjust the length of the wire by fixing the handle in the correct position and cut to length if necessary.



An electronic version of the ACO Q-Brake Vortex installation detail is available to download from the ACO website. Visit www.aco.co.uk.

Operation and maintenance recommendations

Commissioning the product

Before the product is commissioned, the chamber containing the ACO Q-Brake Vortex should be inspected in line with normal practice. Any debris or silt should be removed. Any visible fixing bolts should be checked.

If an internal blockage is suspected, the control can be inspected internally and cleaned out by opening the inspection bypass door on the upstream end. The bypass door must be returned to the closed position before the control becomes operational or bolted shut.

Frequency of inspection / maintenance

Inspections should be carried out at frequent and regular intervals (approximately every 3-6 months). The frequency will depend upon the location and the environment, and should be based on local knowledge. Action is only required in the event of a blockage or suspected blockage.

Maintenance plan

ACO Q-Brake Vortex flow controls require no routine maintenance although inspections should be carried out at regular intervals (See frequency of inspection / maintenance section).

Manual handling

ACO Q-Brake Vortex flow controls should be handled in accordance with current legislation and regulations:

- The Health and Safety at Work Act 1974
- The Management of Health and Safety at Work Regulations 1999
- The Manual Handling Operations Regulations 1992

Service life

ACO Q-Brake Vortex flow controls have no moving parts to wear or fail. Manufactured from grade 304 stainless steel plate they will resist scour, degradation and chemical attack. The unit is designed to easily outlast the drainage system in which it is installed.

COSHH

ACO Q-Brake Vortex flow controls are manufactured from grade 304 stainless steel. This material is not regarded as hazardous to health and demonstrates no chemical hazard when used for the stated applications.

MODEL SPECIFICATION CLAUSE

The vortex flow control device shall be supplied by ACO Technologies plc; all materials and components within the scope of this system shall be obtained from this manufacturer.

All units shall be manufactured from grade 304 stainless steel incorporating rear mounted remote access bypass and emergency drain down door complete with stainless steel cable and fixings.

ACO Q-Brake Vortex is a vortex flow control device designed to suit a design head of #mm and design flow of # litres per second.

Insert information as appropriate

NBS Specification

ACO Q-Brake Vortex should be specified in section R12. Assistance in completing this clause can be found in the ACO Water Management entry in NBS Plus, or please contact the ACO Water Management Design Services Team.

Note: A specification in NBS format is available to download from www.thenbs.com or www.aco.co.uk

RECYCLED CONTENT

ACO Technologies aims to incorporate as much recycled material or waste material as is practicable in its manufactured products.



Typically steel products contain between 25% and 33% recycled content by weight. Therefore the total recycled content of the ACO Brake Vortex will contain be at minimum approximately 25% by weight recycled material.

ACO Q-Brake Vortex is intended for a long life with low maintenance, to reduce the need to recycle, but when eventually the product is no longer needed, much of its content can be readily recycled with a very low risk of pollution to the environment.



Product Testing

Through ACO's continual product development and refinement programme has led to an enhanced range of ACO Q-Brake Vortex flow controls. The range has been independently tested and complex software written to ensure that the best possible characteristics and curves are achieved to help reduce upstream storage requirements and installation costs.

What is ACO Q-Plate?

ACO Q-Plate orifice plates are designed for use where an ACO Q-Brake vortex is not the most effective solution. To suit application requirements, the range is available with or without remote bypass and drain down and is designed to match a variety of manhole configurations. A neoprene sealing gasket and fixing holes are featured on each unit.



ACO Q-Plate with remote draindown and bypass
recommended for all orifice apertures less than 100mm



ACO Q-Plate

ACO Q-Plate Bypass features

- ▶ Manufactured from 304 stainless steel
- ▶ Orifice aperture up to 150mm
- ▶ Sealing pipe gasket
- ▶ Emergency drain-down and access cable
- ▶ Bypass door (with improved seal) and latch
- ▶ Flat or curved radius to suit manhole diameter
- ▶ Manhole fixings

ACO Q-Plate features

- ▶ Manufactured from 304 stainless steel
- ▶ Four fixing positions
- ▶ Pipe sealing gasket
- ▶ Manhole fixings
- ▶ Flat or curved radius to suit manhole diameter

ACO Q-Plate Specification and design process

To suit project requirements, two options of ACO Q-plate are available:

ACO Q-Plate Bypass

< 100mm orifice with remote drain-down and bypass (also available up to 150mm)

ACO Q-Plate

> 100mm orifice without remote drain-down and bypass

In order to complete this process and deliver the product options available, please provide the ACO engineers with the following information:

- ▶ The proposed design flow – maximum allowable discharge
- ▶ The proposed design head – invert of outlet pipe to top water level
- ▶ The proposed outlet pipe diameter
- ▶ The proposed type and size of outlet manhole

Before production can commence, ALL of the above information must be verified on ACO's Contract Review Document issued at the time of order placement.

Finished product

From this information ACO will size and design the ACO Q-Plate to meet the design criteria and to suit the proposed surface water application.

ACO will supply:

- ▶ Head discharge table & graph
- ▶ ACO Q-Plate installation details
- ▶ Information for manhole sizing

Guide to installing an ACO Q-Plate

Step 1:

Construct the chamber that is to house the ACO Q-Plate orifice control. Note that if the chamber has a curved wall (e.g. a concrete ring manhole), the diameter of the chamber should be specified on the order and Contract Review Document for the ACO Q-Plate Orifice control unit.

Step 2:

There should be a small sump under the outlet to ensure the orifice control does not easily block, ideally there should be upstream sediment and debris traps. When the chamber base is benched, there should be a minimum 200mm deep sump below the bottom of the unit as shown on the sketch.

Step 3:

Offer the ACO Q-Plate orifice control unit up to the outlet pipe. Ensure the unit is upright (arrow pointing vertically up) and that the orifice is correctly positioned at the invert of the outlet pipe.

Check there is a good seal between the orifice plate and the outlet pipe. Mark the position of the fixing holes on the chamber wall. Remove the unit and drill fixing holes to suit the bolts supplied with the unit.

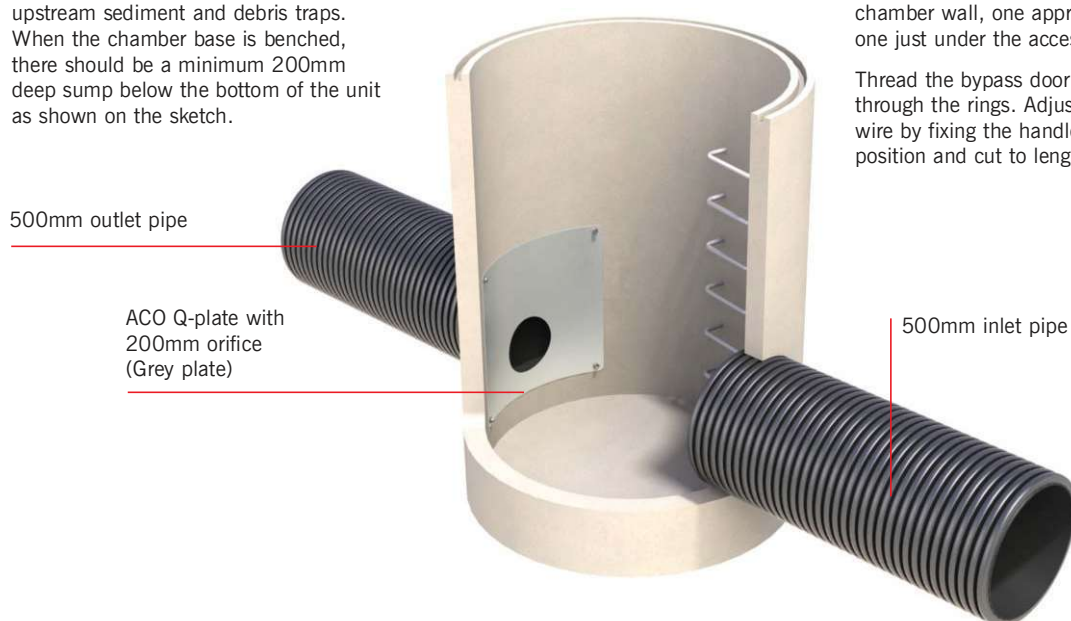
Step 4:

Place bolts into the drilled holes. Locate the ACO Q-Plate orifice control onto the bolts (again check it is correctly aligned). Ensure that the gasket is flat against the wall. Fit the nuts and tighten them to pull the unit against the gasket and seal it against the wall.

Step 5:

If you have been supplied the Q-Plate with the drain down and bypass door fix the two wire guide rings (supplied) to the chamber wall, one approx mid height and one just under the access cover.

Thread the bypass door lifting wire through the rings. Adjust the length of the wire by fixing the handle in the correct position and cut to length if necessary.



Model specification

ACO Q-Plate orifice control *with remote drain down and bypass (delete as appropriate), ##mm orifice designed to suit a pipe outlet size of ###mm, a design head of ## mm and design flow of # litres per second.

ACO Technologies plc

- ACO Water Management
Civils + Infrastructure
Urban + Landscape
- ACO Building Drainage
- ACO Sport
- ACO Wildlife

ACO Water Management: Civils + Infrastructure

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e-mail Technical: technical@aco.co.uk
website: www.aco.co.uk

The ACO Group: A strong family you can depend on.

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ACO CARES ABOUT THE ENVIRONMENT

Printed on material approved by the Forest Stewardship Council (FSC) who provide a means of assuring that products come from responsibly managed forest.



ISO 9001
FM 13502



ISO 14001
EMS 538781



OHSAS 18001
OHS 524145

Appendix B

Cellular Attenuation Tank

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



Agrément Certificate
03/4018
Product Sheet 3

INTESIO ATTENUATION AND INFILTRATION SYSTEMS

AQUACELL PLUS ATTENUATION AND INFILTRATION SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the AquaCell Plus 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

Brian Chamberlain
Head of Approvals — Engineering

Greg Cooper
Chief Executive

Date of First issue: 9 June 2010

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.

British Board of Agrément
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website: www.bbacerts.co.uk

Regulations

In the opinion of the BBA, the Aquacell Plus Attenuation and Infiltration System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:



The Building Regulations 2000 (as amended) (England and Wales)

Requirement:	H3(3)	Rainwater drainage
Comment:		The units can be used in a construction to meet this Requirement. See sections 5.1 to 5.10 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. See section 11 and the <i>Installation</i> part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The use of the system satisfies the requirements of this Regulation. See sections 10.1 to 10.6, 11 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards – construction
Standard:	3.6(a)	Surface water drainage
Comment:		The units can be used in a construction to satisfy this Standard, with reference to clauses 3.6.1 ⁽¹⁾ (2) to 3.6.5 ⁽¹⁾ (2). See sections 5.1 to 5.10 of this Certificate. (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 11 and the <i>Installation</i> part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The system is acceptable. See sections 10.1 to 10.6 of this Certificate.
Regulation:	N5	Rain-water drainage
Comment:		The system can be used in a construction to satisfy this Regulation. See sections 5.1 to 5.10 of this Certificate.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 2 *Delivery and site handling* (2.3) and 13 *Installation — Procedure* of this Certificate.

Non-regulatory Information

NHBC Standards 2008

In the opinion of the BBA, the use of the AquaCell Plus Attenuation and Infiltration System, in relation to this Certificate, is not subject to the requirements of these standards.

General

This Certificate relates to the AquaCell Plus Attenuation and Infiltration System, consisting of polypropylene units, shear connectors and clips.

The system assembles to form an underground structure which can be used either for sub-surface water storage or as a soakaway to manage run-off from impermeable surfaces.

This Certificate does not cover the collection or disposal of the surface water. Information relating to this can be obtained from the Certificate holder.

1 Description

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

Table 1 Characteristics of modular unit

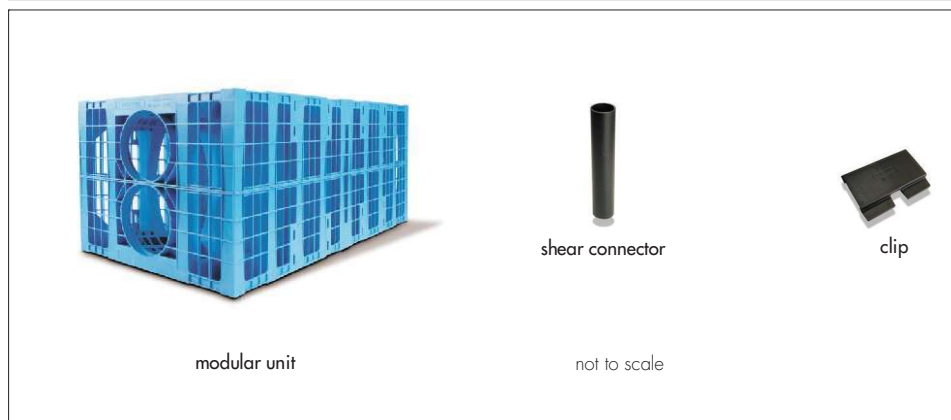
Element (Unit)	Value
Dimensions (nominal) (l x w x h) (mm)	1000 x 500 x 400
Volume (nominal) (m ³)	0.20
Storage volume (nominal) (m ³)	0.19
Porosity (void ratio) (%)	95
Ultimate compressive strength at yield (kN·m ⁻²)	
– vertical loading on top face	650
– lateral loading on side face	85
Short-term deflection (mm per kN·m ⁻²) ⁽¹⁾	
– vertical loading on side face	1 per 74
– lateral loading on side face	1 per 9
Estimated long-term deflection ⁽²⁾ (Ln) ⁽³⁾ (mm)	0.4755

(1) Applied load.

(2) At up to 20 years at 20°C at 232 kN·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 incorporate a central, open channel which facilitates inspection of the structure by camera, provided a suitable inspection chamber is installed at the end of the channel. They also have pre-formed sockets which enable direct coupling with 160 mm diameter pipework or 150 mm pipework via an adaptor. Connection can also be made at points other than to the pre-formed socket 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 m² 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.

2.4 The units contain an inhibitor to resist the effects of ultraviolet light for up to six months. However, prolonged exposure to direct sunlight should be avoided.

2.5 Units should not be stored near fuel bowsers, fuel tanks or areas where solvents may be kept.

2.6 The units are resistant to damage that could occur with normal handling. They should be stored away from the possibility of impacts by vehicles and other construction plant.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Aquacell Plus Attenuation and Infiltration System.

Design Considerations

3 General

3.1 The AquaCell Plus Attenuation and Infiltration System design must be in accordance with the Certificate holder's *Stormwater Solutions — Design Manual*. Guidance on the application of sustainable drainage systems (SUDS) for new developments, such as the AquaCell Plus Attenuation and Infiltration System, can also be found in the Communities and Local Government Planning Policy Statement PPS25 *Development and Flood Risk* and *The SUDS Manual C697* published by the Construction Industry Research and Information Association (CIRIA).

3.2 The system can be used for the control of stormwater run-off from impermeable surfaces in three main ways:

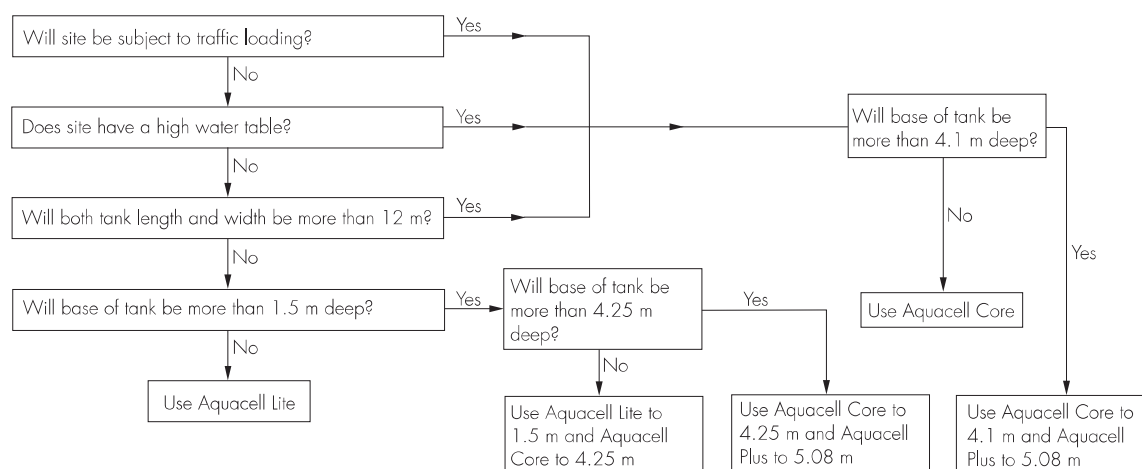
- Infiltration — water is collected in the units during rainfall and allowed to drain away by soaking into the surrounding ground over a period of time
- Attenuation — water is collected in the units during rainfall and released at a reduced flow rate through a flow control device into an appropriate outfall. This reduces peak flows in the watercourse, thereby minimising the risk of flooding
- Combined — a combination of the above two systems.

3.3 Design of the appropriate system (see Figure 2 and Table 2) for a specific project must always be preceded by a detailed audit of the proposed site to establish:

- existing factors and considerations applicable to the site
- predicted factors relating to the site's use following the planned development, and the parameters within which the installation is required to function
- the type of function of application suggested by this audit.

3.4 Once the project criteria have been established from the site audit, there are two main parts to the design procedure: hydraulic design and structural design.

Figure 2 Aquacell unit selection flowchart^{(1) (2)}



(1) This Certificate covers Aquacell Core units only — the validity of Certificates covering other Aquacell units can be checked on the BBA website: www.bbacerts.co.uk.

(2) Maximum burial depths assume ideal soil conditions and should be verified by site investigations (see section 6 of this Certificate for information relating to structural design). Maximum burial depths for a variety of soil types are given in Table 9.

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 Protection Agency or water and sewerage company
Health and safety	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 (m ³)	Maximum area to be drained (m ²)
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.

5.3 When the BRE or CIRIA approach is used, the design volumes and areas for trench or cuboid type installations can be found in Tables 4 and 5.

Table 4 Volumetric data per linear metre for a one-unit (0.5 m) wide trench configuration

Number of units high	Volume (m ³)	Side area (m ²)	Base area (m ²)
1	0.19	0.8	0.5
2	0.38	1.6	0.5
3	0.57	2.4	0.5

Table 5 Volumetric data for 3D usage two units high

No of units long (1 m side)	2 wide (0.5 m side)			4 wide (0.5 m side)			8 wide (0.5 m side)		
	Vol (m ³)	Side (m ²)	Base (m ²)	Vol (m ³)	Side (m ²)	Base (m ²)	Vol (m ³)	Side (m ²)	Base (m ²)
1	0.76	3.20	1.00	1.52	4.80	2.00	3.04	8.00	4.00
2	1.52	4.80	2.00	3.04	6.40	4.00	6.08	9.60	8.00
4	3.04	8.00	4.00	6.08	9.60	8.00	12.16	12.80	16.00
8	6.08	14.40	8.00	12.16	16.00	16.00	24.32	19.20	32.00
10	7.60	17.60	10.00	15.20	19.20	20.00	30.40	22.40	40.00
100	76.00	161.60	100.00	152.00	163.20	200.00	304.00	166.40	400.00

5.4 For calculations, the size and volume of the units are given in Table 1. The total areas of the base and sides are required as water is absorbed through the geotextile soil interface. Storage volume is 95% of the total volume. As an example, using Table 4, for a typical linear trench 40 m long and two units deep, the volume is 0.38 by 40 = 15.2 m³ and the side area 1.6 by 40 = 64 m².

Attenuation

Calculation principles

5.5 The anticipated run-off volume (A) from the site must be estimated. The most commonly used method for evaluating storm rainfall events in the UK is the Wallingford Procedure by which the total rainfall level of storms over defined time periods ranging from five minutes up to 48 hours are assessed. The depth of water (mm) found can be multiplied by the catchment area to assess the size of attenuation systems and is normally based upon a two-hour storm of a return period appropriate for the catchment. The allowable discharge rate from the site to an appropriate outfall is established but will normally be set by the Environment Agency or Planning Authorities. The outflow volume (B) to be discharged at this rate over the two-hour period is calculated and subtracted from the run-off volume (A – B). This defines the excess volume (C) to be stored in AquaCell Plus units constructed as an underground tank. The number of AquaCell Plus units needed to contain this excess is calculated on the basis that the storage volume is equal to 95% of the total volume of the tank.

Connection

5.6 Connection is made to AquaCell Plus units using a pre-formed socket and adaptor or a flange adaptor. These items are outside the scope of this Certificate. Information can be found in the Certificate holder's *Stormwater Solutions – Design Manual*.

5.7 It is recommended that all connections into storage applications (using a geomembrane) are made using a flange adaptor. Adhesive or double-sided tape should be used between the geomembrane and flange adaptor to ensure a watertight seal.

Manifold design

5.8 The capacity of this input pipe is limited and may be insufficient for the anticipated flow load. Therefore, the flow load may be split between a number of 150 mm diameter flow pipes or other connection arrangements used (see Figure 3). The maximum areas that can be drained according to the number of input pipes provided is given in Table 6. The calculations are based on:

- paved surfaces — two-year, three- to five-minute event
- eaves drained roofs — one-year, two-minute event
- internal gutters — 500-year, two-minute event.

Figure 3 Typical inlet connection designs

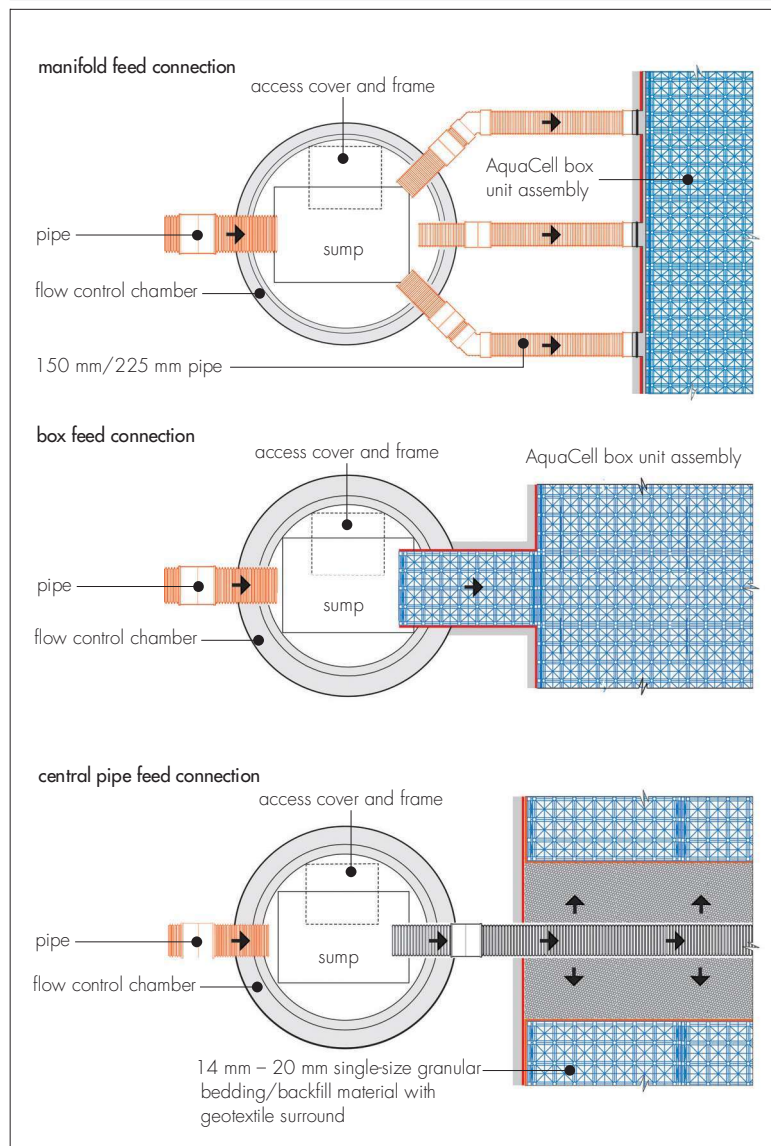


Table 6 Multiple manifolds

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 Plus 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.

6 Structural performance

6.1 AquaCell Plus units can be placed under a wide variety of landscaped or lightly-trafficked areas. Design procedures for heavily-trafficked applications are outside the scope of this Certificate. If the proposed application is in areas subject to high-intensity traffic, commercial vehicles or other heavy loads, the advice of the Certificate holder should be sought.

6.2 The short-term ultimate compressive strength at yield for the AquaCell Plus units, as derived from independent test data, is $650 \text{ kN}\cdot\text{m}^{-2}$ for vertical loading on the top face and $85 \text{ kN}\cdot\text{m}^{-2}$ for lateral loading on the side face. A partial safety factor for materials (f_m) of 2.75 for ultimate limit state and 1.5 for serviceability limit state should be applied to these values for a design life of 20 years. The short- and long-term deflections are given in Table 1.

6.3 Creep tests indicate that the long-term deflection may be estimated from the following expression. This is valid for loads up to $232 \text{ kN}\cdot\text{m}^{-2}$ for durations of up to 20 years at 20°C . In locations where settlement is not a concern, designs of up to 50 years can be considered:

$$\text{deflection (mm)} = 0.4755 \ln(\text{time in hours}) + 2.0477$$

6.4 For a small-scale application such as soakaways for individual house roof drainage, the AquaCell Plus system is typically located below a garden a minimum of 5 m from the building (see Table 7). In this case there are no traffic loads.

Table 7 Design criteria for use of AquaCell Plus system as soakaway for individual house

Criterion	Value
Maximum depth to base of units ⁽¹⁾ (m)	3.55
Minimum depth of cover required over units to prevent accidental damage (m)	0.50

(1) Assumes a minimum value for the angle of shearing resistance of the surrounding soil of 29° . This should be confirmed from the results of the site investigation. Groundwater must be at least one metre below base of units.

6.5 AquaCell Plus units used for large-scale storage or infiltration must be designed to carry all loads that will be applied, including dead and imposed loads. Design parameters and estimated loads should be used to determine the maximum depth of installation and the maximum and minimum cover depths.

6.6 The criteria provided in Tables 8 and 9 can be used to design the AquaCell Plus units for installation below lightly- and non-trafficked areas. These design tables are only applicable in temperate climate conditions such as those in the UK. The partial safety factors for loads that have been applied are given in Table 10. Partial safety factors for materials (f_m) of 2.75 for ultimate limit state and 1.5 for serviceability limit state have been applied. The AquaCell Plus system can be used for areas where greater loads are anticipated but these applications are outside the scope of this Certificate and specific advice should be sought from the Certificate holder.

Table 8 Maximum installation depths (to base of units)

ϕ ⁽¹⁾⁽²⁾	Maximum depth of installation (to base of unit) (m)		
	Non-trafficked area	Trafficked area	
		Cars ⁽³⁾	HGV
24	2.96	2.65	2.35
26	3.18	2.88	2.57
28	3.42	3.12	2.82
30	3.69	3.39	3.08
32	3.98	3.68	3.38
34	4.31	4.01	3.71
36	4.68	4.38	4.07
38	5.08	4.78	4.48

(1) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of ϕ .

(2) The design is very sensitive to small changes in the assumed value of ϕ , therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.

(3) Applicable for car parks or similar areas trafficked only by slow moving vehicles. Assumptions made are:

- ground surface is horizontal
- shear planes or other weaknesses are not present within the structure of the soil.

Table 9 Minimum cover depths over top of AquaCell Plus units⁽¹⁾

Design load case	Minimum cover depth ⁽¹⁾ (m)
DIN 3/3 loading (cars up to 3000 kg GVW)	0.50
DIN 9/9 loading (vehicles up to 9000 kg GVW)	0.75
DIN 60/30 loading (vehicles up to 60000 kg GVW)	1.10 ⁽²⁾

(1) The minimum cover depths have been assessed using the characteristic parameters for the AquaCell Plus and the guidance in CIRIA Report C680.

(2) This is less than the limiting value in CIRIA C680, but is acceptable based on the calculations.

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 Plus 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 Plus 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 Plus 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 Plus 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 Plus 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 Plus 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.

Table 11 Typical specification for a polypropylene geomembrane

Property	Value	Test method
Thickness $\pm 10\%$ (mm)	1.0	ASTM D 751
Density (minimum) ($\text{g}\cdot\text{cm}^{-3}$)	0.9	ASTM D 792
Tensile stress at break (min) ($\text{N}\cdot\text{mm}^{-2}$)	18	ASTM D 638
Elongation at break (%)	>700	ASTM D 638
Puncture resistance (min) (N)	150	FTMS 101C, Method 2065
Tear resistance (min) (N)	60	ASTM D 1004
Dimensional stability (max) (% change)	± 2.0	ASTM D 1204, 1 h at 100°C
Stress crack resistance (%)	100	ASTM D 5397
Volatile loss, 5% loss (max)	0.2	ASTM D 1203
Ozone resistance	No cracks	ASTM D 1149
Carbon black content (%)	2 to 3	ASTM D 1603
Moisture vapour ($\text{g}\cdot\text{m}^{-2}\cdot\text{day}^{-1}$)	<0.1	ASTM E 96
Friction angle (non-woven geotextile)	21°	Shear box
Methane permeability ($\text{g}\cdot\text{m}^{-2}\cdot\text{day}^{-1}\cdot\text{atm}^{-1}$)	0.11	European Standard
Methane transmission rate ($\text{m}^3\cdot\text{m}^{-2}\cdot\text{s}^{-1}\cdot\text{atm}^{-1}$)	0.8×10^{-9}	BRE
Permeability coefficient	1.8×10^{-12}	
Application temperature ($^\circ\text{C}$)	>4	

7.7 To ensure total impermeability, joints between adjacent sheets of impermeable geomembranes should be sealed correctly using proprietary welding techniques. The integrity of joints should be demonstrated by non-destructive testing⁽¹⁾.

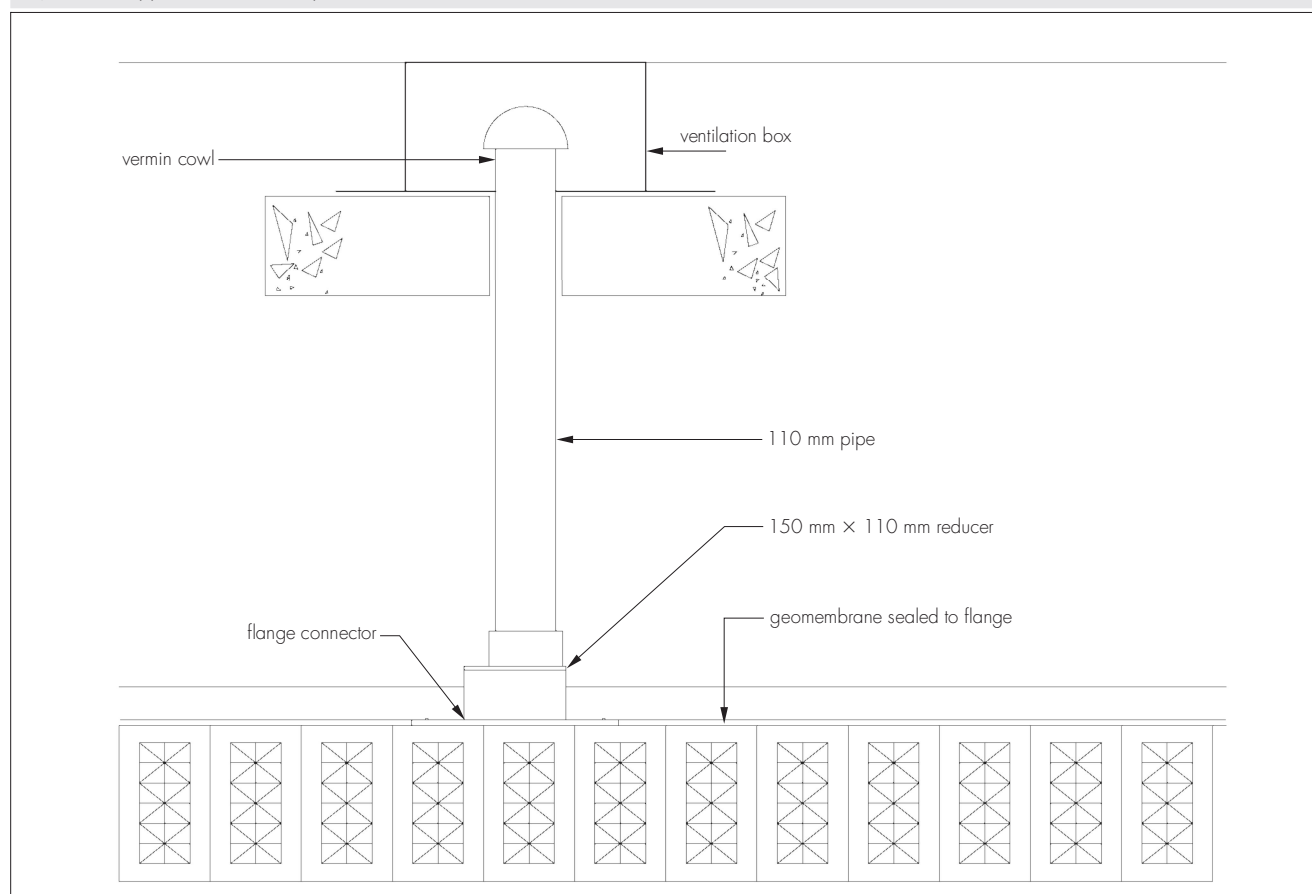
(1) Advice on seam testing is given in CIRIA SP124 *Barriers, liners and cover systems for containment and control of land contamination*.

8 Venting

8.1 Adequate venting must be provided to the AquaCell Plus structure. One 110 mm diameter air vent is required per 7500 m² of impermeable catchment area to be drained (see Figure 4).

8.2 Typical air vent connectors and pipework can be seen in the Certificate holder's *Intesio Stormwater Solutions – Design Manual*. It is recommended that all air vent installations in attenuation/storage applications (using an impermeable geomembrane) are made using a flange adaptor. Adhesive or double-sided tape should be used between the geomembrane and flange adaptor to ensure a watertight seal.

Figure 4 Typical air vent system



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 Plus 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.

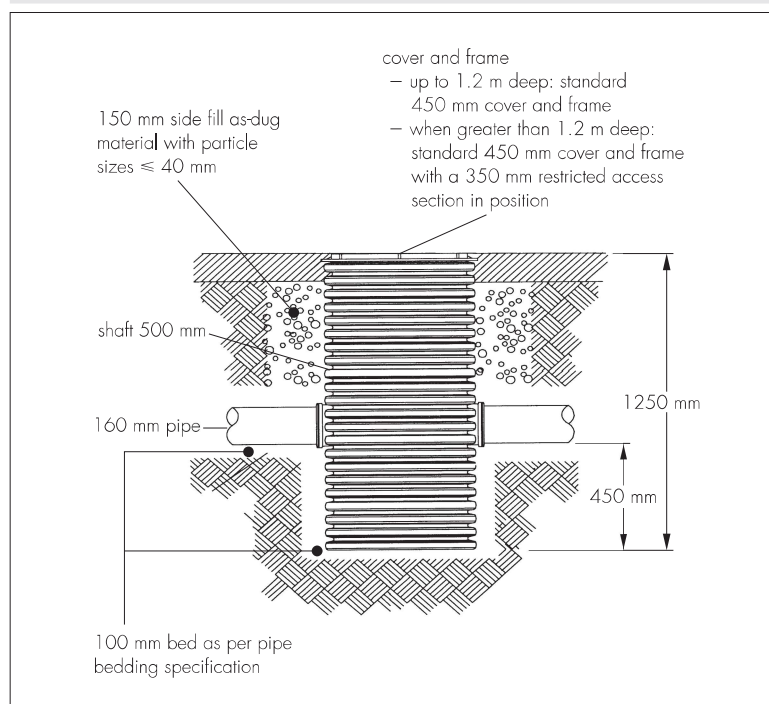
10.3 For large installations or where the receiving waters are environmentally sensitive, a system of regular inspections should be established to prevent the accumulation of silt in the system which, if allowed to develop, would reduce effectiveness. They should also be inspected after every major storm event. It is recommended that a minimum of three inspection tunnels are included, positioned at the inlet or centre line of the tank and at the edges of the structure.

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 Plus Attenuation and Infiltration System, when used in accordance with this Certificate, will have a life in excess of 50 years.

12 General

The system should be installed in accordance with the Certificate holder's *Stormwater Solutions — Design Manual*.

13 Procedure

13.1 The hole or trench is excavated to the required depth, dimensions and levels. It must be ensured that the plan area is sufficient to allow plant access around sides to compact backfill material (300 mm minimum). The base must be smooth and level without sharp drops or humps. Slopes must be cut to a safe angle or adequately supported and safe access must be provided to allow personnel to enter the excavation.

13.2 The base must be inspected for soft spots in the formation – any present must be excavated and replaced with compacted granular fill material.

13.3 A 100 mm thick, bedding layer of coarse sand is laid on the base and sides of the excavation. If required in attenuation systems, a layer of geotextile is laid to protect the impermeable geomembrane.

13.4 The impermeable geomembrane (or geotextile, if in an infiltration system) is laid over the sand bedding layer and up the sides of the excavation. The impermeable geomembrane is inspected for damage and all welds are tested as required. Joints between adjacent sheets of impermeable membrane should be sealed correctly using proprietary techniques with a minimum lap of 50 mm. Jointing with tape is not recommended as the system then becomes reliant on the mechanical properties of the tape to maintain its integrity.

13.5 The AquaCell Plus units are installed in accordance with the installation schedule for correct orientation. Wherever possible, continuous vertical joints should be avoided. The units are arranged so that pre-formed sockets are in the correct alignment for inlet and outlet pipes. For single-layer applications, Wavin clips are used and, for multi-layers, Wavin clips and shear connectors are used. Units at the end of the structure should be fitted with end caps unless positioned in a row that will be used for inspection.

13.6 The geotextile or impermeable geomembrane encapsulation to base, sides and top of installation, including protective geotextile (if required to protect the geomembrane) is completed. Impermeable geomembranes should be welded with double seams. All welds should be tested as required and the membrane inspected for damage.

13.7 Drainage connections are made to the installation using proprietary adaptors. Pre-formed socket positions for pipe connections must be located at the correct position for receiving pipework. Alternatively, flange adaptors are used attached to AquaCell Plus units with adhesive tape and self-tapping screws (flange adaptors cannot be used at the invert of AquaCell Plus units into the pre-formed socket). It is recommended that all connections and air vent installations, in attenuation/storage applications, are made with a flange adaptor, using adhesive or double-sided tape to form a seal. Alternatively, drainage connections are sealed into a pre-formed socket using proprietary seals approved by the geomembrane manufacturer.

13.8 The installation is backfilled with Type 1 or 2 sub-base or Class 6P (side fill only) selected granular material in accordance with the *Manual of Contract Documents for Highway Works (MCHW)*, Volume 1. The backfill is compacted in 150 mm thick layers.

13.9 A coarse sand protection layer, 100 mm thick, should be placed over the top of the units that have been wrapped. Backfilling is continued with:

- trafficked areas (eg car parks) — Type 1 or 2 sub-base material compacted in 150 mm layers in accordance with the MCHW, Volume 1. Compaction plant over the top of the system must not exceed 2300 kg per metre width
- landscaped and non-trafficked areas — selected as-dug material, with size of pieces less than 75 mm, compacted to 90% maximum dry density. Compaction plant over the top of the system must not exceed 2300 kg per metre width.

13.10 Pavement construction or landscaping over the AquaCell Plus system is completed.

Technical Investigations

14 Tests

Tests were carried out on the system to determine:

- long- and short-term resistance to loading
- performance and durability of geosynthetics
- volumetric capacity and discharge rate.

15 Investigations

15.1 The manufacturing process was examined, including the method adopted for quality control, and details obtained on the quality and composition of the material used.

15.2 An assessment of the system was made in relation to material properties and design procedures.

15.3 A site visit was made to assess the practicability and ease of installation and connection.

Bibliography

- BS EN 752 : 2008 *Drain and sewer systems outside buildings*
- ASTM D 638 : 2002 *Test Method for Tensile Properties of Plastics*
- ASTM D 751 : 2000 *Standard Test Methods for Coated Fabrics*
- ASTM D 792 : 2000 *Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement*
- ASTM D 1004 : 1994 *Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting*
- ASTM D 1149 : 1999 *Standard Test Method for Rubber Deterioration — Surface Ozone Cracking in a Chamber*
- ASTM D 1203 : 1994 *Standard Test Methods for Volatile Loss From Plastics Using Activated Carbon Methods*
- ASTM D 1204 : 1994 *Standard Test Methods for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperatures*
- ASTM D 1603 : 2001 *Test Method for Carbon Black in Olefin Plastics*
- ASTM D 5397 : 1999 *Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test*
- ASTM E 96 : 2000 *Standard Test Methods for Water Vapor Transmission of Materials*
- Manual of Contract Documents for Highway Works, Volume 1 *Specification for Highway Works*, August 1998 (as amended)

16 Conditions

16.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

16.2 Publications and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

16.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

16.4 In granting this Certificate, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

16.5 Any information relating to the manufacture, supply, installation, use and maintenance of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.

Appendix C

Surface Water Treatment & Grease Trap

It is a known fact the planet's atmosphere and climate have been changing for decades, and hydrocarbons are one of the main culprits. Spillages of oil and fuel from industrial sites, filling stations and the emissions from automotive leaks can have a cumulative effect that can damage the environment in devastating ways.

Highway surface runoff discharges contain pollutants that have accumulated on the carriageway, particularly following periods of dry weather.

These pollutants can then be transported via the surface water drainage system to discharge to ground or receiving watercourses.

Previous studies have demonstrated that highway runoff affects the quality of waters and sediments. Increased concentrations of metals, hydrocarbons and anions are associated with changes in the structure and functioning of biological communities.

Spills and leaks from fuel handling facilities using containers, tanks, drums, intermediate bulk containers (IBCs) and mobile containers called 'bowzers', can cause serious pollution incidents.

The common saying is 'prevention is better than cure'. To fit a SPEL Separator to capture fuel, oil and silt prior to SuDS attenuation schemes is far better than hoping for the best and then have to instigate remedial work. All have a responsibility to cater for any possible pollution incidents.

- General Guidance by the Environment Agency regarding fuel/oil separators
- They are typically needed for any site with a risk of oil contamination, such as:
- Car parks larger than 800m² in area or for 50 or more car parking spaces
- Smaller car parks discharging to a sensitive environment, such as a marsh that has been designated as a nature reserve
- Vehicle maintenance areas
- Roads
- Refuelling facilities

The type and class of separator needed will depend on the activity and where the discharge is directed to.

Fuel/oil separators do not work if there is detergent in the water, e.g. from car washing (see Section 6).

Testing and independent accreditation

The highly successful and well known SPEL fuel/oil/silt Separators are the result of extensive testing by H R Wallingford, the hydraulics research testing station, for hydrocarbon removal performance against the stringent European Standard BS EN 858 -1:2002. The tests required the hydrocarbons introduced into the separator at 5ml/litre to be reduced to a maximum of 5mg/litre in the outlet.

H R Wallingford started the testing in 1999. The SPEL Stormceptor® by-pass class 1 by-pass separator was the first to be accredited under the standard in the UK.



Hydrocarbon removal performance

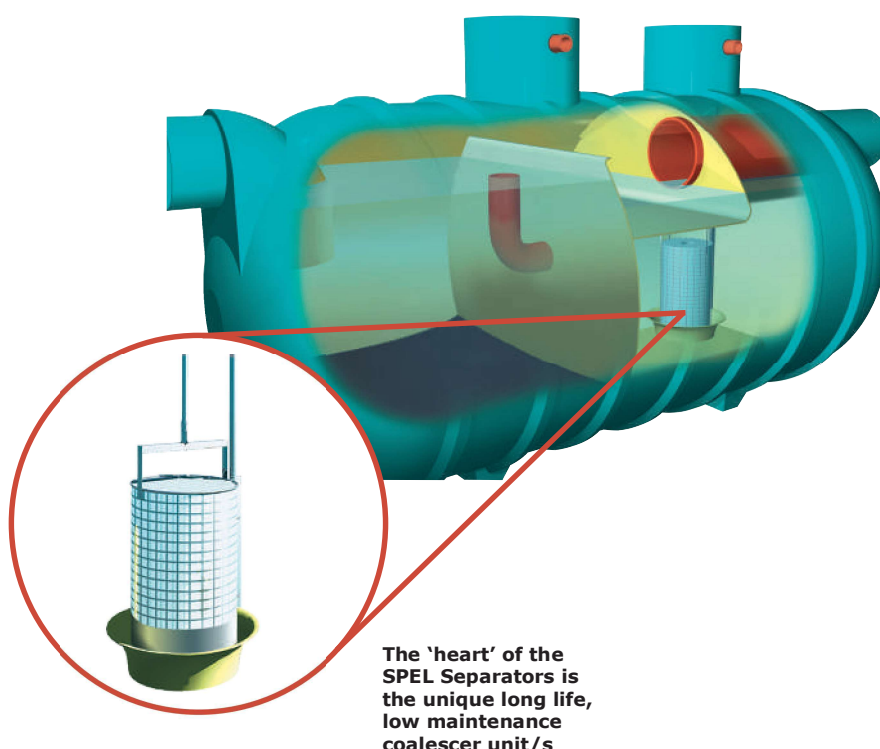
All models performed well within the European Standard with an average of 0.64mg/l.

Since then the SPEL Stormceptor® Class 1 by-pass and the Puraceptor® Class 1 full retention Separators have advanced in performance and construction as a result of technological advances in design and manufacture.

The 'heart' of the SPEL Separators is the unique long life, low maintenance coalescer unit/s which 'polishes' the final effluent AFTER 90% hydrocarbon and silt have been separated out.

Coalescer units comprise a stainless steel holder with a robust and efficient high volume reticulated foam insert. The coalescing process brings the smaller globules of oil into larger and buoyant forms to separate by gravity. The high volume foam safeguards against blockages due to silt and ensures a long life between servicing.

The coalescer inserts are easy to clean with normal pressure water and rarely require replacing.



3.2 Introduction

25 Year Warranty (life expectancy of over 50 years)

Manufacture

The full range of models is manufactured in glass reinforced plastics using the latest computerised equipment to ensure consistent quality. The shells are chop-hoop filament wound (see Section 2), the end domes using a specialised computer controlled machine and the components sprayed up by an eight axial robotic machine.

Quality control procedures ensure each serial numbered tank is tested and inspected to the strict quality parameters required.



The design and construction

The SPEL Separators are designed to meet the requirements of underground tanks with a generous safety factor and meet the external load requirements depending on the burial depth and water table level as detailed in Section 3 with tables for each tank series. The quality shells have a chemical resistant inner lining suitable for aviation fuels with a smooth moulded finish to ensure easy desludging and cleaning.

Tests 'in the field' in other countries

SPEL being used globally has allowed us to obtain 'in the field' performance data in other countries for total suspended solids (TSS) with 75% removal and the reduction in soluble metals e.g. zinc, lead, copper, nickel, cadmium, arsenic and mercury.

CERTIFICATE

LIGHT LIQUID SEPARATOR TEST PERFORMANCE CERTIFICATE

Separator make and model number: SPEL STORMCEPTOR 250C/SC NSR25

Test date: 21 June 2006

Designated/min flow rate, Q₁ (litres/second): 20 litres

Net capacity of separator (excluding any allowance for air storage), V₁ (litres): 3859 litres

Total duration of test (minutes): 20 min

Running-in period (± 15 minutes): 15 min

Sampling period (minutes): 5 minutes correct to all test

Oil flow rate (based on 0.5% of water flow rate, litres/second): 0.1 litres

Temperature of oil (°C): 17.4

Temperature of water (°C): 18.1

Temperature of air (°C): 18.9

Analysis of samples by IR spectroscopy carried out by: Intertek Cable Rest Test Engineering Services

Date of results: 20/06/06

Sample	Oil concentration (mg/l) ^{**}
1	0.5
2	0.4
3	0.6
4	0.7
5	0.1
Resulting average:	0.4

Name: [Signature] Date: 23/06/06

For and behalf of IIR, Wallingford Limited

* NAIMAS accredited laboratory

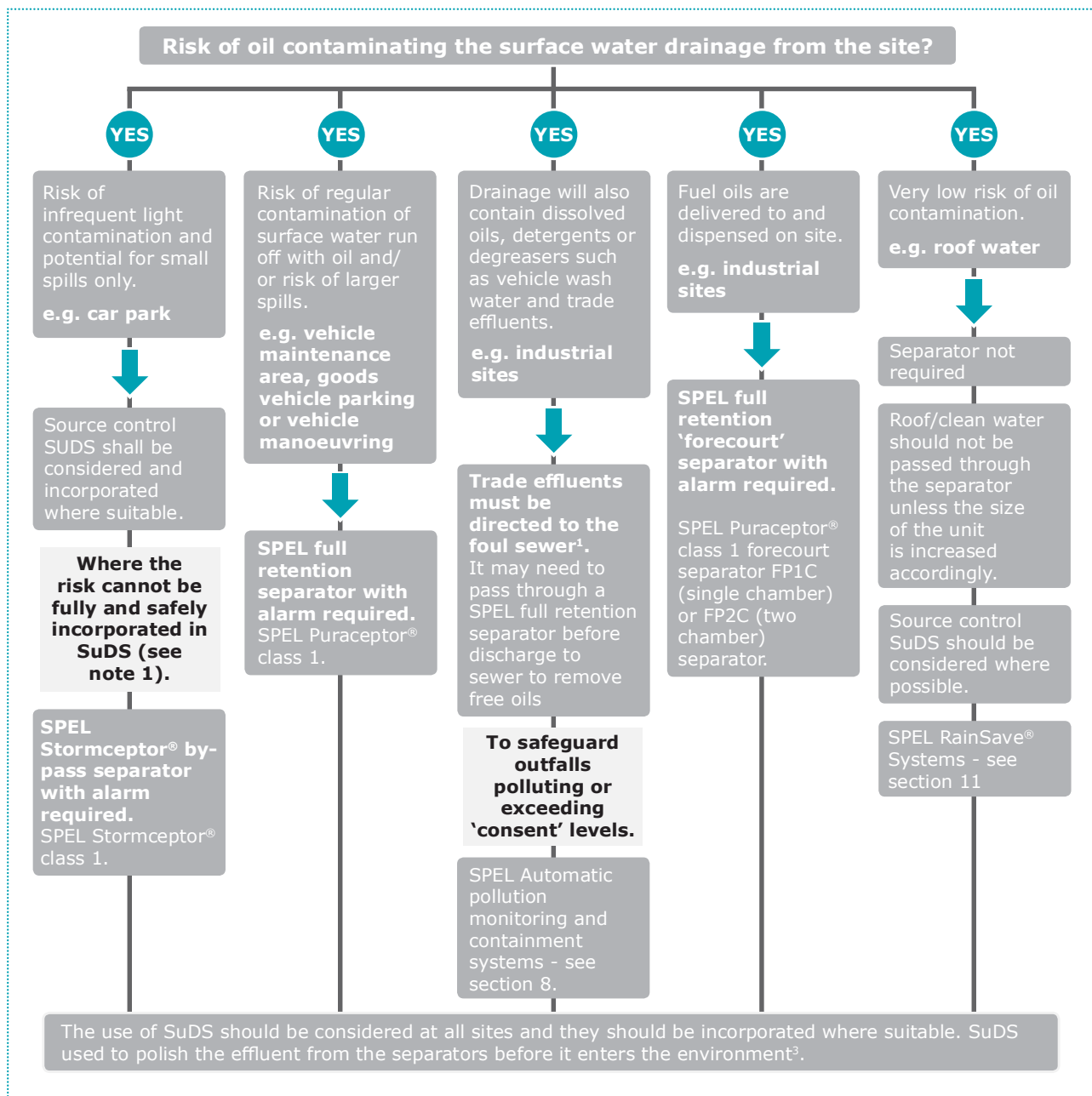
** Value of baseline concentration deducted

Where are separators needed?

Surface water can be contaminated by oil and other contaminants depending on the site use. Sites with this risk need to have measures in place to prevent polluting the environment. These sites include:-

- Car parks typically larger than 800m² or for 50 or more car parking spaces
- Smaller car parks discharging to a sensitive environment
- Areas where goods vehicles are parked or manoeuvred
- Vehicle maintenance areas
- Roads
- Industrial sites where fuel and oil are stored or handled
- Refuelling facilities
- Any other site with a risk of contamination

3.4 How to Select and Specify Separator Type & Class



Selecting the appropriate type of SPEL Separator

This flow chart is to aid selection of the most suitable and appropriate type of SPEL Separator for use in surface water drainage systems that discharge to rivers and soakaways. However, the appropriate provision on any site will require detailed consideration of the local circumstance and risk factors including:

- The discharge point of your proposed separator.
- The environmental sensitivity of your location.
- Activities on your site.

Notes to accompany the flowchart

¹ You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.

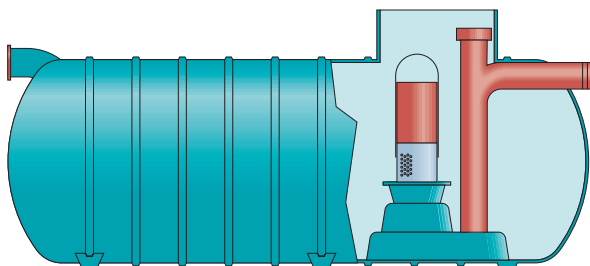
² Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.

³ A separator may be one of the devices used in the SuDS scheme.

SPEL Puraceptor® separators have been designed and tested to meet the stringent European Standard BS EN 858-1 for installations for separator of light liquids where the maximum hydrocarbon concentration in the outlet does not exceed 5mg/l. Suitable for discharging into a surface water drain. For further details see section 5.

The 'heart' of SPEL Separators is the unique long life, low maintenance coalesce unit which 'polishes' the final effluent AFTER 90% hydrocarbons of SPEL

SINGLE CHAMBER MODELS



Typical sites

- Medium to high risk oil/fuel storage and handling areas.
- Filling stations (SPEL Puraceptor® forecourt separator FP1C).
- Commercial vehicle/plant maintenance yards and heavily contaminated industrial areas.

Features

Good access to all parts for desludging.

Sampling point incorporated into outlet.

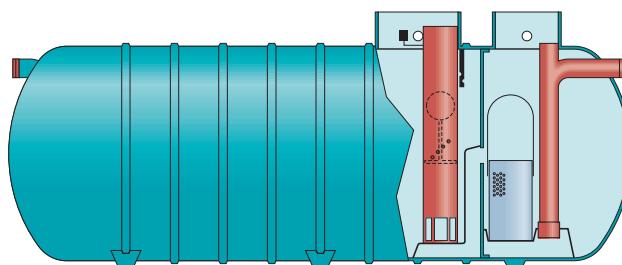
Stainless steel/plastic or copper ball automatic closure device. (ACD).

Robust stainless steel coalescer unit with long life foam insertion and lifting handle. These strong stainless steel units incorporate robust high volume reticulated foam inserts. The inserts efficiently coalesce the finer globules of hydrocarbons for gravity separation and due to their large volume, last for long periods before requiring cleaning.

Cleaning is then a simple operation using normal pressure water. The inserts can be reused again and again, rarely requiring replacement.

One access shaft for desludging tank and servicing of ACD and coalescer unit.

TWO CHAMBER MODELS



Typical sites

High risk oil/fuel storage and handling areas, filling stations (SPEL Puraceptor® forecourt separator FP2C), heavily contaminated industrial areas, commercial vehicle/plant maintenance yards, power stations and sub-stations.

Two chamber models provide protection to the coalescer foam inserts from silt and heavy fuel/oil contamination resulting in less frequent maintenance and easier cleaning of the coalescer foam inserts.

Features

Good access to all parts for desludging.

Coalescer unit/s incorporated into second chamber.

Stainless steel, plastic or copper ball automatic closure device (ACD).

Two access shafts for generous access to the desludging tank and servicing of the ACD and coalescer units.

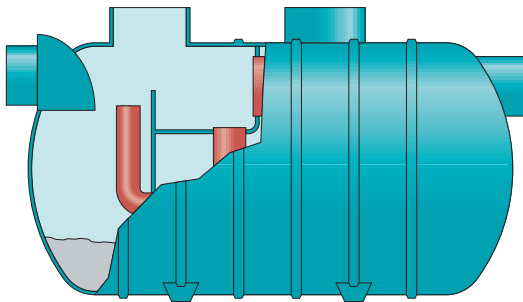
Sampling point incorporated into outlet.

Robust stainless steel coalescer unit with long life, high volume foam insert and lifting handle. These strong stainless steel units incorporate robust high volume reticulated foam inserts. The inserts efficiently coalesce the finer globules of hydrocarbons for gravity separation and due to their large volume, last for long periods before requiring cleaning. Cleaning is then a simple operation using normal pressure water. The inserts can be reused again and again, rarely requiring replacement.

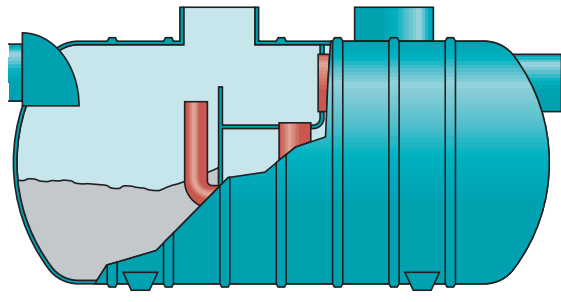
- Sized for working capacity PLUS fuel/oil and silt containment, ensuring optimum performance between maintenance periods.
- Designed for a long life span of high performance with low maintenance.

3.6 SPEL Separators Stormceptor® By-Pass Separator

By-Pass Separator with Minimum Silt Capacity



By-Pass Separator with Silt Capacity BS EN 858



SPEL Stormceptors® are the most widely used separators where it is acceptable to treat the first flush and normal flows up to 6.5mm/hr rainfall. This covers approximately 99% of all rainfall events in the UK. Any excess rainfall is by-passed without treatment.

Class 1 separators, which are designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets, such as those arising from car park run-off.

These are used when it is considered an acceptable risk not to provide full treatment for high flows, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small. They are especially suitable for situations where the main requirement is to trap spillages.

The SPEL Stormceptor® is the first by-pass separator certified to BS EN 858-1.
For further details see section 4.

Typical sites and range

200/300 series the popular range of Stormceptors® for small to medium parking areas associated with smaller supermarkets and industrial estates.

400 series large capacity Stormceptors® for supermarkets, hypermarkets and large vehicle parking areas, industrial complexes, docks, airport aprons etc.

500/600 series the largest Stormceptor® range, for catchment areas from eight hectares upward to in excess of 30 hectares. Details are supplied against specific schemes.

Features

- Good access to all parts for desludging.
- Large and fully accessible primary chamber for silt capacity and its removal.
- Outlet junction chamber-approved sampling point.
- Dip pipe inlet for minimum turbulence and to prevent inflammable vapours passing upstream in drainage system.
- Most models can provide a choice of nine different inlet/outlet orientations to suit site drainage lay-out (check before specifying). See section 4.
- Coalescer unit/s incorporated within the main separation chamber provide an efficient coalescing separation process to reduce the hydrocarbon content in the outlet to 5mg/litre or less. These strong stainless steel units incorporate robust high volume reticulated foam inserts. Cleaning is then a simple operation using normal pressure water. The inserts can be reused again and rarely require replacement.
- Handle and/or lifting retaining cables with security fixing provided with each coalescer unit (see optional extra systems). See 3.4.
- Designed for high performance and low maintenance over a long life span.

SPEL coalescer unit guide rails

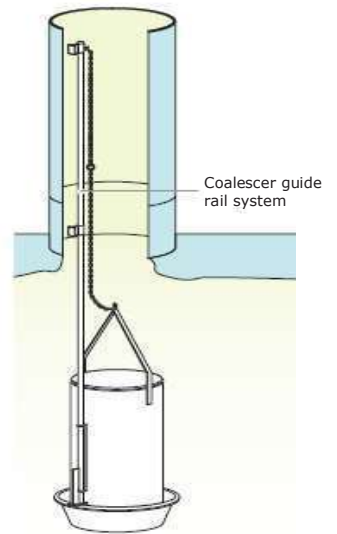
Normal servicing of the smaller SPEL Separators frequently requires emptying the unit completely providing access for the coalescer units to be taken out, cleaned and returned and guided accurately to their seating positions. However larger SPEL Separators may only require the hydrocarbon pollutants and silt to be removed.

In order to limit the servicing to sucking off the fuel/oil from the top and the silt from the bottom guide rails are required to ensure coalescer units are replaced into their correct positions.

The system is robust, manufactured throughout in stainless steel and the action positive, leaving no doubt the coalescer unit is located properly.

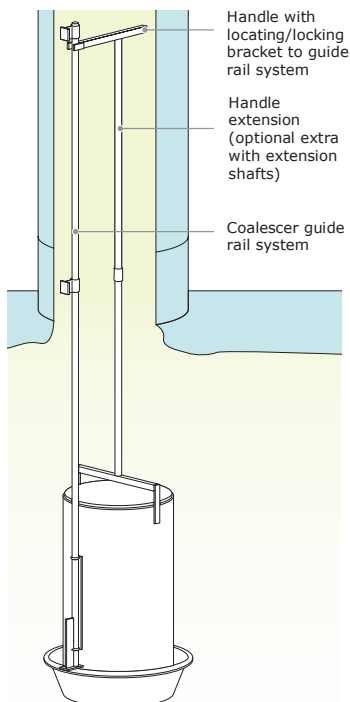
Brackets fixed to the top and bottom of the coalescer unit simply engage the stainless steel guide rail fixed to the top of the stub access shaft. The coalescer is then lowered in the normal way, being guided at the correct angle into the conical base unit which locates the coalescer unit into its final position.

Extension guide rails can be incorporated into SPEL extension shafts to suit (preferably when ordered with the separator).



SPEL coalescer unit guide rail system

SPEL coalescer unit lifting/locating/locking system for positive location and security locking



SPEL coalescer units lowered into the separator with the SPEL guide rail system are easily guided into the base unit's conical moulding to automatically seat correctly.

However, when the separator is full of water, debris or sludge accumulated over a period, this could prevent the coalescer unit from re-seating correctly after servicing.

The coalescer unit lifting/locating/locking system provides assurance the coalescer unit is seated correctly and can be locked into position to prevent tampering.

The system is particularly suitable in SPEL Separator + Econoskim® systems where the total contents of the separator are not emptied on servicing.



The system comprises a robust stainless steel lifting and lowering handle that locates on the guide rail system. When the coalescer unit is correctly located in the conical seating in the separator, the handle will align with guide rail top bracket i.e. the handles slotted holes with the top bracket clip locking groove, see diagram.

When aligned the stainless steel clip can be located through the slots and lock into position on the top bracket.

The stainless steel lifting handle can be extended to suit deep tank inverters and provide easy access for lifting manually or with the SPEL tripod and hoist.

SPEL coalescer unit guide rail system/lifting, locating and locking system

3.8 How to Specify SPEL Separators

Type and model

Follow these steps to specify your requirements

Determine the type of separator – full retention or by-pass – see chart 3.4.

Specify whether silt capacity is required integrally or separately upstream of the separator.

Against the catchment area within which your requirements fall, the SPEL Separator nominal size can be ascertained or

To meet projected 'climate change' requirements – e.g. return storm frequency and percentage for climate change.

Optional extras available:

SPEL automatic alarm/monitoring system (section 3).

Extension shafts (see 2.13).

SPEL coalescer unit guide rail system (see 3.7).

SPEL mechanical anchoring system (see 13.11 – 13.12).

SPEL Econoskim® light liquid skimming and separate containment system (section 7).

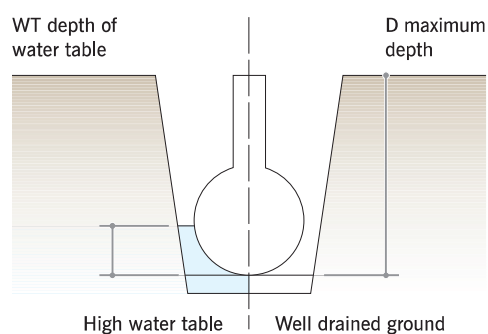
SPEL automatic alarm/monitoring system (section 3).

Tank specification

SPEL Separators are available in four specifications to suit invert depths and ground water conditions. Standard, Heavy, Extra Heavy and Special, see tables alongside.

Concrete surround

Standard tanks		
Series	WT(m)	D(m)
100/200/300	1.0	4.0
400	1.3	5.0
500	1.9	5.7
600	2.4	6.2



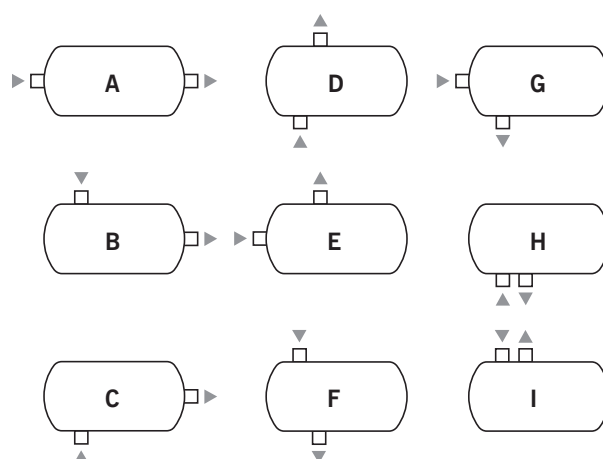
For detailed tables – see section 13.4 & 13.5

Connections

110,160,225 mm diameter mm PVCu/Quantum Inlets are socket and outlets are spigots.

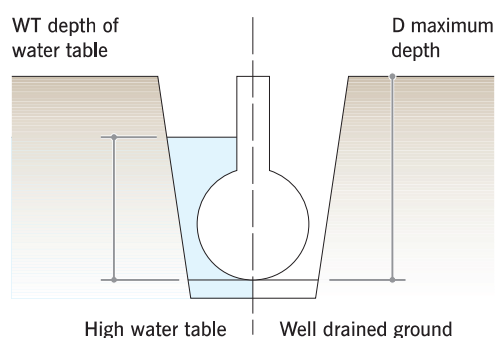
300 mm diameter and larger Inlet and outlets are spigots and can be connected to the site pipework using Flex-Seal, Band-Seal or similar flexible couplings.

Inlet/outlet pipe connection orientation A-I (see options below).



For extra heavy and special specification range and pea gravel surround refer to section 13 or contact technical sales.

Heavy tanks		
Series	WT(m)	D(m)
100/200/300	2.0	6.0
400	2.8	5.6
500	3.5	6.0
600	4.5	7.25
700	4.7	7.3



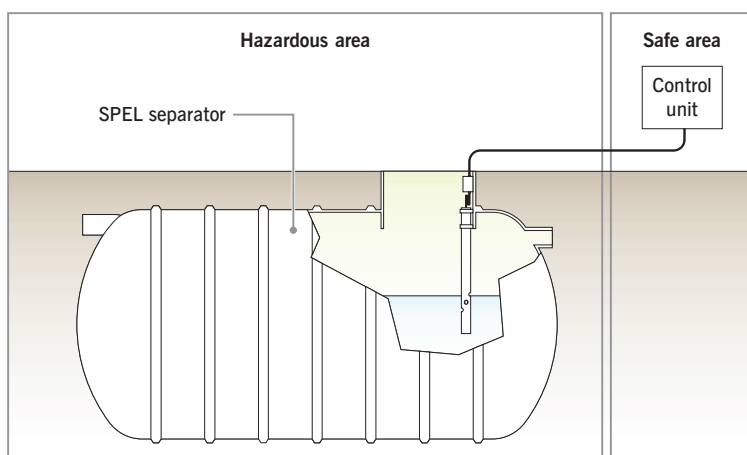
Installation, operation and maintenance instructions

SPEL Automatic Alarm/Monitoring Systems – Overview

The SPEL automatic alarm/monitoring systems provide visual and audible warning when the level of the oil in the SPEL Separator reaches 90% of the storage volume under static liquid level conditions.

The systems comprise a conductive 'fail safe' probe mounted in the main separation chamber which senses when the designed volume of light liquids has accumulated and sends a signal to the electronic control unit activating a red 'empty now' warning light and an audible alarm.

Cabinets



Maintenance

When the separator is maintained, lift the probe out of the probe protection tube, check it operates the alarm (see under Ref. 3.18) and at the same time wipe oil and contaminants from the probe to prevent a fake alarm after re-inserting.

It is a legal requirement in the UK to kit and oil alarm/monitor construction. Product regulation trading standards. It is less expensive to fix appropriate tube during construction.

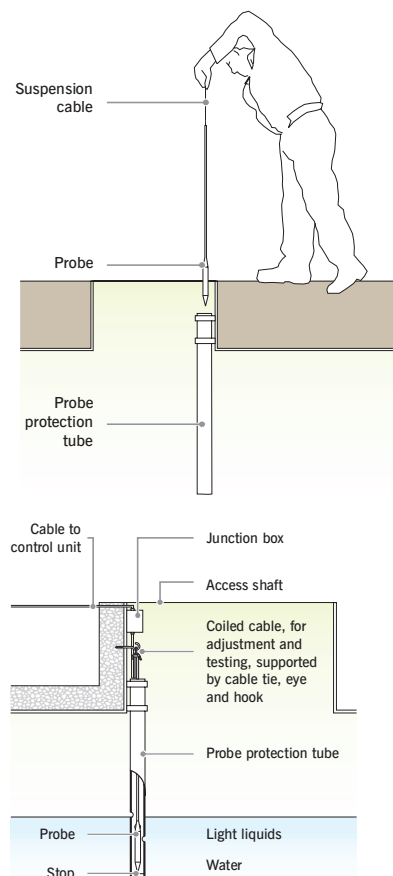
Operation

The probe is freely suspended in the probe protection tube in the separator at the correct level. When the oil-layer or depth of hydrocarbons reaches the predetermined level, the top of the probe will be immersed in the oil, breaking the circuit and activating the alarm. It is a 'fail-safe' system providing complete assurance that it is operative. If a fault occurs it will be signalled immediately.

Installation

Control unit (general positioning)

The control unit has been designed to be located indoors and outdoors, within a non-hazardous area. It should be wall mounted and positioned such that the LED display and push switches on the front panel can be readily seen and accessed. The unit can be secured to the wall using the four mounting holes provided. Included within the control is an intrinsically safe circuit (approved according to ATEX Directive 94/9/EC), to which the probe unit is connected.



Inserting probe on site

All that is required on site is to undertake the electrical installation in accordance with the instructions provided. Fix the plated hook provided in the position indicated and lower the probe into the probe protection tube until it locates onto the stop at the base. Coil excess cable and secure with the nylon cable-tie provided. The cable-tie eyelet is then hooked onto the hook to maintain the probe in the vertical position just touching the stop.

The probe protection tube is factory fitted and positioned to ensure the probe activates the alarm when the light liquids retained reach 90% of the storage volume the SPEL Separator is designed for.

3.10 SPEL Automatic Oil Alarm/Monitoring System Model ALARM-DY14400

Ideal for new build sites or where mains supply is readily available, making installation efficient and cost effective. The unit has an audible alarm and mute button. there is provision for a remote low power beacon.

Alarm warnings allow you time to take corrective action ensuring the safe and economic operation of separators preventing oil passing through the separator and polluting watercourses which may result in expensive fines and clean up costs.

Benefits

The alarm system and sensors guarantee an increased level of safety and requires simple installation for bespoke monitoring of oil and petrol separators.

Warn of excessive oil level

Tells you when a separator needs emptying

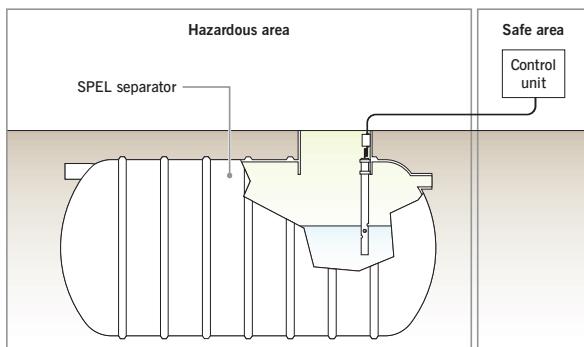
Reduces waste management costs

Designed to comply with EN858-1 and 2

Can be fitted to interceptors from all manufacturers

Reduces interceptor servicing costs

Ensures safe and economic operation of interceptors



Specifications

- Mains powered: 230VAC
- IP65 ABS Enclosure: 180 x 130 x 60mm
- Output: Remote Beacon Only (11volt. 100m Amax)
- Alarm: Audible (local)
- Probe Range: 200 metres max. (dependent on cable style)
- ATEX approved: Baseefa 13ATEX0172
- Specific Marking of Explosion Protection: Ex II (1) G [Ex ia Ga] IIB (-20°C ≤ Ta ≤ 50°C)
- ATEX Directive Marking: Ex II (1) G
- Notified Body: Baseefa 1180 Buxton UK

Compatible probe types:

- High Oil



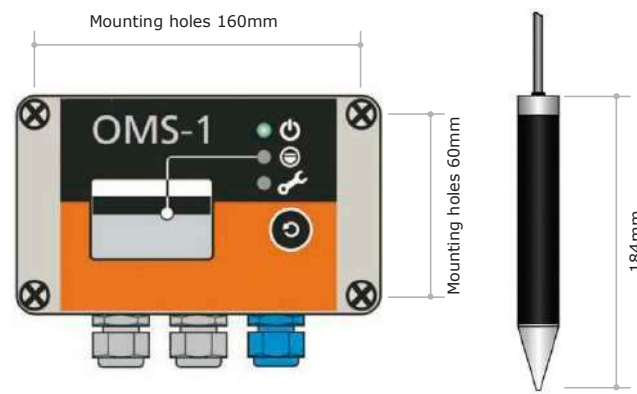
Oil separator alarm device

The SPEL OMS-1 alarm device is specially designed for oil separators. It indicates when it is time to empty the oil separator and thus prevents harmful hydrocarbon emissions to the sewer system.

SPEL OMS-1 control unit and SPEL OMS sensor



Accessories: Cable joint

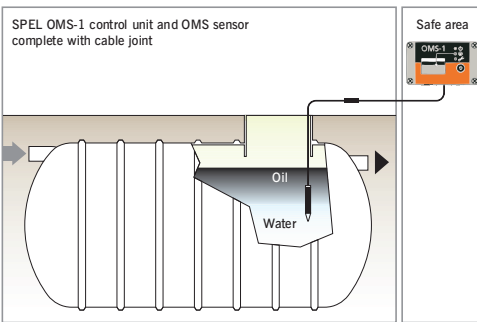


Mounting holes diameter ø 4.5mm Enclosure depth 35mm

Control unit	SPEL OMS-1
Dimensions:	175 mm x 75 mm x 35 mm (L x H x D)
Material:	Polycarbonate
Enclosure:	IP65
Operation temperature:	-30 °C...+50 °C
Supply voltage:	230 VAC ± 10 %, 50/60 Hz The device is not equipped with a mains switch.
Power consumption:	1 VA
Sensors:	OMS sensor
Relay outputs:	Potential-free relay output 250 V, 5 A, 100 VA Operational delay 10 sec. Relay de-energize at trigger point
Electrical safety:	IEC/EN 61010-1, Class II  , CAT II
Insulation level sensor/mains supply voltage:	375 V (IEC/EN 60079-11)
EMC:	EC/EN 61000-6-3 (Emission) IEC/EN 61000-6-1 (Immunity)
Ex-classification:	 II (1) G [Ex ia] IIB (Ta = -30 °C...+50 °C)
Special conditions	VTT 12 ATEX 003X
ATEX	IECEX VTT 12.0001X
Electrical parameters:	U _o = 6,6 V I _o = 20,2 mA P _o = 33,3 mW
Manufacturing year: Please see the serial number on the type plate	xxx x xxxxx xx YY x Where YY = manufacturing year (e.g. 12 - 2012)

Sensor	SPEL OMS
Principle of operation:	Measurement of conductivity
Material:	PVC, AISI 316
Enclosure:	IP68
Temperature:	Operation: 0 °C...+60 °C Safety: -30 °C...+60 °C
Cable:	Oil-proof cable 2 x 0,75 mm ² , standard length 5 m. Other lengths optional. The max. length of the fixed cable is 15 m. Can be extended up to 100 m.
EMC:	IEC/EN 61000-6-3 (Emission) IEC/EN 61000-6-1 (Immunity)
Ex-classification:	 II 1 G Ex ia IIA T6 Ga According to IEC/EN 60079-11 simple apparatus.
Manufacturing year: Please see the serial number on the type plate	x xxx x xxxxx xx YY x Where YY = manufacturing year (e.g. 12 - 2012)

Application



3.12 IdOil® Sensors

idOil sensors are an integral part of the idOil oil separator alarm system and they are to be used with the idOil control units. All idOil sensors are digital and polarity free.

	idOil-LIQ	idOil-OIL	idOil-SLU
Measurement principle	Vibration	Conductive	Ultrasonic
Mounting	Suspension		
Wetted parts	PVC, aluminium, PA, CR, Viton	PVC, AISI 316, PA, CR, NBR	PP, AISI 316, PA, CR, Silicon
Weight incl. 5m cable	240g	395g	530g
IP classification	IP68		
Ambient temperature	-30°C...+60°C		-25°C...+60°C
Supply voltage	12 V DC		
Fixed cable	Length 5m, 2 x 0.75 mm² PUR unshielded		
EMC	IEC/EN 61000-6-2 Emission IEC/EM 61000-6-3 Immunity		
ATEX	VTT 17 ATEX 005X	VTT 17 ATEX 004X	VTT 17 ATEX 006X
IECEX	IECEX VTT 17.0003X	IECEX VTT 17.0002X	IECEX VTT 17.0004X
Ex-classification	II 1 G Ex ia IIB T5 Ga	II 1 G Ex ia IIA T5 Ga	II 1 G Ex ia IIB T5 Ga
Exi Interface Values	$U_i=16\text{ V}$, $I_i=80\text{ mA}$, $P_i=400\text{ mW}$	$U_i=16\text{ V}$, $I_i=80\text{ mA}$, $P_i=400\text{ mW}$	$U_i=16\text{ V}$, $I_i=80\text{ mA}$, $P_i=400\text{ mW}$
Max values in IIB	$C_i \leq 5.2\text{ nF}$, $L_i \leq 1.6\text{ mH}$	$C_i \leq 5.2\text{ nF}$, $L_i \leq 1.6\text{ mH}$	$C_i \leq 4.0\text{ nF}$, $L_i \leq 1.6\text{ mH}$



idOil-LIQ high liquid level sensor

Indicates when the liquid level in the oil separator rises excessively e.g. in an outlet blockage situation.



idOil-OIL oil sensor

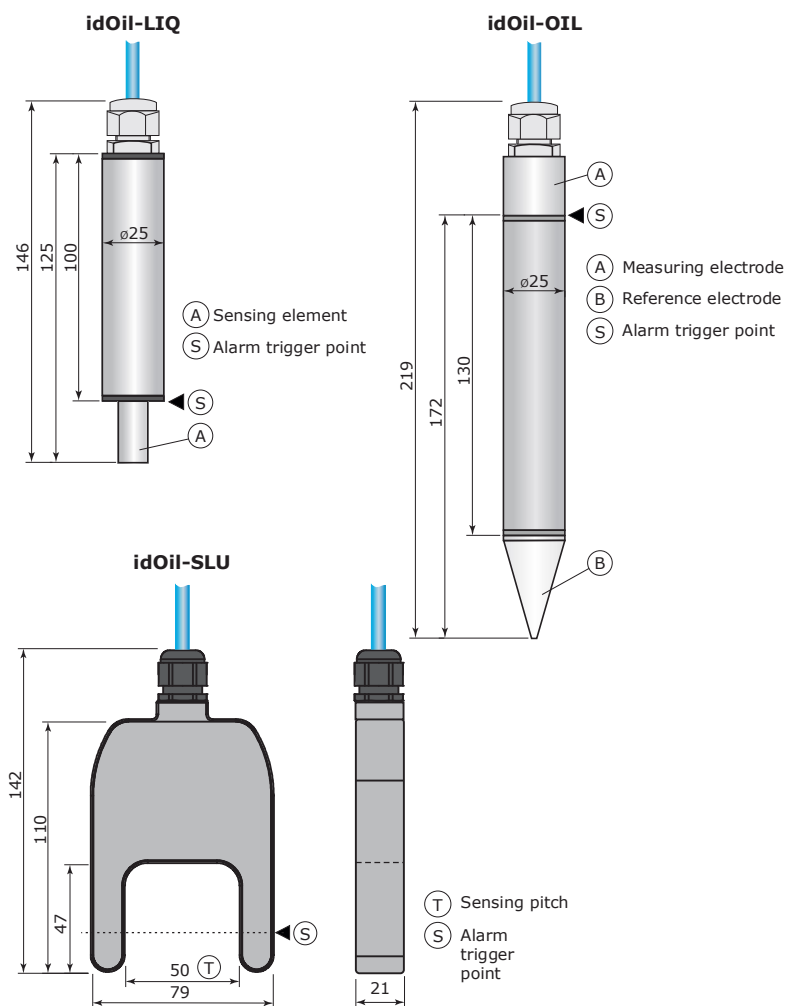
Detects oil and indicates when the separator's oil storage is full.



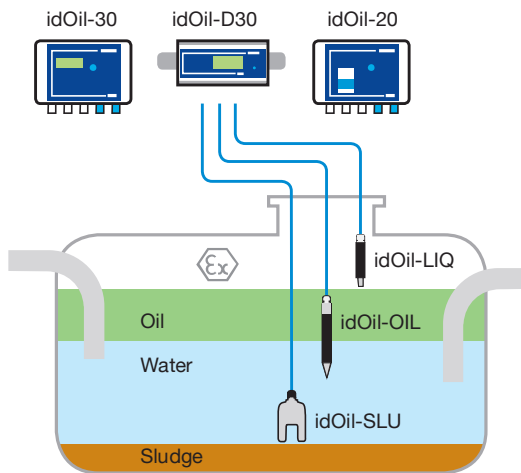
idOil-SLU sludge sensor

Monitors the sludge layer in the oil separator and indicates when the sludge layer has reached its maximum level.

Dimensions (mm)



Application



Cable connectors

Cable connectors are used for cable extension between the sensors and the control unit. They are oil resistant, IP68 and suitable for ATEX Zone 0. Simple apparatus according to IEC/EN 60079-11.



LCJ1-1

Cable connector for one sensor



LCJ1-2

Cable connector for two sensors



LCJ1-3

Cable connector for three sensors

Sensor cable extension with installation

Sensor cable extension with Labkotec cable connector

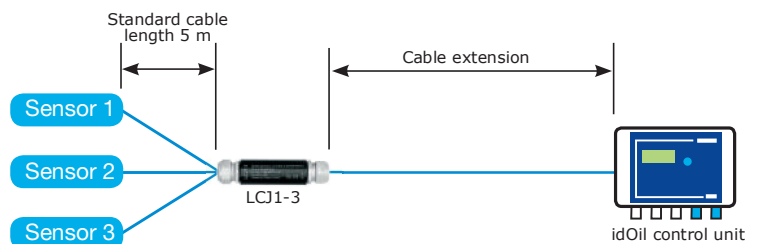
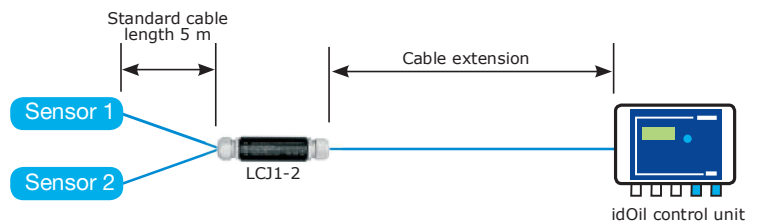
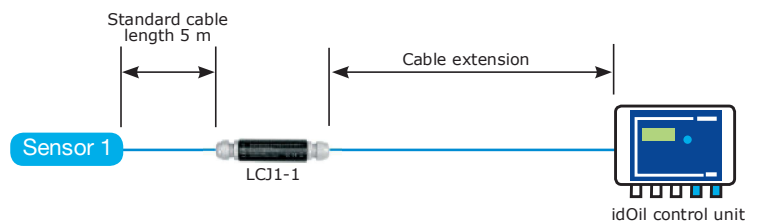
LCJ1-1 for one sensor
LCJ1-2 for two sensors
LCJ1-3 for three sensors

Extension cable example

Twisted pair cable, 2 x 0.75 mm²

Extension cable diameter

LCJ1-1: Ø 4mm...9mm
LCJ1-2 and LCJ1-3: Ø 5mm...10mm
Max. extension cable resistance 68 Ohms.



3.14 IdOil®-20 Oil Separator Alarm Control Unit



Fulfils requirements of EN 858-1&2 standards

The idOil-20 is an easy to use oil separator alarm control unit that offers all necessary basic features. It can be equipped with up to three different types of idOil sensors that are identified automatically with a one-touch commissioning feature.

- High liquid level alarm, when the liquid level in the oil separator rises excessively e.g. in an outlet blockage situation.
- Oil layer thickness alarm, when the oil separator's full capacity for oil or petrol has been reached.
- Sludge layer thickness alarm, when the sludge layer in the bottom of the separator has reached its maximum level.
- Separator leakage alarm, when the liquid level drops unexpectedly.

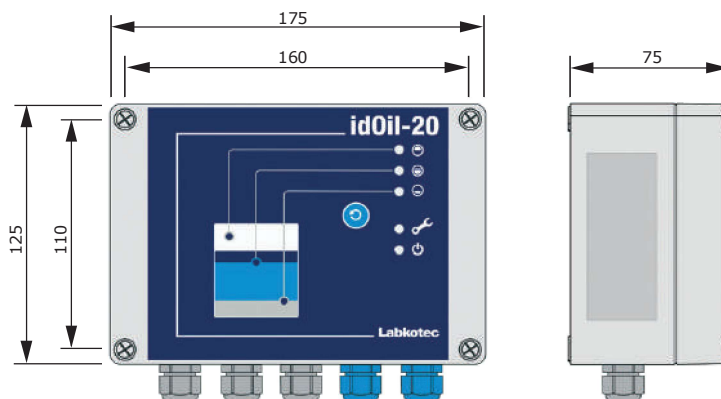
In these situations, an integrated alarm buzzer will sound, the display will show the alarm information and the relay(s) will switch.

Features

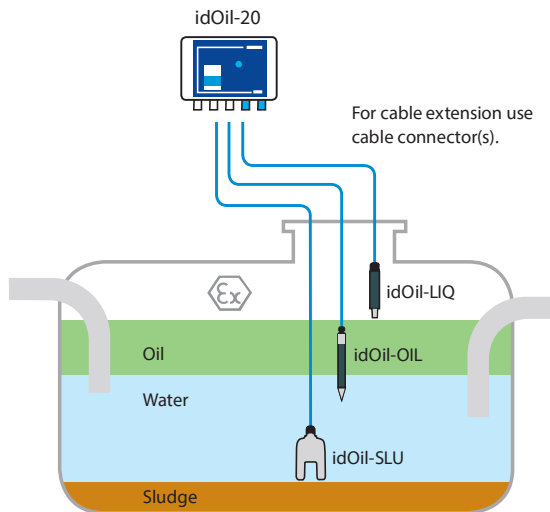
- Multi supply voltage
- Sensor combination with up to three different idOil sensors
- Polarity-free sensor connection
- Automatic sensor and sensor type detection
- Quick one-touch commissioning
- LED lights for alarms, sensor fault and power
- Buzzer for alarm indication
- Two potential free relay outputs. One for alarms and one for faults

Mounting	Wall mounting
Enclosure material	Polycarbonate
Weight	750g
IP classification	IP65
LED Lights	For alarms, sensor fault and power
Ambient temperature	-30°C...+60°C
Supply voltage	100-240 V AC, 50/60 Hz
Supply power fuse	Max. 10 A
Power consumption	Max. 8 VA
Relay outputs	5 A, 250 V AC/30 V DC, 100 VA potential free changeover contracts, 2 pcs
EMC	IEC/EN 61000-6-2 IEC/EN 61000-6-3
Electrical safety	Class I, CAT II IEC/EN 61010-1, UL 61010-1 CAN/CSA-C 22.2 NO. 61010-1-12
Ex-classification	Ⓔ II (1) G [Ex ia Ga] IIB
ATEX IECEX	VTT 16 ATEX 018X IECEX VTT 16.0005X
Exi interface values	$U_o = 14.5 \text{ V}$, $I_o = 78 \text{ mA}$, $P_o = 367 \text{ mW}$, $R = 243 \Omega$
Max values in IIB	$C_o = 4.0 \mu\text{F}$, $L_o = 16.7 \text{ mH}$
Compatible sensors	idOil-LIQ high liquid level sensor idOil-OIL oil sensor idOil-SLU sludge sensor
Accessories	LCJ1-1 cable connector for one sensor LCJ1-1 cable connector for two sensors LCJ1-3 cable connector for three sensors LMS-SAS5 mounting set for one sensor

Dimensions (mm)



Application



Cable connectors

Cable connectors are used for cable extension between the sensors and the control unit. They are oil resistant, IP68 and suitable for ATEX Zone 0. Simple apparatus according to IEC/EN 60079-11.



LCJ1-1
Cable connector for one sensor

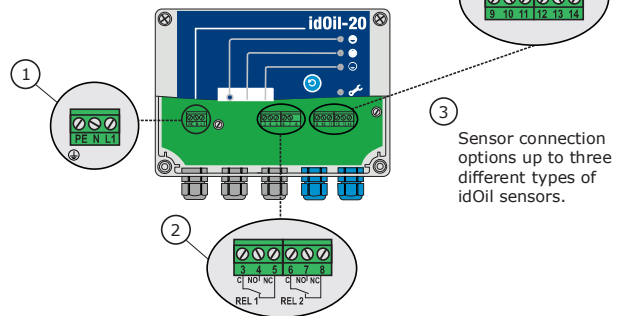
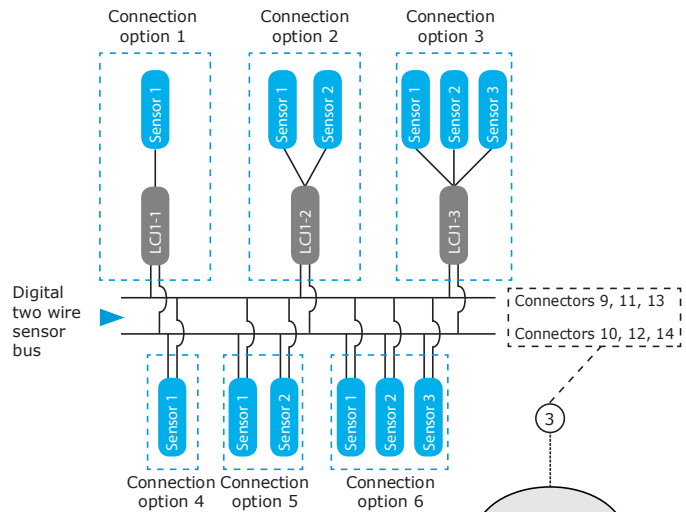


LCJ1-2
Cable connector for two sensors



LCJ1-3
Cable connector for three sensors

Installation



① Supply voltage 100-240 V AC

PE = Ground conductor
N = Neutral conductor
L1 = Phase conductor

② Supply voltage 100-240 V AC

Relay 1
3 = Common pole
4 = Opening pole when alarm
5 = Closing pole when alarm
Relay 2
6 = Common pole
7 = Opening pole when alarm
8 = Closing pole when alarm

③ Sensor connectors

9 = Sensor 1 connection 1
10 = Sensor 1 connection 2
11 = Sensor 2 connection 1
12 = Sensor 2 connection 2
13 = Sensor 3 connection 1
14 = Sensor 3 connection 2

3.16 IdOil®-30 Oil Separator Alarm Control Unit



Fulfils requirements of EN 858-1&2 standards

idOil-30 is a control unit for oil separator alarm systems. It can be equipped with up to three types of idOil sensors. With the idOil-30 and applicable Labkotec sensors following alarms can be monitored:

- High liquid level alarm, when the liquid level in the oil separator rises excessively e.g. in an outlet blockage situation.
- Oil layer thickness alarm, when the oil separator's full capacity for oil or petrol has been reached.
- Sludge layer thickness alarm, when the sludge layer in the bottom of the separator has reached its maximum level.
- Separator leakage alarm, when the liquid level drops unexpectedly.

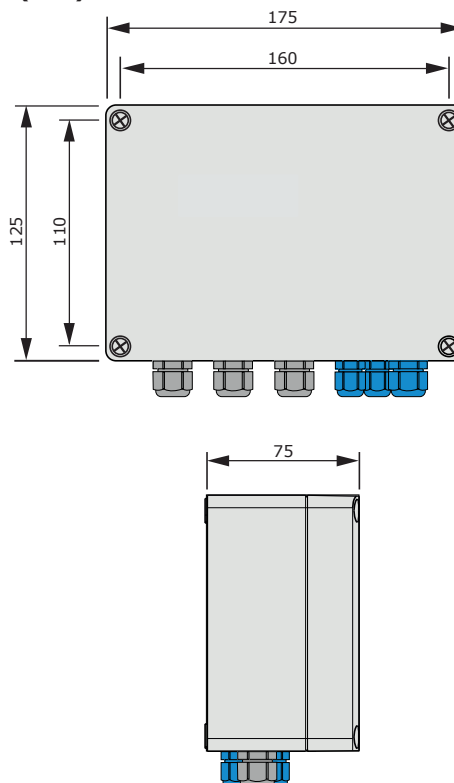
In these situations, an integrated alarm buzzer will sound, the display will show the alarm information and the relay(s) will switch. idOil-30 can be connected locally to laptop/tablet/smartphone via WLAN to access the inbuilt browser user interface for further configurations and settings.

Features

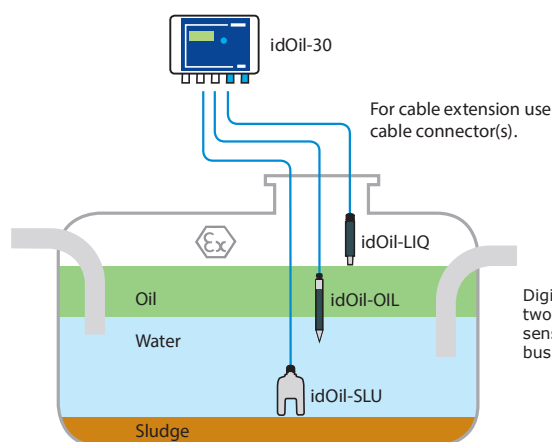
- Multi supply voltage
- Selectable sensor combination with up to three sensors
- Polarity-free sensor connection
- Automatic sensor and sensor type detection
- Quick one touch commissioning
- Display for system status and alarm information
- Two fully configurable potential free relay outputs
- Alarm log
- Service and maintenance diary
- WLAN connection locally between control unit and laptop/tablet/smartphone to access the built in browser user interface for settings and configuration

Mounting	Wall mounting
Enclosure material	Polycarbonate
Weight	780g
IP classification	IP65
Display	4 line monochrome LCD
Ambient temperature	-30°C...+60°C
Supply voltage	100-240V AC, 50/60 Hz
Supply power fuse	Max. 10 A
Power consumption	Max. 12 VA
Relay outputs	5 A, 250 V AC/30 V DC, 100 VA potential free changeover contacts, 2 pcs
EMC	IEC/EN 61000-6-2 IEC/EN 61000-6-3
Electrical safety	Class 1, CAT II IEC/EN 61010-1, UL 61010-1 CAN/CSA-C 22.2 NO. 61010-1-12
Ex-classification	II (1) G [Ex is Ga] IIB
ATEX IECEX	VTT 16 ATEX 018X IECEX VTT 16.0005X
Exi interface values	$U_o = 14.5 \text{ V}$, $I_o = 78 \text{ mA}$, $P_o = 367 \text{ mW}$, $R = 243 \Omega$
Max values in IIB	$C_o = 4.0 \mu\text{F}$, $L_o = 16.7 \text{ mH}$
Compatible sensors	idOil-LIQ high liquid level sensor idOil-OIL oil sensor idOil-SLU sludge sensor
Accessories	LCJ1-1 cable connector for one sensor LCJ1-2 cable connector for two sensors LCJ1-3 cable connector for three sensors LMS-SAS5 mounting set for one sensor

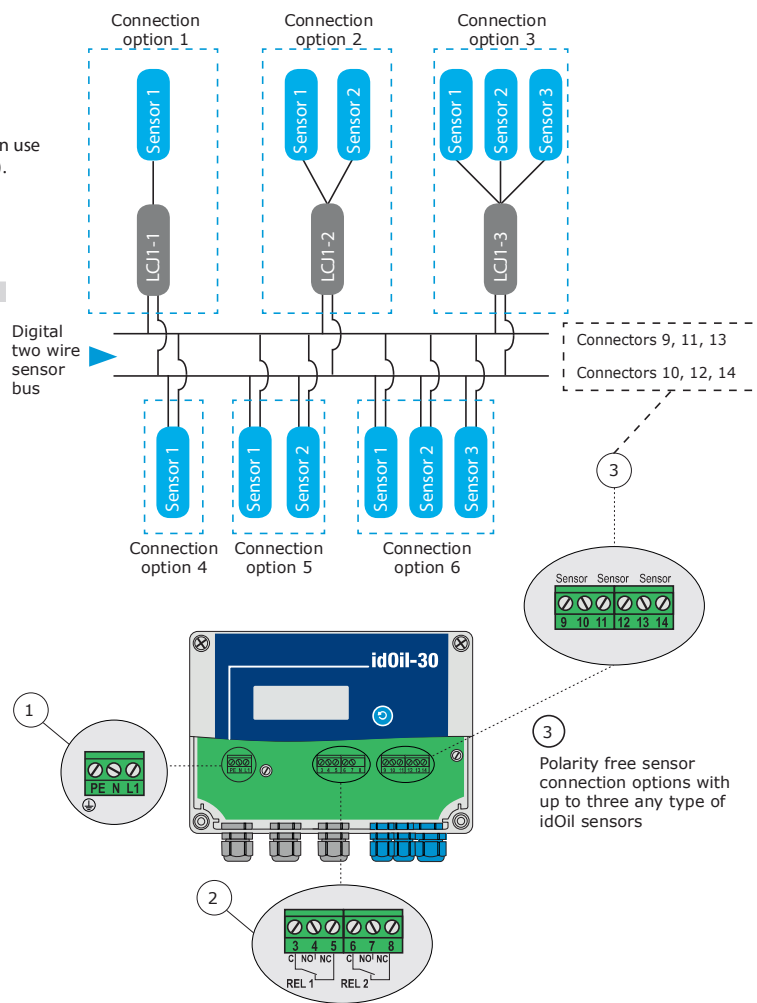
Dimensions (mm)



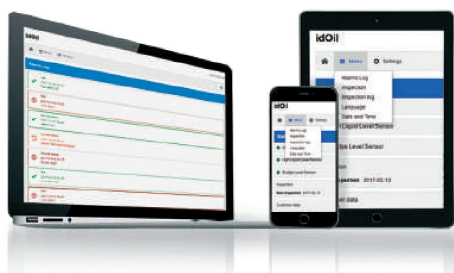
Application



Installation



Settings, configurations and information via browser user interface



- System status view with current alarms
- Date and time settings
- Language selection
- Alarms log, downloadable
- Inspection settings
- Write inspection notes
- Inspection diary, downloadable
- Customer data input for display
- Alarm settings
- Sensor identification and naming
- Relay configuration
- Software update

Cable connectors



LCJ1-1
Cable connector for one sensor



LCJ1-2
Cable connector for two sensors



LCJ1-3
Cable connector for three sensors

① Supply voltage 100-240 V AC

PE = Ground conductor
N = Neutral conductor
L1 = Phase conductor

② Supply voltage 100-240 V AC

Relay 1
3 = Common pole
4 = Opening pole when alarm
5 = Closing pole when alarm
Relay 2
6 = Common pole
7 = Opening pole when alarm
8 = Closing pole when alarm

③ Sensor connectors

9 = Sensor 1 connection 1
10 = Sensor 1 connection 2
11 = Sensor 2 connection 1
12 = Sensor 2 connection 2
13 = Sensor 3 connection 1
14 = Sensor 3 connection 2

3.18 IdOil®-D30 Oil Separator Alarm Control Unit



Fulfils requirements of EN 858-1&2 standards

idOil-D30 is a control unit for oil separator alarm systems. It can be equipped with up to three types of idOil sensors. With the idOil-D30 and applicable Labkotec sensors following alarms can be monitored:

- High liquid level alarm, when the liquid level in the oil separator rises excessively e.g. in an outlet blockage situation.
- Oil layer thickness alarm, when the oil separator's full capacity for oil or petrol has been reached.
- Sludge layer thickness alarm, when the sludge layer in the bottom of the separator has reached its maximum level.
- Separator leakage alarm, when the liquid level drops unexpectedly.

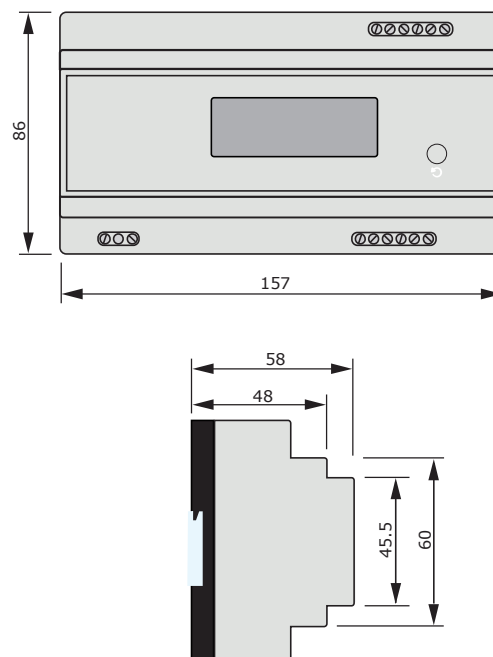
In these situations, an integrated alarm buzzer will sound, the display will show the alarm information and the relay(s) will switch. idOil-D30 can be connected locally to laptop/tablet/smartphone via WLAN to access the inbuilt browser user interface for further configurations and settings.

Features

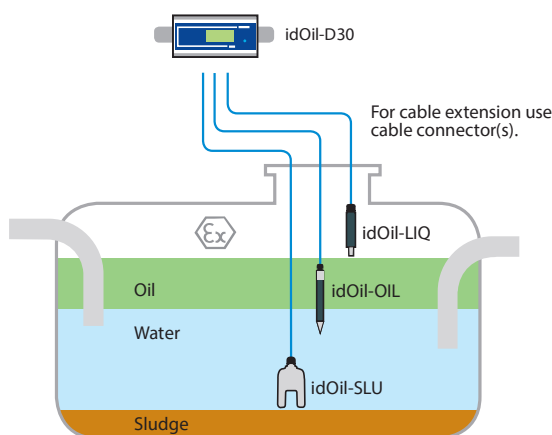
- Multi supply voltage
- Selectable sensor combination with up to three sensors
- Polarity-free sensor connection
- Automatic sensor and sensor type detection
- Quick one touch commissioning
- Display for system status and alarm information
- Two fully configurable potential free relay outputs
- Alarm log
- Service and maintenance diary
- WLAN connection locally between control unit and laptop/tablet/smartphone to access the built in browser user interface for settings and configuration

Mounting	M36 DIN rail mounting
Enclosure material	Lexan 940 (top), Noryl VO 1550 (base)
Weight	380g
IP classification	IP20
Display	4 line monochrome LCD
Ambient temperature	-30°C...+60°C
Supply voltage	100-240V AC, 50/60 Hz
Supply power fuse	Max. 10 A
Power consumption	Max. 12 VA
Relay outputs	5 A, 250 V AC/30 V DC, 100 VA potential free changeover contacts, 2 pcs
EMC	IEC/EN 61000-6-2 IEC/EN 61000-6-3
Electrical safety	Class 1, CAT II IEC/EN 61010-1, UL 61010-1 CAN/CSA-C 22.2 NO. 61010-1-12
Ex-classification	II (1) G [Ex is Ga] IIB
ATEX IECEx	VTT 16 ATEX 018X IECEx VTT 16.0005X
Exi interface values	$U_o = 14.5 \text{ V}$, $I_o = 78 \text{ mA}$, $P_o = 367 \text{ mW}$, $R = 243 \Omega$
Max values in IIB	$C_o = 4.0 \mu\text{F}$, $L_o = 16.7 \text{ mH}$
Compatible sensors	idOil-LIQ high liquid level sensor idOil-OIL oil sensor idOil-SLU sludge sensor
Accessories	LCJ1-1 cable connector for one sensor LCJ1-2 cable connector for two sensors LCJ1-3 cable connector for three sensors

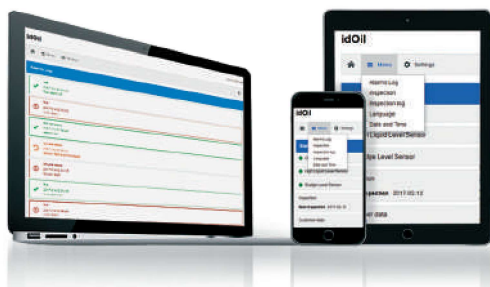
Dimensions (mm)



Application



Settings, configurations and information via browser user interface



- System status view with current alarms
- Date and time settings
- Language selection
- Alarms log, downloadable
- Inspection settings
- Write inspection notes
- Inspection diary, downloadable
- Customer data input for display
- Alarm settings
- Sensor identification and naming
- Relay configuration

Cable connectors



LCJ1-1
Cable connector for one sensor

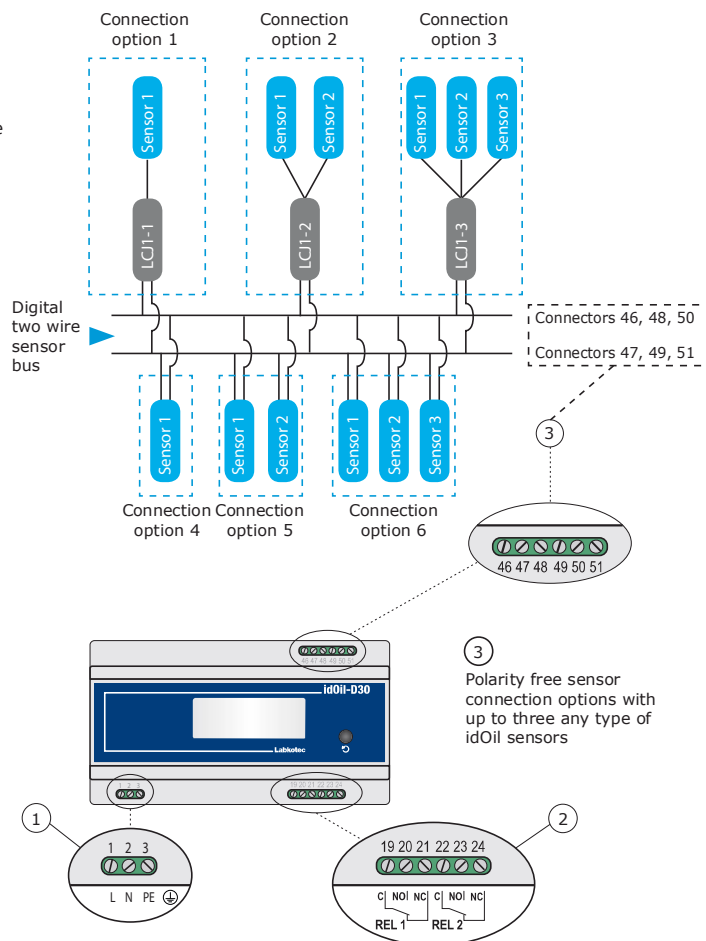


LCJ1-2
Cable connector for two sensors



LCJ1-3
Cable connector for three sensors

Installation



- ① **Supply voltage 100-240 V AC**
1 = L, phase conductor
2 = N, neutral conductor
3 = PE, ground conductor

- ② **Relay output**
Relay 1
19 = Common pole
20 = Opening pole when alarm
21 = Closing pole when alarm
Relay 2
22 = Common pole
23 = Opening pole when alarm
24 = Closing pole when alarm

- ③ **Sensor connectors**
46 = Sensor 1 connection 1
47 = Sensor 1 connection 2
48 = Sensor 2 connection 1
49 = Sensor 2 connection 2
50 = Sensor 3 connection 1
51 = Sensor 3 connection 2

3.20 IdOil® Solar Oil Separator Alarm



idOil Solar oil separator alarm

The idOil Solar is a solar powered oil separator alarm for off-grid areas. It can be equipped with a beacon light and/or 3G modem.

In an alert situation, the beacon light will flash and/or an alarm message will be sent to the user's mobile phone. The idOil Solar control unit has the same features as the idOil-30.



Enclosure material	Polycarbonate
Weight	8000g
IP classification	IP43 with two ventilation devices
Ambient temperature	-30 °C...+60 °C
Supply voltage	11-17 V DC
Compatible sensors	idOil-LIQ, idOil-OIL, idOil-SLU
Relay outputs	5 A, 30 V DC, 100 VA potential free, 2 pcs
EMC	IEC/EN 61000-6-2 IEC/EN 61000-6-3
Electrical safety	Class III, IEC/EN 61010-1, UL 61010-1 CAN/CSA-C 22.2 NO. 61010-1-12
Overvoltage category	
ATEX	VTT 16 ATEX 018X
IECEX	IECEX VTT 16.0005X
Ex-classification	Ⓔ II (1) G [Ex ia Ga] IIB

The purpose of the automatic closure device (ACD) is to close the separator off automatically when the maximum storage capacity of light liquid is attained.

The ACD is to ensure that in the event of a major spillage, pollutants do not pass into the drainage system; it should not be regarded as a substitute for an automatic alarm/monitoring system.

Prior to installation

Prior to installation the ACD retaining tube should be covered with polythene to prevent ingress of concrete etc., which would fall onto the ACD and upset its calibration.

Operation and maintenance

If the tank should fill with light liquid the ACD, which is calibrated for a specific gravity of 0.85, will automatically fall and close off the SPEL Puraceptor®.

Normally routine maintenance would include removing light liquid intercepted within the Puraceptor®. If a SPEL automatic alarm/monitoring system is incorporated, it will automatically indicate when the Puraceptor® should be emptied. Only in an emergency will the Puraceptor® fill to its maximum and operate the ACD.

In such an event the Puraceptor® should be completely sucked out and the ACD lifted out (see Maintenance Procedure – Ref: 5.5).

SPEL Puraceptor® class 1 separators two chamber models and full retention class 2 separators

Commissioning

After the tank has been installed, leave the water in.

1. Remove the ACD from the packing box, taking care not to cause damage.
2. Remove the retaining cap from the top of the retaining tube in the separator.
3. Insert the ACD into the retaining tube using the lifting eye provided, ensuring it floats correctly with the float just visible above the water level.
4. Replace the retaining cap. This is to safeguard against the removal of the float by unauthorised persons or rising above the tube under abnormal conditions.

Note: If the tank's invert depth exceeds 1m it is advisable to remove the retaining cap prior to installation and only replace after inserting the ACD, if it is possible to do so from ground level.

SPEL Puraceptor® class 1 separators single chamber models

Models P004/1C to P050/1CSC.

Commissioning

After the tank has been installed, leave the water in.

1. Remove the ACD from the packing box, taking care not to cause damage.
2. Remove the retaining cap from the top of the retaining tube in the separator.
3. Insert the ACD into the retaining tube using the lifting eye provided. Allow it to sink to the bottom. The stainless steel retaining plate should seat on the base flange and the ACD attain its operating position as shown in the open position.
4. Replace the retaining cap. This is to safeguard against the removal of the float by unauthorised persons or rising above the tube under abnormal conditions.

Note: If the tank's invert depth exceeds 1m it is advisable to remove the retaining cap prior to installation and only replace after inserting the ACD, if it is possible to do so from ground level.

Larger Models

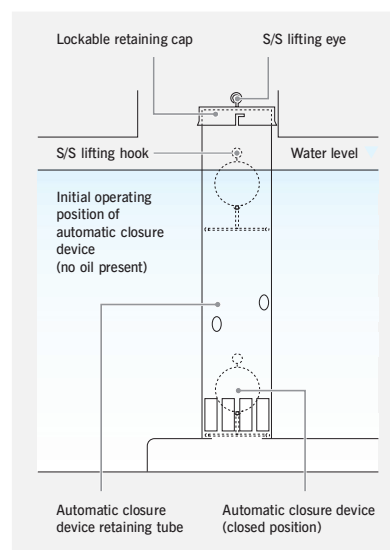
Where the ACD is already positioned in the unit, proceed as follows:

1. Before putting any water in the tank, lift rope attached to ACD up to the next knot and hang it from the rope hook. This is now in the 'operating position'.
2. As soon as the water level in the tank is above the ACD, the rope must be removed altogether and the rope hook must be unbolted. Do not leave the rope hook attached to the shaft. Ensure the ACD automatically remains in the 'operating position'.
3. Tape up or fill the hole(s) in the shaft where the rope hook was attached to prevent any backfill seeping into the shaft.

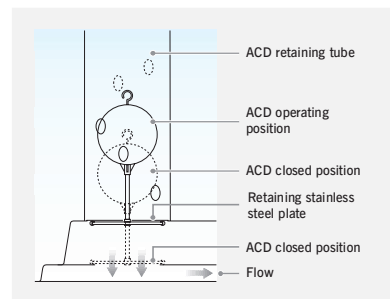
Maintenance

Dependent upon site conditions it is advisable to remove the ACD periodically taking care not to raise it too quickly and damage the plastic/copper float. Clean from debris/silt to prevent premature closing. Check the seating in the base unit is free of debris/silt that could prevent proper closing in an emergency.

Automatic closure device Type F (Floating) SPEL Puraceptor® class 1 separators (two chamber) & full retention class 2 separators.



Automatic closure device Type R (Retained) SPEL Puraceptor® class 1 separator (single chamber).



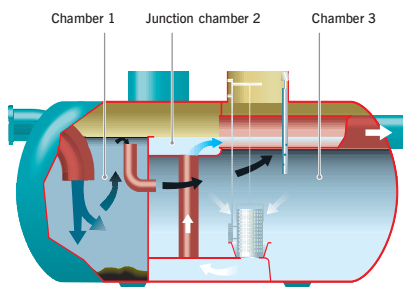
3.22 SPEL Stormceptor® By-Pass Separators

Maintenance

The SPEL Stormceptor® by-pass separator is a well proven high quality factory made unit, designed and tested in accordance with the European Standard BS EN 858-1 and meets the requirements of the Environment Agency and the Construction Products Regulations.

SPEL Stormceptors® are designed for long term performance and with SPEL high volume coalescer units, low maintenance.

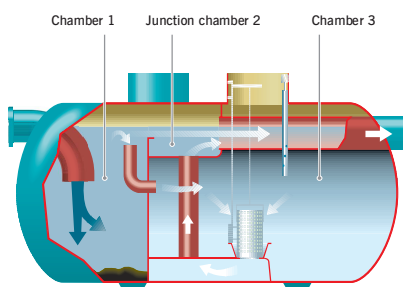
SPEL Stormceptor® by-pass separators are manufactured in class 1 and class 2 models and with or without silt capacity in accordance with BS EN 858-1. The range of models is listed in section 4 or on the SPEL Stormceptor® selection chart – available on request.



Flows according to nominal size (NSB)

The polluted surface water first enters the primary chamber where silt settles out and is retained. The fuel, oil and other pollutants lighter than water, rise to the surface and are efficiently skimmed off and transferred to the separation chamber.

In normal conditions all the flow is through the separation chamber, where the quiescent conditions allow the pollutants to separate out efficiently. Water from the cleanest zone in the separation chamber flows through a coalescer unit, to remove smaller globules of oil, up to the junction chamber and thence to the outlet.



Storm flows above NSB

During a storm the level in the primary chamber rises and the stormwater passes over the weir into the junction chamber and to the outlet.

The design keeps the turbulence within the separation chamber to a minimum which avoids disturbing the contaminants retained.

Maintenance requirements

The SPEL automatic alarm/monitoring system will automatically warn you when the SPEL Stormceptor® requires emptying of light liquids, however, silt will accumulate and require removing at intervals depending on the site conditions.

We recommend the SPEL Stormceptor® is checked at 3, 6, or 12 monthly intervals to determine the depth of silt in the primary chamber.

Where a SPEL automatic alarm/monitoring system is not fitted, the SPEL Stormceptor® should be checked at 3, 6, 12 monthly intervals, depending upon site conditions, to determine the depth of retained pollutants. When the depth of light liquids retained has reached the predetermined design level in accordance with the European Standard BS EN 858-1, or if excessive silt has accumulated, it should be emptied.

When emptying ensure both chambers (primary - chamber 1 and separation - chamber 3) are emptied equally to prevent unequal pressure on the internal partition.

Chamber 1

The inlet connects directly into chamber 1 - the primary chamber where silt etc. is deposited and light liquids are skimmed off to be transferred to the main separation chamber, chamber 3.

Maintenance requires the removal of accumulated silt etc., checking the skim pipe is not blocked and removing floating debris.

Chamber 2

This is the junction chamber where the clean water passing out of the main separation chamber and the storm flow over the weir from the primary chamber meet and pass to the outlet. This chamber is an approved sampling point if samples are required for analysis. As it is mainly clean water passing through the chamber, maintenance is confined to checking the weir plate is free of debris.

Chamber 3

The main separation chamber is where the light liquids are retained and in the case of class 1 Stormceptors®, where the coalescer units are incorporated.

If coalescer units are incorporated, these should be removed and cleaned in accordance with the requirements set out in Data Sheet ref. 3.23 steps 1 to 5.

Retained light liquids should be removed from the top and any sediment from the bottom. Small Stormceptor® by-pass separators generally need to be completely emptied.

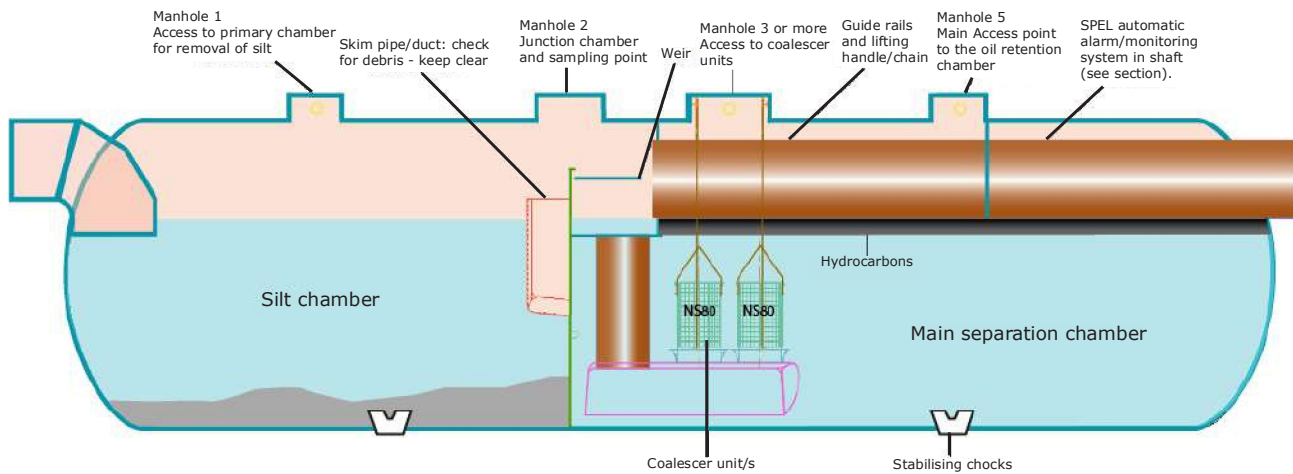
SPEL automatic alarm/monitoring system

If a SPEL automatic alarm/monitoring system is fitted this will automatically signal when the Stormceptor® requires light liquids to be removed. If this system is fitted see 3.10 – 3.19.

When emptying take care not to damage or shift the probe protection tube situated in the access shaft of chamber 3.

Maintenance Access

SPEL Stormceptor® class 1 by-pass separators 400, 500 & 600 Series



A wide range of SPEL Stormceptor® class 1 by-pass separators is available incorporating coalescer unit/s for small to large catchment areas.

When emptying ensure both chambers (primary – chamber 1 and separation – chamber 3) are emptied equally to prevent unequal pressure on the internal partition.

Manhole access 1

This is the access to the primary chamber for removal of silt, the inspection of the skim pipe and clearing of any floating debris.

Manhole access 2

This provides access to the junction chamber which is suitable as a sampling point for the final discharge.

Manhole access 3 & 4 (larger models)

These provide access for the inspection, the removal and reinsertion of the coalescer units and the removal of hydrocarbons and silt.

The SPEL automatic alarm/monitoring system probe is generally situated at the base of this access shaft (see section on alarms).

3.24 SPEL Puraceptor® Class 1 Separators

Maintenance

SPEL Puraceptor® class 1 separators

The SPEL Puraceptor® class 1 separator is available in single chamber or two chamber models.

Single chamber models (Figure 1)

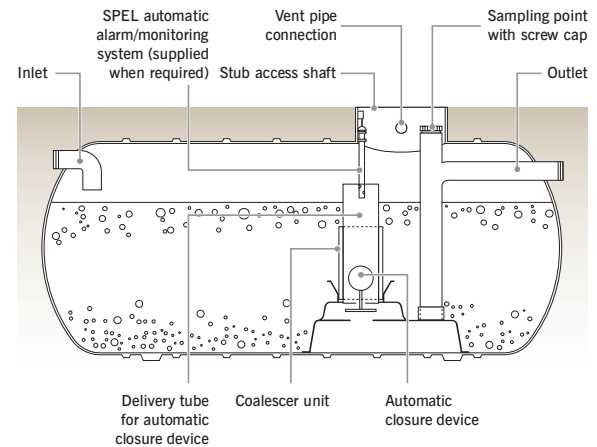
Two chamber models (Figure 2)

These incorporate a coalescer unit and an automatic closure device type 'R'. For maintenance see 3.20.

Two chamber models (Figure 2)

The maintenance procedure for the SPEL Puraceptor® class 1 two chamber models is detailed on sheet 3.20.

Figure 1



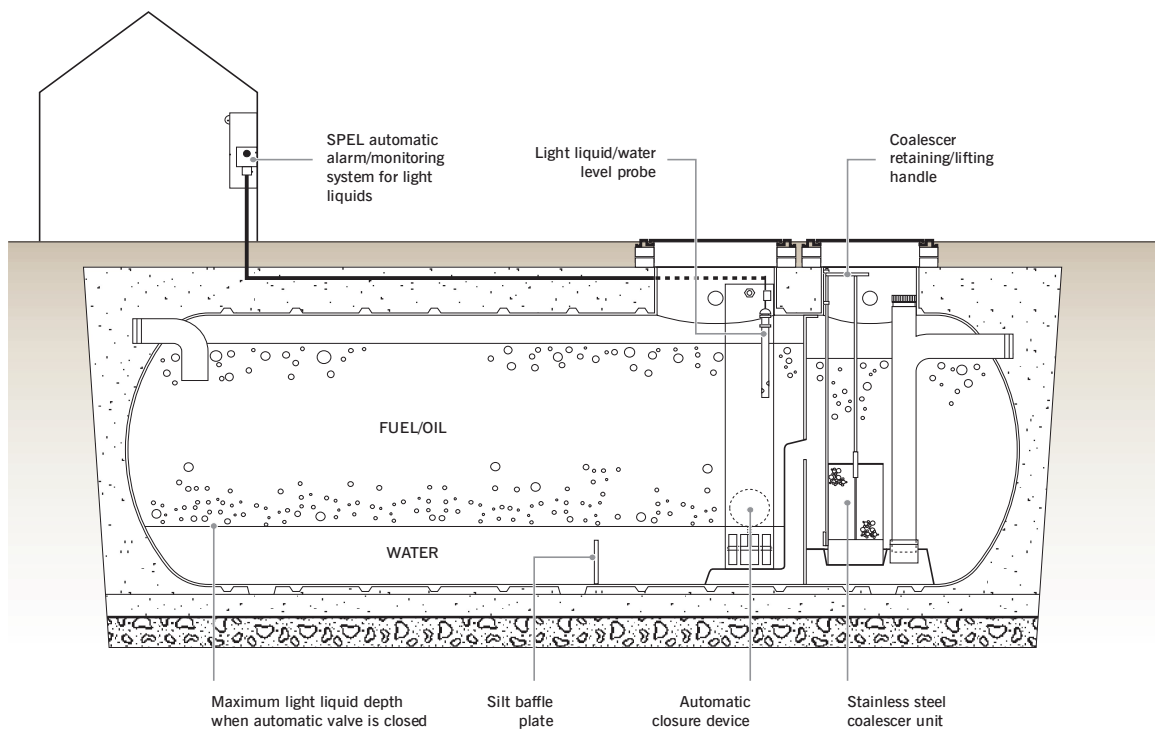
Maintenance requirements

The SPEL automatic alarm/monitoring system will automatically warn you when the SPEL Separator requires emptying of light liquids. See ref. 3.10 – 3.19. However, silt will accumulate and require removing at intervals depending on the site conditions.

We recommend the SPEL Separator is checked at 3, 6 or 12 monthly intervals to determine the depth of silt in the primary chamber.

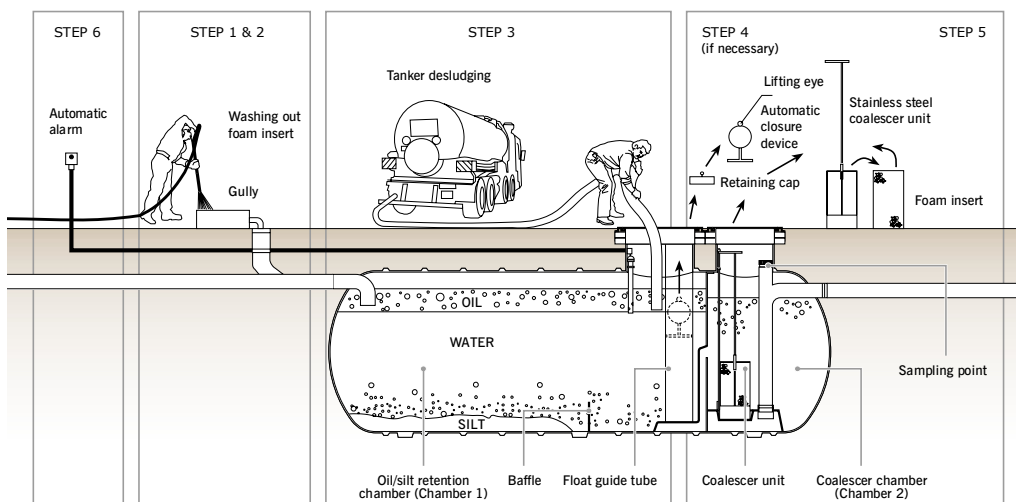
Separators must be provided with a remote device to provide visual and audible warning when the level of oil reaches 90 per cent of the oil storage volume (V) under static liquid level conditions. This automatic warning device indicates that the separator is in need of immediate emptying for it to continue to work effectively.

Figure 2



Maintenance

SPEL Puraceptor® separator - two chamber model



Step 1: Coalescer unit

Use the lifting handle or unclip the retaining clip for the wire rope and lift the coalescer unit out of the tank and place ahead of the Puraceptor®.

Step 2: Cleaning foam insert

Remove foam insert and wash with normal water pressure ensuring the dirty water runs into the Puraceptor®.

Step 3: Sucking out oil/fuel and silt

Suck off the retained oil from both chambers of the Puraceptor® and then the silt deposited on the bottom, leaving sufficient water to ensure the ACD remains floating.

Step 4: Sucking out complete contents (if necessary)

If the quantity of pollutants exceeds recommended levels, the complete contents of the Puraceptor® may need to be removed.

After sucking out completely, remove the ACD in the ACD retaining tube by first removing the retaining cap (this is to safeguard against the removal of the float by unauthorised persons).

Then, by means of a pole with a hook, lift out the ACD using the lifting eye on the float. Check the seating at the base of the retaining tube is free of debris/silt that could prevent the ACD closing off in an emergency.

Step 5: Re-insert coalescer unit and ACD

Re-insert the foam insert into the stainless steel coalescer unit and re-insert the coalescer unit into the Puraceptor®. Re-clip the wire rope or location pin as provided with the SPEL lifting/locating/locking system (see 3.7).

Partially fill the Puraceptor® with clean water to ensure the ACD when re-inserted remains floating. Check the ACD is not damaged and the closure plate is clean. Re-insert the ACD.

Finally check the ACD is floating and the retaining cap has been replaced to safeguard against its removal by unauthorised persons, unless depth of tank precludes doing so from ground level.

ACD closes off in emergency due to oil spill

If the ACD closes off, the oil/fuel spill needs to be removed by a suction tanker. With a single chamber model, the complete contents will need to be removed in order to release the ACD. With the two chamber models, insert the suction hose into the first chamber (oil/silt retention chamber) and then the head in the second chamber will normally provide a back pressure and automatically release the ACD.

Precaution: never try to pull the ACD off its seating by force.

Step 6: SPEL automatic alarm /monitoring system

The SPEL automatic alarm/monitoring system probe should be lifted out of the probe protection tube, wiped clean and re-inserted. The system should now be reset according to instructions. See 3.10 – 3.19.

Maintenance procedure

The SPEL automatic alarm/monitoring system will automatically warn you when the Puraceptor® requires emptying. See 3.10 – 3.19. Where a SPEL automatic alarm/monitoring system is not fitted, SPEL Puraceptors® should be checked at three, six or twelve-monthly intervals depending on site conditions, to determine the depth of retained pollutants and silt in both chambers and the correct operating of the ACD (automatic closure device). When the depth of the oil/fuel retained has reached the predetermined design level, in accordance with BS EN 858-1, it should be emptied.

Important Note: When emptying, ensure both chambers are emptied equally starting with the oil retention chamber and then the coalescer chamber and back again until empty.

GA-1

Grease Separator Alarm Device

Installation and Operating Instructions



TABLE OF CONTENTS

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SYMBOLS



Warning / Attention



Device is protected by double or reinforced insulation

1 GENERAL

GA-1 is an alarm device for monitoring the thickness of the grease layer accumulating in a grease separator.

The system consists of GA-1 control unit, GA-SG1 sensor and a cable joint.

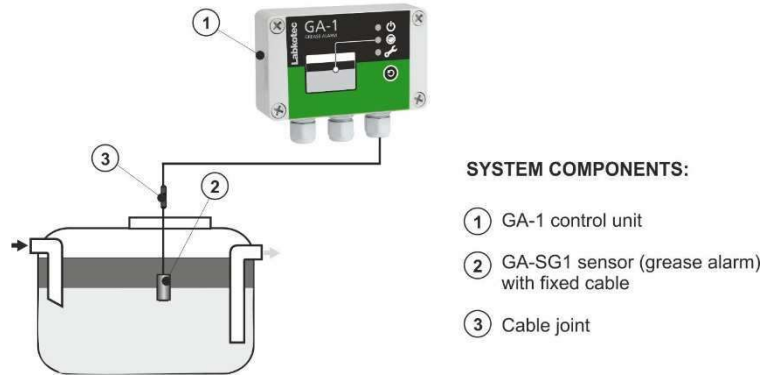


Figure 1. Grease separator supervision with GA-1 alarm device

GA-SG1 sensor is installed into the grease separator and it supervises thickness of grease layer.

The LED indicators, push button and interfaces of the GA-1 control unit are described in figure 2.

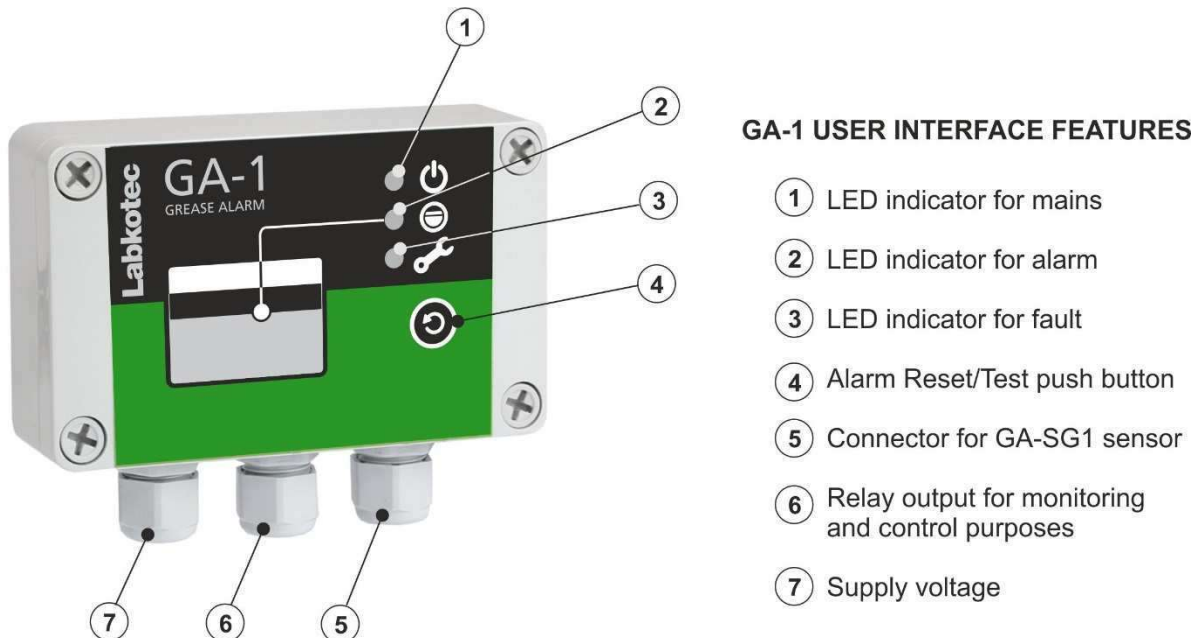


Figure 2. GA-1 control unit – features

2 INSTALLATION

2.1 GA-1 control unit

GA-1 control unit can be wall-mounted. The mounting holes are located in the base plate of the enclosure, beneath the mounting holes of the front cover.

The cover of the enclosure must be tightened so, that the edges touch the base frame. Only then does the push button function properly and the enclosure is tight.

Before installation, please read the safety instructions in chapter 6!

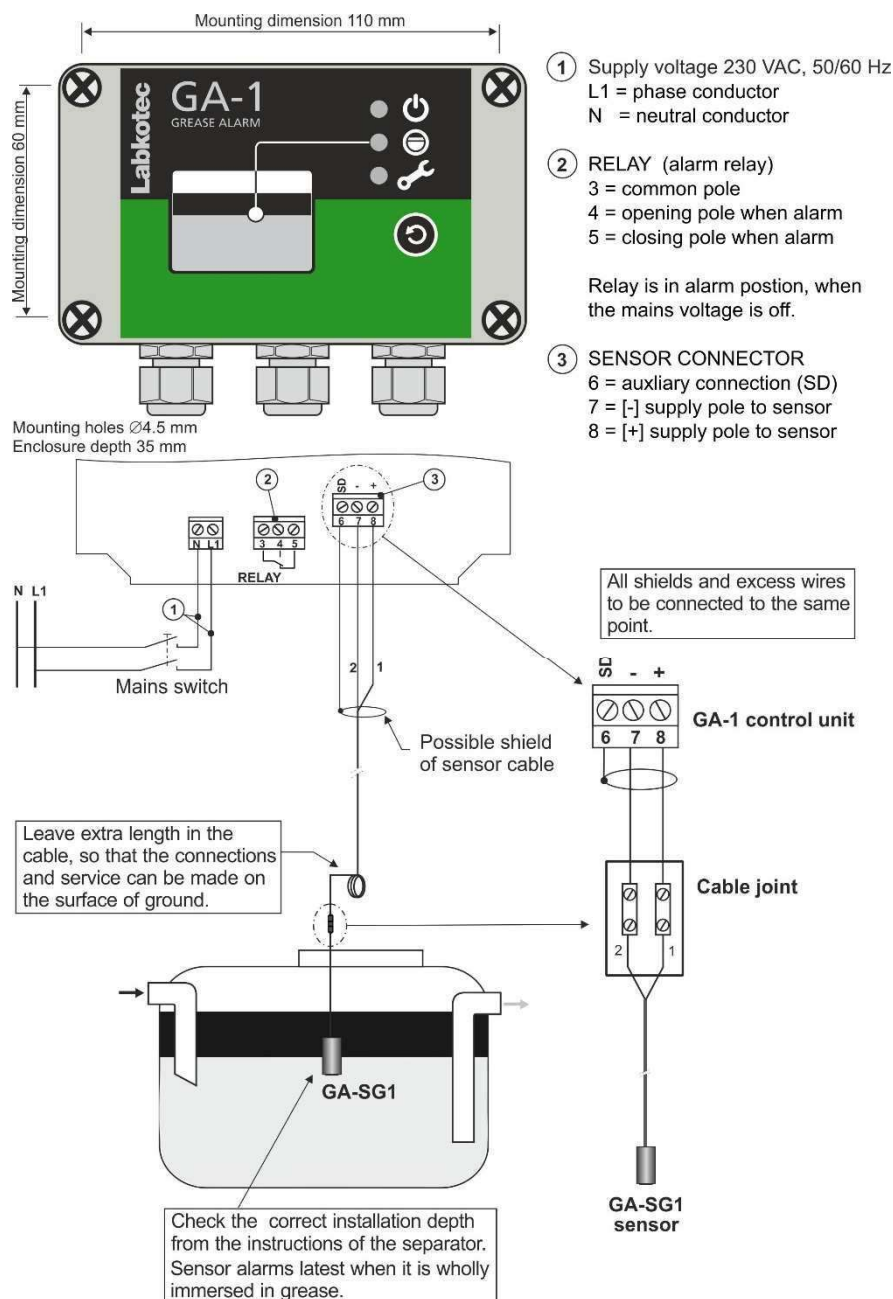


Figure 3. GA-1 alarm device installation.

2.2 GA-SG1 sensor

GA-SG1 sensor should be installed as described in figure 3.

The sensor gives an alarm latest when it is wholly immersed in grease.

Please check the correct installation depth also from the instructions of the grease separator.

2.3 Installation Accessories

The delivery includes a cable joint (figure 4), fixing accessories (figure 5) for installation of the control unit and the sensor. In figure 6 is an installation example of cable with suspension hook.

Connections of the sensor cable inside the cable joint are explained in figure 3. If shielded cable is used cable shields and possible excess wires need to be connected to the same point in galvanic contact.

IP rating of the cable joint is IP68. Make sure, that the cable joint is closed properly.



Figure 4 Cable joint



Figure 5. Fixing accessories



Figure 6. Cable installation example

3 OPERATION

The operation of the alarm device should be checked always after the installation. Also check the operation always when emptying the separator or at least once every six months.

Functionality test

1. Immerse the sensor into water. The device should be in normal mode.
2. Lift the sensor up in air or grease. A grease alarm should be generated (see chapter 3.1 for more detailed description).
3. Clean up the sensor.
4. Immerse the sensor back into water. The alarm should go off after a delay of 10 sec.

A more detailed description of the operation is provided in chapter 3.1. If the operation is not as described here, check connections and cabling. If necessary contact a representative of the manufacturer.

3.1 Modes of operation

Normal mode – no alarms

Sensor is totally immersed in water.
Mains LED indicator is on.
Other LED indicators are off.
Relay is energized.

Grease alarm

Sensor is immersed in grease. (the sensor gives an alarm latest when it is wholly immersed in grease).
Mains LED indicator is on.
Grease Alarm LED indicator is on.
Buzzer on after 10 sec delay.
Relay de-energize after 10 sec delay.
(Note. The same alarm takes place when GA-SG1 sensor is in the air.)

After removal of an alarm, the Grease Alarm LED indicator and buzzer will be off, and relay will be energized after 10 sec delay.

Fault alarm

Sensor cable break, short circuit or a broken sensor.
Mains LED indicator is on.
Sensor circuit Fault LED indicator is on after 10 sec delay.
Buzzer is on after 10 sec delay.
The relay de-energize after 10 sec delay.

Reset of an alarm

When pressing the Reset/Test push button.
Buzzer will go off.
Relay and LED indicator will not change their position until the alarm or fault situation is removed.
If the buzzer is not reset, it goes off automatically after three days.

TEST FUNCTION

Test function provides an artificial alarm, which can be used to test the function of the GA-1 alarm device and the function of other equipment, which are connected to GA-1 via its relay.



Attention! Before pressing the Reset/Test button, make sure that the change of relay status does not cause hazards elsewhere!

Normal situation

*When pressing the Reset/Test push button:
Grease Alarm and Fault LED indicators are immediately on.
Buzzer is immediately on.
Relay de-energize after 2 sec of continuous pressing.

When the Reset/Test push button is released:
LED indicators and buzzer go immediately off.
Relay energize immediately.*

Alarm on

*When pressing the Reset/Test push button for the first time:
Buzzer will go off.

When pressing the Reset/Test push button after that:
Fault LED indicator is immediately on.
Grease Alarm LED indicator remains on.
Buzzer remains on. If it has been reset earlier, it will return to be on.

When the Reset/Test push button is released:
The device returns right away to the preceding status.*

Fault alarm on

*When pressing the Reset/Test push button:
The device does not react to the test at all.*

4 TROUBLE-SHOOTING

Problem:	No alarm when sensor in grease or air, or the alarm will not go off
Possible reason:	Sensor is dirty.
To do:	1. Clean-up the sensor and check the operation again.



The following operations must be performed only by a qualified electrician!

Problem:	MAINS LED indicator is off
Possible reason:	Device doesn't get supply voltage.
To do:	1. Check that power separation switch is not switched off. 2. Measure the voltage between poles N and L1. It should be 230 VAC + 10 %.

Problem:	FAULT LED indicator is on
Possible reason:	Current in sensor circuit too low (cable break or out of connector) or too high (cable in short circuit). The sensor might also be broken.
To do:	1. Make sure, that the sensor cable has been connected correctly to the GA-1 control unit. 2. Measure the voltage separately between the poles 7 and 8. The voltages should be between 7,0 - 8,5 V. Note! The voltage alternates between the sensor connectors in 1 second intervals. 3. Measure sensor current when the sensor is in the air or in grease. The measured current should be 7,0 – 8,5 mA. 4. Measure current when the sensor is in the water. Measured current should be 2,5 – 3,5 mA

If the problem can not be solved with the above instructions, please contact Labkotec Oy's service.

5 REPAIR AND SERVICE

The sensor should be cleaned and the operation should also be tested when emptying or maintaining the grease separator or at least once every six months. The easiest way to check the operation is to lift the sensor up in the air and to put it back to the separator. The operation is described in chapter 3.

For cleaning, a mild detergent (e.g. washing-up liquid) and a scrubbing brush can be used.

In case of queries, please contact Labkotec Oy's service:
service@labkotec.fi.

6 SAFETY INSTRUCTIONS



The device does not include a mains switch. A two pole mains switch (250 VAC 1 A), which isolates both lines (L1, N) must be installed in the main power supply lines in the vicinity of the unit. This switch facilitates maintenance and service operations and it has to be marked to identify the unit.



If opening of housing's cover is needed, only a qualified electrician is allowed to install or to maintain the device.



If the device is used against the manufacturer's instructions, the protection provided by the device may be damaged.



The device is not allowed to install in hazardous areas.

7 TECHNICAL DATA

GA-1 control unit	
Dimensions	125 mm x 75 mm x 35 mm (L x H x D)
Weight	250 g Package 0,8 kg (control unit + sensor + cable joint)
Enclosure	IP 65, material polycarbonate Cable glands adjustment range is 6 – 10mm
Operation temperature	-30 °C...+50 °C
Supply voltage	230 VAC ± 10 %, 50/60 Hz The device is not equipped with a mains switch
Power consumption	5 VA
Sensors	GA-SG1 sensor
Relay output	Potential-free relay output 250 V, 5 A Operational delay 10 sec. Relay de-energize at trigger point.
Electrical safety	IEC/EN 61010-1, Class II  , CAT II
EMC	Emission IEC/EN 61000-6-3 Immunity IEC/EN 61000-6-1
Manufacturing year: Please see the serial number on the type plate	xxx x xxxxx xx YY x where YY = manufacturing year (e.g. 14 = 2014)

GA-SG1 sensor	
Principle of operation	Capacitive
Material	POM, PUR, AISI 316
Weight	350 g (sensor + fixed cable)
IP-classification	IP68
Operation temperature	0 °C...+90 °C
Cable	Fixed cable 2 x 0.75 mm ² . Standard length 5 m, other lengths optional. The max. length of the fixed cable is 15 m, can be extended. Maximum cable loop resistance is 75 Ω.
EMC	Emission IEC/EN 61000-6-3 Immunity IEC/EN 61000-6-1
Manufacturing year: Please see the serial number from the bottom of sensor	GAXxxxYY where YY = manufacturing year (e.g. 14 = 2014)

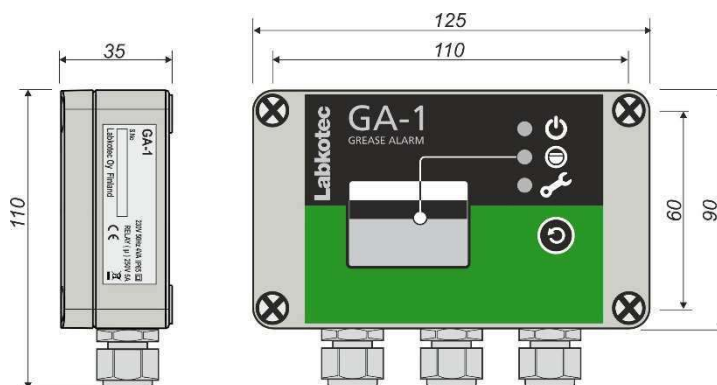


Figure 7. GA-1 control unit

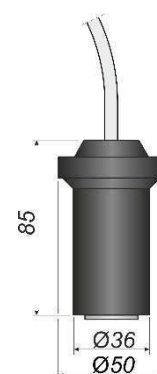
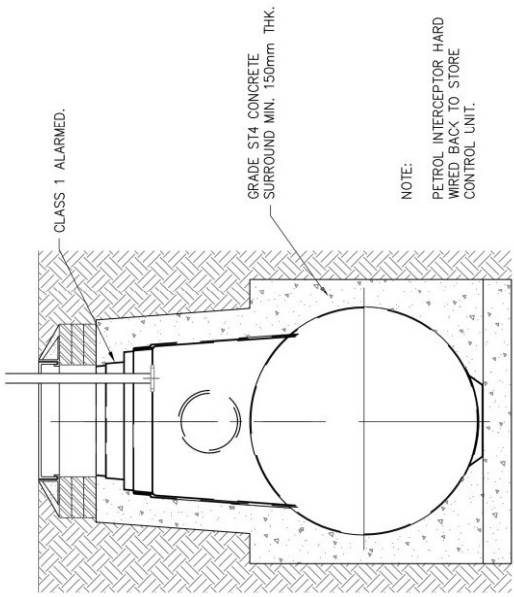
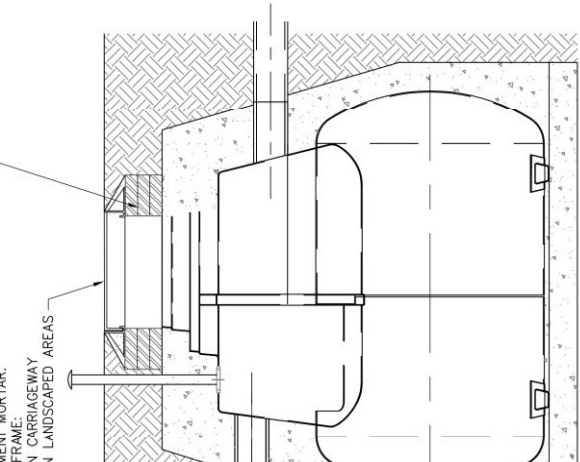


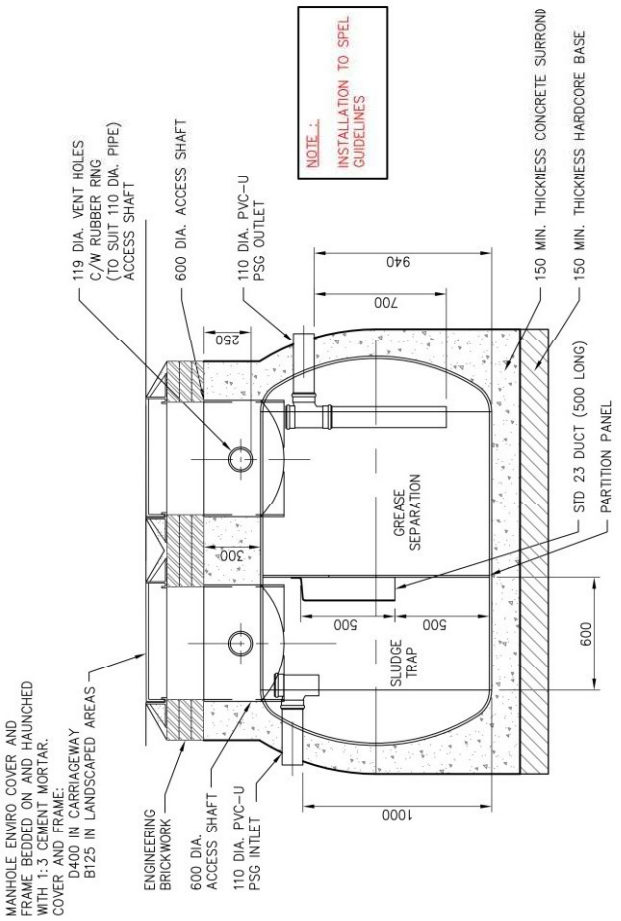
Figure 8. GA-SG1 sensor

REAR FOR FAC.
FRAME
N CARRIAGEWAY
N LANDSCAPED AREAS

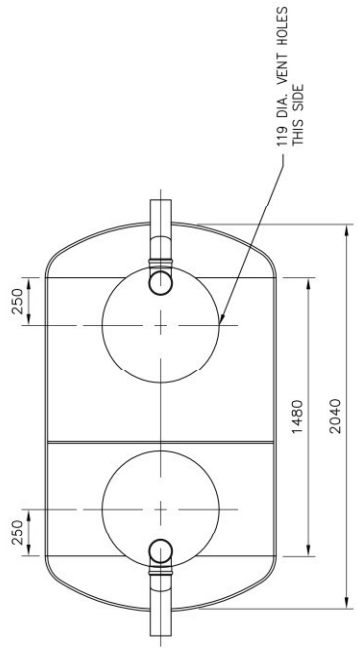


SPEL 206 C1 PETROL INTERCEPTOR (OR SIMILAR APPROVED). CONCRETE SURROUND
Scale 1:20

NOTE:
INSTALLATION TO SPEL GUIDELINES



SECTION



PLAN
2000L SPEL GREASE INTERCEPTOR WITH TELEMETRY ALARM
SCALE 1:20

Declaration of Conformity

This declaration certifies that the below mentioned apparatus conforms to the essential requirements of the EMC directive 2004/108/EY and Low-Voltage directive (LVD) 2006/95/EC.

Description of the apparatus: Measuring and control unit with sensor

Type: GA-1 Grease Alarm control unit with GA-SG1 sensor
GA-2 Grease Alarm control unit with two GA-SG1 sensors

Manufacturer: Labkotec Oy
Myllyhaantie 6
FI-33960 Pirkkala
FINLAND

The construction of the appliance is in accordance with the following standards:

EMC:

EN 61000-6-1 (2007)	Electromagnetic compatibility, Generic standards – Immunity for residential, commercial and light-industrial environments.
EN 61000-6-3 (2007) +A1 (2011)	Electromagnetic compatibility, Generic standards – Emission standard for residential, commercial and light-industrial environments.
EN 61000-3-2 (2006) +A1+A2 (2009)	Electromagnetic compatibility, Product family standard: Harmonic current emissions.
EN 61000-3-3 (2008)	Electromagnetic compatibility, Product family standard: Voltage changes, fluctuations and flicker sensation.

LVD:

EN 61010-1 (2010)	Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements.
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This product is CE-marked since 2013.

Signature

The authorized signatory to this declaration, on behalf of the manufacturer, and the Responsible Person based within the EU, is identified below.

Pirkkala 20.5.2013



Ari Tolonen
CEO
Labkotec Oy

SPEL Grease/Fat Separators

Introduction

Grease separators are used to remove fat and grease from waste water. This is often essential to eliminate incidents of drain blockages caused by the waste from catering establishments. The operation of septic tanks, pumps, and sewage treatment systems will also be improved by removing the fat and grease from the effluent.

Siting and Installing the Tank

The tank should not be installed near a road or driveway, where it could be subjected to high external loads, unless the installation is designed to withstand such loadings so they are not transferred to the tank shell.

Where the tank is to be emptied using a tanker, it should be sited within 30m of a vehicle access provided that the invert level of the septic tank is no more than 3m below the level of the vehicle access. This distance may need to be reduced where the depth to the invert of the tank is more than 3m. There should also be a clear route for the hose such that the tank can be emptied and cleaned without the contents being taken through a dwelling or place of work.

Adequate ventilation of the tank and the inlet pipework must be provided to prevent the accumulation of fermentation gases.

For full installation instructions concerning tank specification handling and burial please consider our supplied installation guidelines, Sec4.

Operation

Please refer to a supplied drawing. Contaminated water flows into the tank through the inlet pipe. Heavy deposits will settle on the bottom of the chamber and light contaminants will mostly float on top of the water. Cleaner water flows through to the second chamber where water is allowed to pass out of the tank taken from the cleanest part of the chamber.

Maintenance

Grease, sludge and other fatty effluents remain in the tank until removed by a specialist cleansing or waste disposal contractor. The tank must be emptied periodically of retained grease, sludge and other fatty effluents. Other than this action SPEL Grease separators are essentially maintenance free, however, it is not possible to predict site specific maintenance requirements. SPEL tank shells usually carry a 25-year warranty.

Alarm Options

SPEL can provide a range of alarms to suit your needs.

Access

SPEL Grease separators have good access to both chambers for period emptying of retained grease, sludge and similar fatty effluents. Access is made in each case through a circular access shaft of 600mm diameter at the crown of the chamber.

Emptying Period

Periods between emptying will have to be determined depending on site conditions but normally at least twice a year.

Emptying Procedure

Typically the contents of the chambers will be sucked out by a specialist cleansing or waste disposal contractor. Both light and heavy deposits should be removed at this time. A Large hose is usually lowered down into the chamber through the access shaft. As the contents are sucked out care should be taken to ensure that both chambers contents are reduced equally. If one chamber is allowed to contain too great a quantity of fluid in comparison with the other chamber damage to the dividing baffle wall may result. Following removal the tank should be re-charged with clean water. The removed contents should be disposed of by the specialist contractor.

The contents of this document are supplied for general guidance only. SPEL Products can accept no liability for harmful incidents that arise as a result of the contents of this document. It is not possible for SPEL Products to predict site specific operational or maintenance requirements.



Vortex Flow Control

Operation & Maintenance Instructions

Item: Crown Radial Type Vortex Flow Control Unit

Operation

The Vortex Flow Control unit is a surface water regulator. It is entirely self activating and requires no manual intervention

Maintenance

The unit requires no routine maintenance

In the event of a blockage, it can be removed after the system has been drained down by pulling on the lifting cable located at the access

Inspection

The chamber containing the unit should be inspected in line with normal practice. Any debris or silt should be removed

Any visible fixing bolts should be checked. If an internal blockage is suspected the vortex unit can be removed and inspected internally through the inlet or outlet hole
The unit must be replaced and securely fitted before the unit becomes operational

**Crown Water Systems
Index House
Ascot
SL5 7ET
Tel 01344 886996
Fax 01344 885986**

Appendix D

Maintenance Schedule

Inspection Log - Year sheet 1 of 4

Inspection Date 'Month'	A - Surface Water Catchpit Manholes	B - Foul Water Manholes	C - Gulley	D - Channel Outlets	E - Surface Water Treatment	F - Surface Water Flow Control Chamber	Comments
January							
February							
March							
April							
May							
June							

How to complete this Log:

- 1.0 Write date in LH column.
- 2.0 Tick which items have been inspected for that date.
- 3.0 Add to notes the maintenance completed e.g. gullies / catchpits emptied.

Inspection Log - Year sheet 2 of 4

Inspection Date 'Month'	A - Surface Water Catchpit Manholes	B - Foul Water Manholes	C - Gulley	D - Channel Outlets	E – Surface Water Treatment	F – Surface Water Flow Control Chamber	Comments
July							
August							
September							
October							
November							
December							

How to complete this Log:

- 1.0 Write date in LH column.
- 2.0 Tick which items have been inspected for that date.
- 3.0 Add to notes the maintenance completed e.g. gullies / catchpits emptied.

Inspection Log - Year sheet 3 of 4

Inspection Date 'Month'	G – Cellular Attenuation Tank	H - Grease Trap	I – Permeable Paving	J – Filter Drain	K – Shallow Dry Swale		Comments
January							
February							
March							
April							
May							
June							

How to complete this Log:

- 1.0 Write date in LH column.
- 2.0 Tick which items have been inspected for that date.
- 3.0 Add to notes the maintenance completed e.g. gullies / catchpits emptied.

Inspection Log - Year sheet 4 of 4

Inspection Date 'Month'	G – Cellular Attenuation Tank	H - Grease Trap	I – Permeable Paving	J – Filter Drain	K – Shallow Dry Swale		Comments
July							
August							
September							
October							
November							
December							

How to complete this Log:

- 1.0 Write date in LH column.
- 2.0 Tick which items have been inspected for that date.
- 3.0 Add to notes the maintenance completed e.g. gullies / catchpits emptied.

