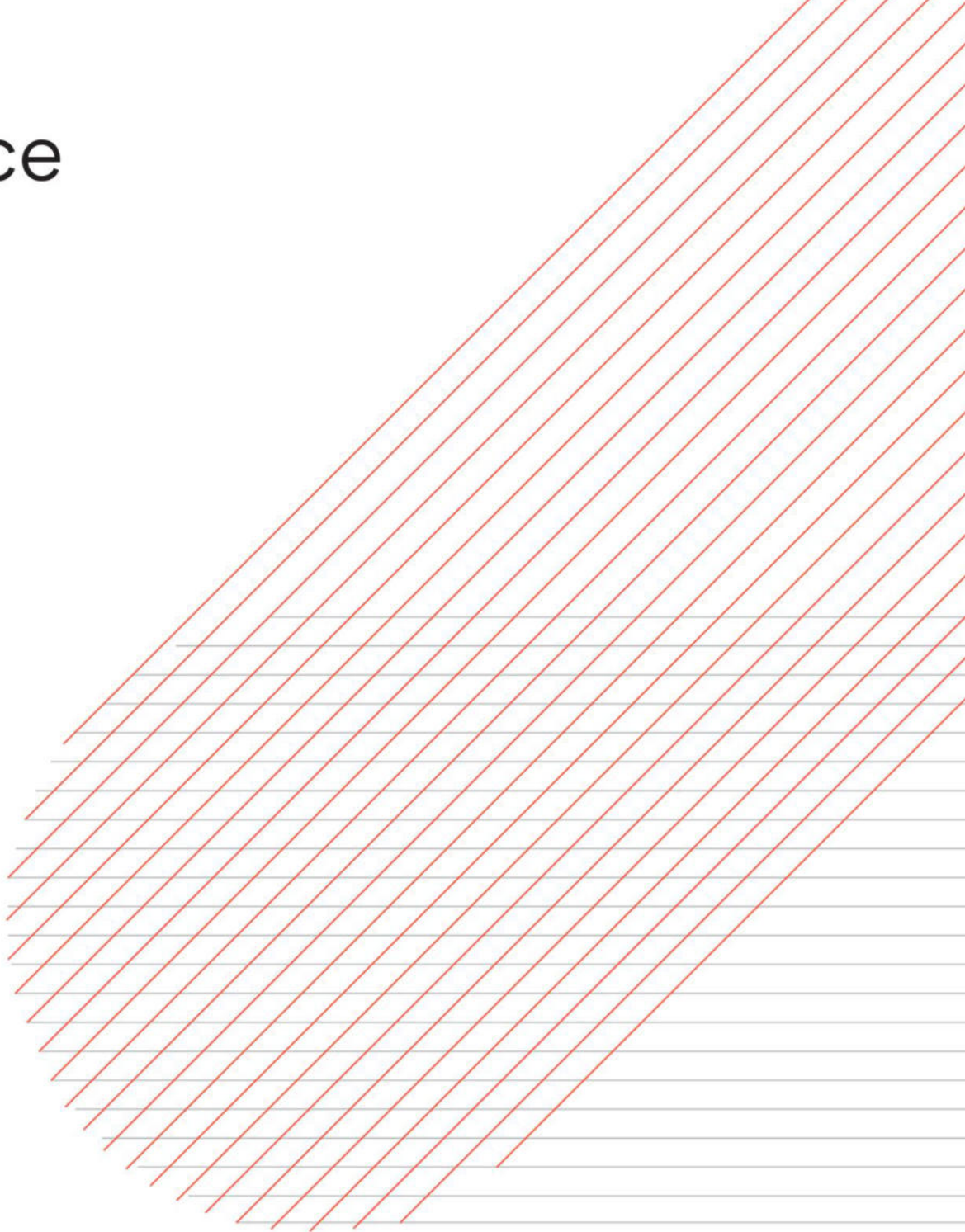




Welcome Break, Hinckley

Drainage Maintenance Plan

HINCK-DCE-XX-XX-RP-C-0001

Welcome Break, Hinckley

Drainage Maintenance Plan

DATE: September 2025
REPORT REF: HINCK-DCE-00-XX-RP-C-0001
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Issue	Revision	Status	Date
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4	P04	For Approval	19/12/2025

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Appendix A – Drainage Strategy

Appendix B – Stormceptor Information

Appendix C – Purceptor Information

Appendix D – Forecourt Separator Information

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Appendix F – Grease Trap Information

Appendix G – Brown Roof Information

Appendix H – Foul Water Pumping Station Information

1. Introduction

- 1.1.1. Dice Consulting Engineers Ltd. (Dice) have been commissioned by Welcome Break to produce a Drainage Strategy and Drainage Maintenance Plan in support of a planning application for a proposed Service Station in Hinckley.
- 1.1.2. This report has been prepared for the sole benefit, use, and information of the client and future maintenance provider. This manual has been produced to establish the maintenance requirements of the drainage systems on-site. The proposed drainage networks can be found in Appendix A.
- 1.1.3. The contents of this report are based on current best practices, CIRIA report C753 The SuDS Manual, and any specific proprietary third-party product guidelines.

1.2. Scope

- 1.2.1. This manual is intended to give an overview of the operation and maintenance for the range of drainage features included with the Proposed Drainage and in relation to typical/standard details only. Where proprietary products are specified the manufacturer's instructions and recommendations should be followed in the first instance, unless specifically noted otherwise due to project constraints.
- 1.2.2. The recommended operations and maintenance intervals are indicative only and should initially be undertaken on a more frequent basis to ensure that there are no unforeseen issues with the construction and early operation.
- 1.2.3. The Maintenance responsibility for the private drainage systems shall revert to Welcome Break at the end of the contractor's defects liability period, the primary responsibility shall be held by Paul Sweet (paul.sweet@welcomebreak.co.uk). Works may be sub-contracted to a third-party maintenance specialists, but overall management shall be retained by Welcome Break.
- 1.2.4. This manual has been produced to set maintenance requirements for the private drainage systems on-site.

1.3. Proposed Surface Water Drainage Design Parameters

- 1.3.1. The surface water networks have been designed to accommodate the 1 in 100-year storm rainfall event plus a 40% allowance for climate change. As the flows are generally being attenuated downstream, there will be a period after storm events where the networks are still

partially or fully surcharged and are discharging runoff. Should any surcharging still be present 48 hours after the end of the storm, appropriate action should be taken as noted in Section 2.

2. Maintenance

2.1. Pipes and Manholes

- 2.1.1. Pipes are the main conveyance for surface water across the development and have been designed to reach self-cleansing velocities.
- 2.1.2. Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drained effectively; thus exposing the development to a greater flood risk level.
- 2.1.3. A recommended sediment/material removal schedule is detailed in the table below.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided in the form of a post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required take remedial action.	Every 3 months, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	Every 6 months
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If poor performance persists, jet and CCTV survey poorly performing runs.	As required.
	Seek advice for the remediation techniques suitable for the type of issue and its location.	As required If above does not improve performance.

2.2. Channel, Slot and Kerb Drains

- 2.2.1. Access for maintenance has been provided through access chambers and rodding points. Additionally, channel drains have removable covers for ease of maintenance.
- 2.2.2. A visual inspection of the units is recommended on a regular basis with sediment\material removal being undertaken when required.

2.3. Proprietary Treatment Systems

- 2.3.1. Maintenance should be carried out as per the manufacturer's guidance for the third-party product installed. Regular inspection should be carried out as per the specification, or where not specified on an annual basis. Information about the proposed SPEL Stormceptor and the maintenance requirements can be found in Appendix B. Information about the SPEL Purceptor and the maintenance requirements can be found in Appendix C. Information about the forecourt separators can be found in Appendix D, for maintenance information, go to Appendix C as Forecourt separators require the same maintenance as the Purceptor. The AquaSwirl data sheet and maintenance information can be found in Appendix E. The maintenance information for Grease Traps can be found in Appendix F.

2.4. Flow Control Chamber

- 2.4.1. Flow control chambers are proprietary products and the manufacturer's recommendations should be followed.
- 2.4.2. Regular inspection and maintenance are important to identify areas which may have been obstructed/clogged and may not be drain efficiently, thus exposing the development to a greater level of flood risk.

2.4.3. A recommended schedule is detailed in the table below.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided using a post-construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly.

2.5. Attenuation Tanks (Geo-Cellular)

2.5.1. Cellular Storage tanks are proprietary products and the manufacturer's recommendations should be followed. Access to the tank for maintenance has been provided through downstream manholes.

2.5.2. A recommended sediment/material removal schedule is detailed in the table below:

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect inlets and outlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
	Check hydro-brakes and other mechanical devices (if present).	Half yearly.
	Inspect ventilation cowl (if present)	Monthly and after large storms.
Regular maintenance\inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then every six monthly
	Remove debris from catchment areas (where they may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae, or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures (e.g. catchpits)	Annually (or as required after heavy rainfall events)
Remedial actions	Repair and/or rehabilitate inlets, outlets and vents.	As required.

2.6. Operation and maintenance requirements for pervious pavements

2.6.1. A recommended maintenance schedule is detailed in the table below:

Maintenance Schedule	Required action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site specific observations of clogging or manufacturers recommendations. Pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As Required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required ± once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks	As Required

	considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging.
Monitoring	Initial Inspection	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers	Annually

2.7. Gullies

2.7.1. Access for maintenance has been provided through access chambers and rodding points. Additionally, gullies have removable covers and sump units with integral buckets for ease of maintenance

2.8. Brown Roofs

2.8.1. Should be maintained in accordance with the landscape architect or specialist designer's maintenance specification, this can be found in Appendix G.

2.9. Rain Gardens

2.9.1. A recommended maintenance schedule is detailed in the table below:

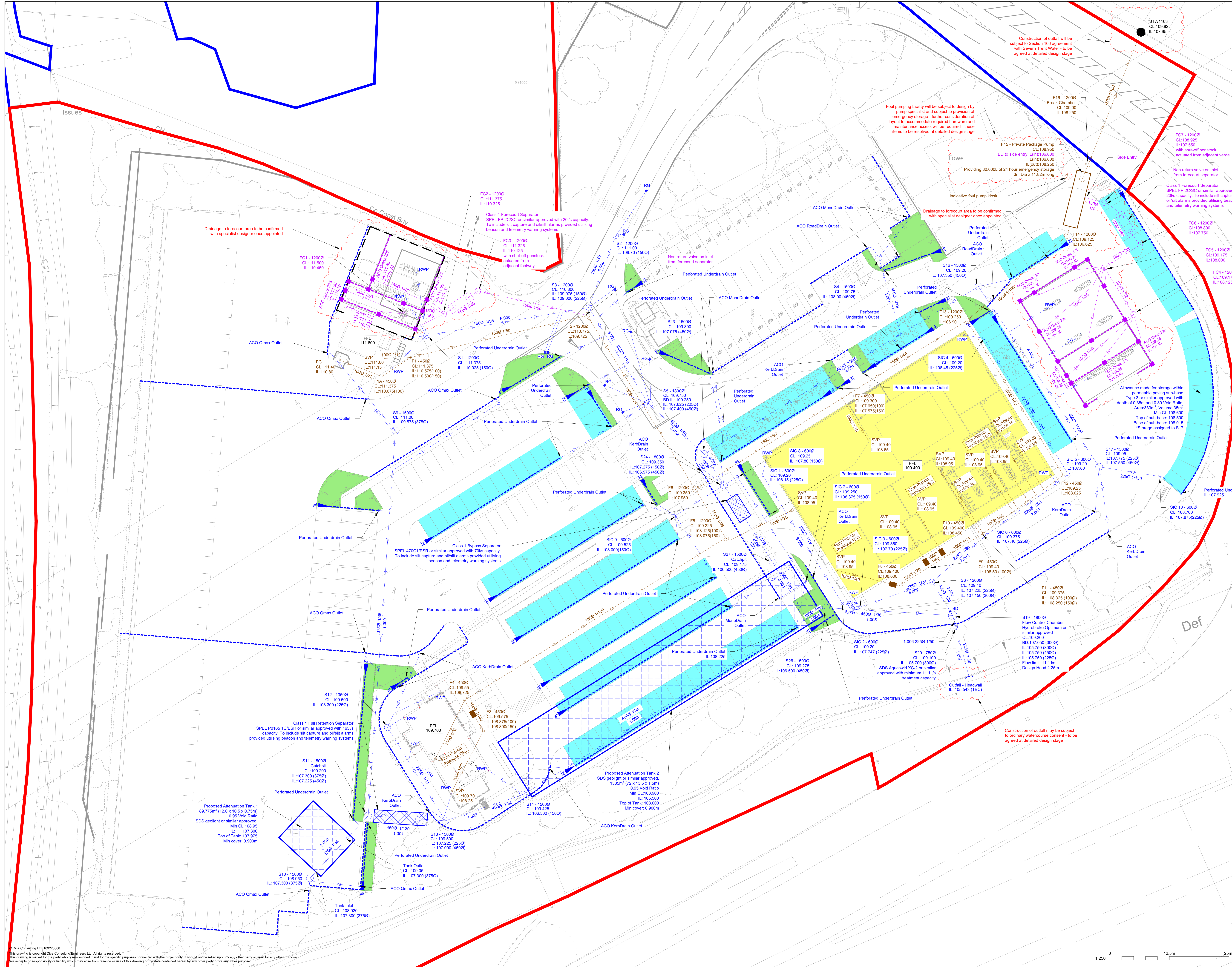
Maintenance Schedule	Required Action	Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary.	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance\inspection	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays.	Quarterly to Biannually

Occasional Maintenance	Repair and/or rehabilitate inlets, outlets and vents.	As required.
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above.	As required but likely to be > 20 years

2.10. Foul Water Pumping Station

2.10.1. Maintenance information for the foul water package pump station can be found Appendix H.

Appendix A



Notes

- All dimensions are in metres unless stated otherwise.
- All levels are in metres unless stated otherwise.
- This drawing shall not be scaled.
- This drawing shall be read in conjunction with all other relevant Engineer and specialist drawings and specifications.
- Drawing is based on Architectural layout drawing 1415-24a.dwg Rev A received from ADS design on 21.09.2023.
- This information is for strategy and coordination purposes only and subject to change following further design development.
- Drainage proposals subject to change during Stage 4 and further design development.
- Only primary drainage runs are shown at this stage. Below slab drainage to be detailed up during Stage 4 detailed design.
- All RWP's and SVP's shown are assumed and illustrative only, positions to be coordinated during Stage 4 detailed design.

Key to Symbols

FFL 162.800	Finished Floor Level
3750	Surface Water Sewer
1500	Foul Water Sewer
RG	Road Gully
Channel / Slot / Kerb / Perforated Drain	
Attenuation Tank	
Permeable underdrained surfacing	
Planning Boundary	
Site Boundary	
Forecourt emergency spillage drainage - to discharge to foul	
Forecourt emergency spillage channel drain	
Proposed roof canopy - to be agreed with architect and forecourt specialist	
Forecourt separator	
Brown Roof Proposed for treatment.	
Grease trap	
Full Retention Separator	
Bypass Separator	
Rain Garden	
Rodding Eye	

Rev	Description	Rev	Description	Rev	Description
Rev	Updated to show new garden	Rev	Updated to show new garden	Rev	Updated to show new garden
Rev	Amended to show new garden	Rev	Amended to show new garden	Rev	Amended to show new garden
Rev	Drainage strategy	Rev	Drainage strategy	Rev	Drainage strategy
Rev	First Issue - Draft	Rev	First Issue - Draft	Rev	First Issue - Draft
Rev	Description	Rev	Description	Rev	Description

Suitable for Stage Approval

Welcome Break

Welcome Break, Hinckley

Drainage Strategy

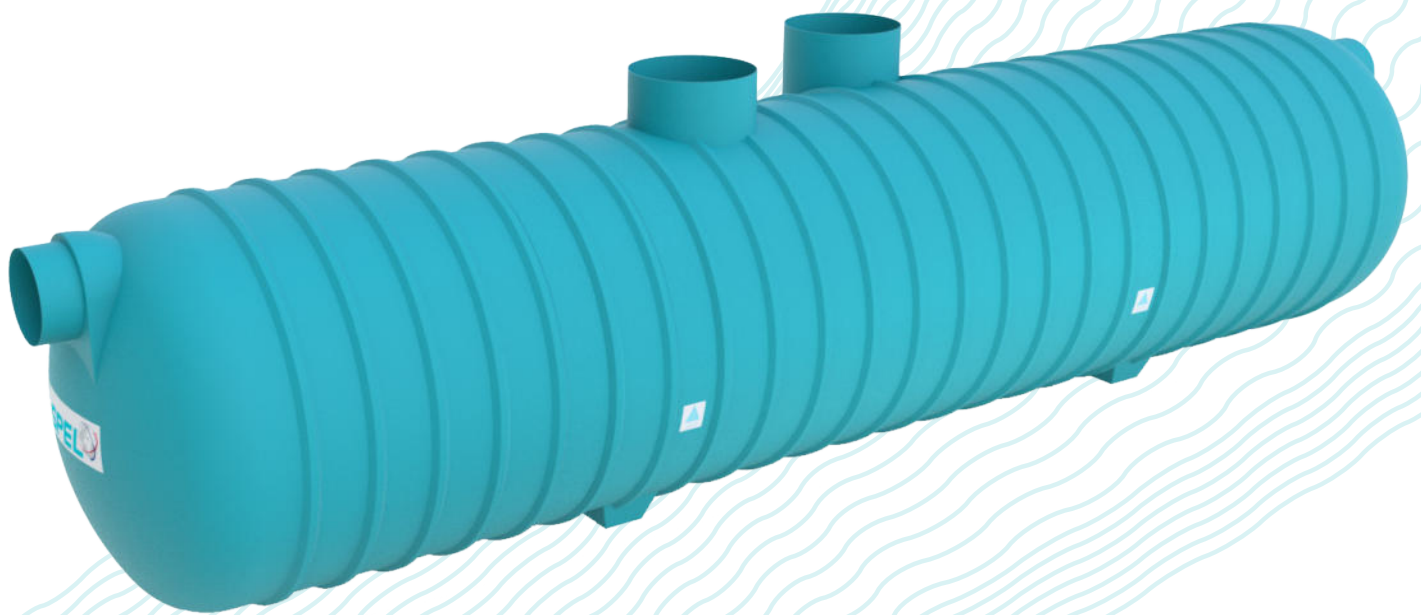
Third Floor
35-37 St Marys Gate
Hinckley
NG21 1PU

Rev	Description	Rev	Description	Rev	Description
Rev	Updated to show new garden	Rev	Updated to show new garden	Rev	Updated to show new garden
Rev	Amended to show new garden	Rev	Amended to show new garden	Rev	Amended to show new garden
Rev	Drainage strategy	Rev	Drainage strategy	Rev	Drainage strategy
Rev	First Issue - Draft	Rev	First Issue - Draft	Rev	First Issue - Draft
Rev	Description	Rev	Description	Rev	Description

101653 Stage 3 - Planning 1:250 S4 P04

HINCK-DCE-XX-XX-DR-C-5000

Appendix B



SPEL Stormceptor

ESR (Enhanced Silt Retention)

SuDS Compliant ESR Range

spelproducts.co.uk

SPEL Stormceptor ESR Range

By-Pass System

The **total** treatment solution for SuDS

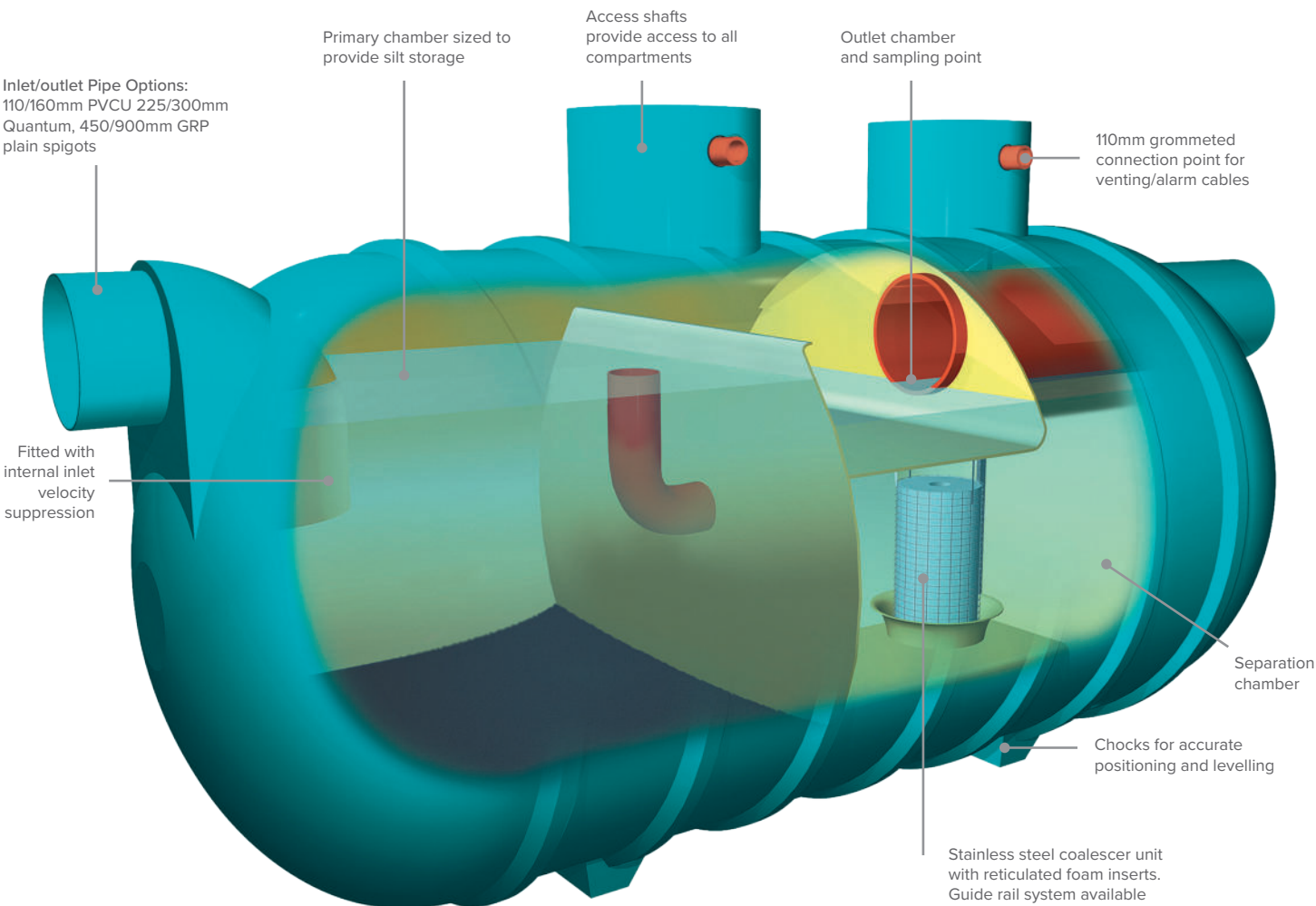
The new SPEL ESR System is fully certified to meet the CIRIA SuDS Mitigation Index. It has been tested by WRc (for TSS and Metals) to the British Water Code of Practice for Manufactured Treatment Devices. This unit is also compliant to the British and European Standard BS EN 858.

SPEL's ESR range is a total treatment system removing Hydrocarbons, Total Suspended Solids (TSS) and Metals (particulate). It's a highly efficient, single unit, water quality SuDS component.

SPEL ESR Stormceptor Certified Mitigation Index

TSS	0.8
Metals	0.6
Hydrocarbons	0.9*

**H R Wallingford test results to BS EN 858*



SPEL Stormceptor ESR Range

By-Pass System



Surface Water Treatment Device Performance Declaration

Testing carried out according to British Water Code of Practice

Product Details	Description
Manufacturer	SPEL Products
Treatment Device Name/Model	Stormceptor Type 210 C1/SC
General description	Class 1 By-pass Separator with Silt Capacity
Envisaged application	Treatment of Surface Water Run-off
Pollutant(s) captured	Suspended Solids

Test	Value	Unit
Treatment device capacity	3200	litres
Sediment Storage capacity	1000	litres
Treatment Flow rate	10	l/s
Connected Area	1,333	m²
Pollution retention flow rate	10	l/s

Parameter	Value	Unit
Maximum capacity flow rate	100	l/s
Device head loss (at treatment flowrate)	0.15	m
Device head loss (at maximum capacity treatment flowrate)	-	m
TSS capture and retention efficiency (Milisil W4 test sediment)	82	%
Zinc capture efficiency (if tested)	Not tested for dissolved metals	%
Zinc retention efficiency (if tested)	Not tested for dissolved metals	%
Copper capture efficiency (if tested)	Not tested for dissolved metals	%
Copper retention efficiency (if tested)	Not tested for dissolved metals	%
Dissolved Metals reduction	0.0	%
Particulate metals reduction*	61.5*	%
Total Metals reduction*	61.5*	%
Total Metals Mitigation Index	0.615*	-

* Extrapolated value in accordance with British Water How to Guide: Applying the CIRIA The SuDS Manual (C753) Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices. Version 7, Section 4.3, (2021 - under pre-publication review).

Certificates of compliance from WRc and HR Wallingford for the SPEL Stormceptor ESR Range

CERTIFICATE

LIGHT LIQUID SEPARATOR TEST PERFORMANCE CERTIFICATE
Compliance with Clause 8.3.3 of BS EN 858

Separator make and model number: SPEL STORMCEPTOR 330C1/SC NSB30
As detailed in SPEL Drawing SSP 9076

The separator tested complied with the drawing provided by the manufacturer and no additional features were noticed

Test date: 12 October 2006

Designated/nominal flow rate, Qw (litres/second): 30 litres/s
Net capacity of separator (excluding any allowance for silt storage), V_k (litres): 5050 litres

Total duration of test (minutes): 20 min
Running-in period (≥ 15 minutes): 15 min
Sampling period (minutes): 5 minutes common to all tests

Oil flow rate (based on 0.5% of water flowrate, litres/second): 0.15 litres/s

Temperature of oil (°C): 16.2
Temperature of water (°C): 15.6
Temperature of air (°C): 16.8

Analysis of samples by IR spectroscopy carried out by: Intertek Caleb Brett Testing Services*
Date of results: 16 October 2006

Sample	Oil concentration (mg/l)**	Name	Date
1	0.1		
2	0.5		
3	<0.1		
4	0.6		
5	0.2		
Resulting average: 0.3mg/l			

* NAMAS accredited laboratory
** Value of baseline concentration deducted

For and on behalf of HR Wallingford Ltd.



SPEL's Head of Technical Development alongside the WRc testing officer.

Research and Development

Research and development is at the heart of what we do at SPEL, our passion as Zero Pollution Ambassadors is to be at the cutting edge of clean surface water technology.

Months of rigorous testing has resulted in the new SPEL Stormceptor ESR Range.

Quality Assured Company
BS EN ISO 9001
Design & Manufacture



Protecting our environment for over 45 years

The SuDS Manual is leading good practise in drainage design, SPEL are endorsing this with the release of the new SPEL Stormceptor ESR range.

Total Suspended Solids (TSS)	Metals	Hydrocarbons
0.8	0.6	0.9*

*H R Wallingford test results to BS EN 858

Added to these class-leading Mitigation Indices, the ESR range benefits from:

- British/European Standard BS EN 858-1 2002 certification.
- The SPEL 25 year shell Warranty.
- 50 year+ life expectancy.
- ISO9001 quality assurance.
- ISO14001 committed to environmental improvement

26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Tables from The SuDS Manual (C753), p568-569

For reference notes, please see the full manual: https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

SPEL Stormceptor ESR Range By-Pass System

ESR Specification Chart

Model	Series	Treated Flow Rate - l/s	Maximum Flow	Catchment area (m²)*	Oil storage (litres)	Silt capacity (litres)	Overall length* (mm) L	Overall diameter (mm)	Inlet Invert (mm) A	Base to Inlet (mm) B	Base to outlet (mm) C	Max in/ out pipe diameter** (mm)	Number of access shafts (dia. mm)			
													600	750	900	1200
ESR10/C1	200	10	100	1,333	150	1,000	2,920	1,225	560	1,350	1,300	300	-	1	-	-
ESR15/C1	200	15	150	2,000	225	1,500	4,237	1,225	560	1,350	1,300	300	-	1	-	-
ESR20/C1	300	20	200	2,665	300	2,000	3,200	1,875	700	1,450	1,350	450	2	-	-	-
ESR25/C1	300	25	250	3,333	375	2,500	3,540	1,875	700	1,450	1,350	450	2	-	-	-
ESR30/C1	300	30	300	4,000	450	3,000	4,420	1,875	700	1,450	1,350	450	-	1	1	-
ESR40/C1	300	40	400	5,333	600	4,000	5,760	1,875	740	1,410	1,310	450	1	1	-	-
ESR45/C1	300	45	450	6,000	675	4,500	6,570	1,875	740	1,410	1,310	450	1	1	-	-
ESR50/C1	300	50	500	6,665	750	5,000	7,060	1,875	740	1,410	1,310	450	1	1	-	-
ESR60/C1	400	60	600	8,000	900	6,000	4,400	2,700	950	2,100	2,000	600	1	-	1	-
ESR70/C1	400	70	700	9,333	1,050	7,000	5,250	2,700	950	2,100	2,000	600	1	-	1	-
ESR80/C1	400	80	800	10,665	1,200	8,000	6,170	2,700	950	2,100	2,000	600	1	-	1	-
ESR100/C1	400	100	1000	13,333	1,500	10,000	7,400	2,700	1,100	1,950	1,850	750	1	-	1	-
ESR125/C1	400	125	1250	16,665	1,875	12,500	9,050	2,700	1,100	1,950	1,850	750	1	-	1	-
ESR150/C1	400	150	1500	20,000	2,250	15,000	9,950	2,700	1,100	1,950	1,850	750	-	-	2	-
ESR160/C1	400	160	1600	21,333	2,400	16,000	11,830	2,700	1,250	1,800	1,700	750	1	1	1	-
ESR180/C1	500	180	1800	24,000	2,700	18,000	7,470	3,650	1,185	2,690	2,550	900	-	-	-	-
ESR200/C1	500	200	2000	26,665	3,000	20,000	8,530	3,650	1,185	2,690	2,355	1,200	-	-	-	-
ESR250/C1	500	250	2500	33,333	3,750	25,000	10,040	3,650	1,185	2,690	2,355	1,200	-	-	-	-
ESR300/C1	600	300	3000	40,000	4,500	30,000	10,310	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR350/C1	600	350	3500	46,665	5,250	35,000	11,470	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR400/C1	600	400	4000	53,333	6,000	40,000	12,690	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR500/C1	600	500	5000	66,665	7,500	50,000	15,870	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR600/C1	600	600	6000	80,000	9,000	60,000	18,260	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR700/C1	600	700	7000	93,333	10,500	70,000	22,250	4,150	2,850	2,850	2,675	1,200	-	-	-	-

*These catchment areas are based on the SuDS Manual requirement for By-Pass devices to treat the 1 in 1 year storm event (27mm).

**This dimension is for A-C inlet/outlet options, larger pipe sizes are available for D-I inlet/outlet options.

200 Series ESR – Inside diameter 1200mm, outside diameter 1225mm.

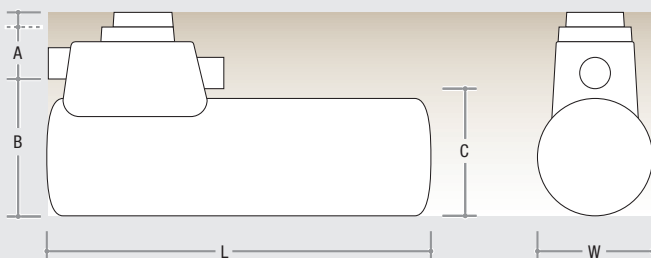
300 series ESR – Inside diameter 1800mm, outside diameter 1875mm.

400 series ESR – Inside diameter 2600mm, outside diameter 2700mm.

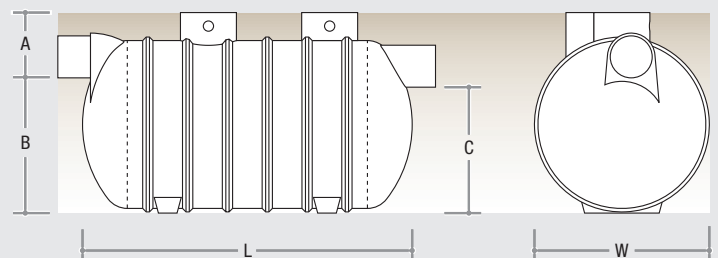
500 series ESR – Inside diameter 3500mm, outside diameter 3650mm.

600 series ESR – Inside diameter 4000mm, outside diameter 4150mm.

200 series



300/400/500 & 600 series



Optional extras

SPEL coalescer unit guide rail systems

To facilitate easy insertion of coalescer units, the SPEL guide rail system manufactured in stainless steel can be incorporated into SPEL Puraceptors and class 1 Stormceptors.

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 unit is then lowered in the normal way, being guided at the correct angle into the conical base.

Lifting chains are available for the larger coalescer units and where extension shafts are fitted.

Extension guide rails can be incorporated into SPEL extension shafts to suit.

SPEL coalescer unit lifting, locating and locking system

The SPEL lifting, locating and locking system is manufactured in stainless steel and replaces the standard coalescer unit handle.

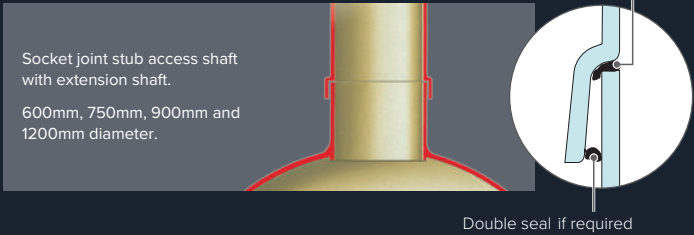
The locating/locking handle ensures the coalescer unit is seated and locked in its correct position after maintenance.



Above left: Lifting, locating and locking system with guide rail system.
Above right: The SPEL coalescer unit with lifting chain.

SPEL extension access shafts

Extension access shafts are available for deep invert applications.



Tank shell specifications

The 'standard' specification is normally adequate for most installations but heavier specifications are available depending upon the burial depth and water table level, in winter. The concern is when the system is emptied completely and remains empty for a period of time.

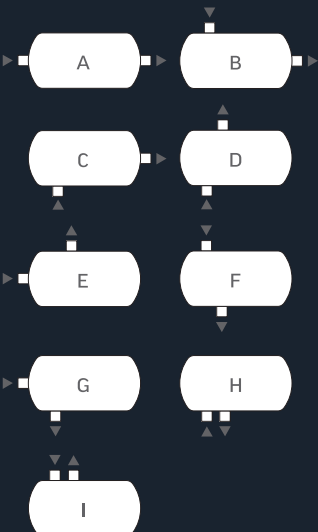
Standard tanks			Heavy tanks		
Series	WT (m)	D (m)	Series	WT (m)	D (m)
100/200	1.0	4.0	100/200	2.0	6.0
300	0.9	4.0	300	2.8	5.6
400	1.3	5.0	400	3.5	6.0
500	1.9	5.7	500	4.5	7.25
600	2.4	6.2	600	4.7	7.3

WT depth of water table	D maximum depth	WT depth of water table	D maximum depth
High water table	Well drained ground	High water table	Well drained ground

Based on installation in concrete with concrete surround
For pea gravel surround, see SPEL Data Manual p13.5

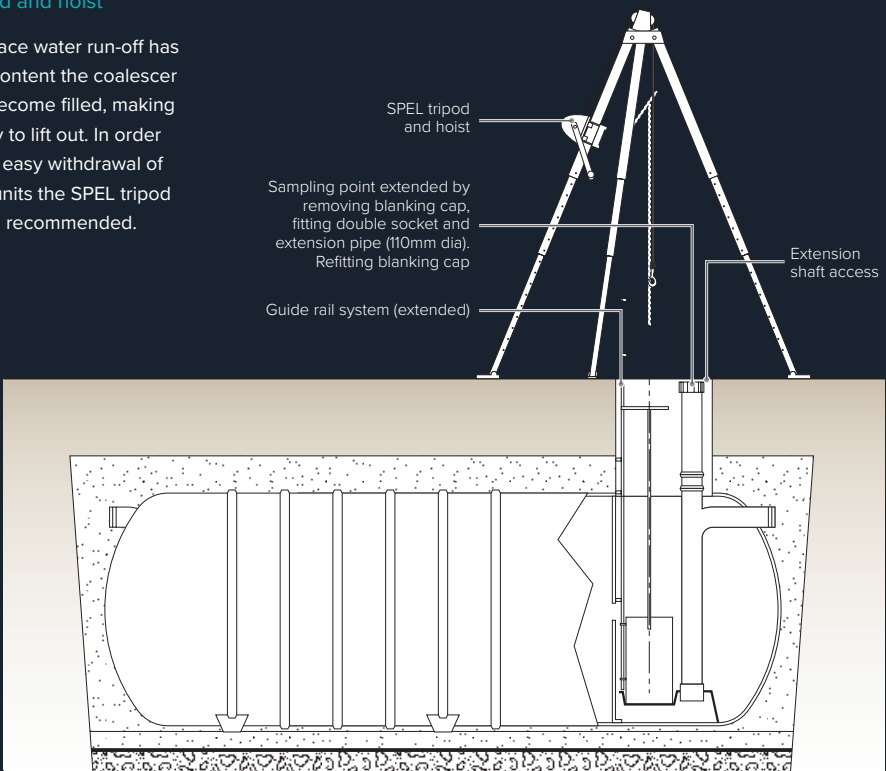
SPEL ESR Range – Inlet/outlet orientation

Dependent upon model and diameter of connections, these nine different orientations are available. However on the larger models it is important to check with our technical department.



SPEL tripod and hoist

Where surface water run-off has a high silt content the coalescer units can become filled, making them heavy to lift out. In order to facilitate easy withdrawal of coalescer units the SPEL tripod and hoist is recommended.



SPEL

Quality that protects the environment the **safest way**



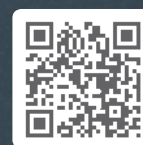
The SPEL underground tanks have been designed with reference to BS EN 13121

SPEL Tank shells carry a 25 year Warranty and have a life expectancy of over 50 years

Rigorous quality control procedures at all stages of manufacture for each serial numbered tank, ISO 9001.

SPEL is an environmentally accredited company to ISO 14001.

Certificate No: FM 35174 UVDB/Achilles accredited – Supplier No. 88611.



Scan code with a QR reader to launch our website: spelproducts.co.uk

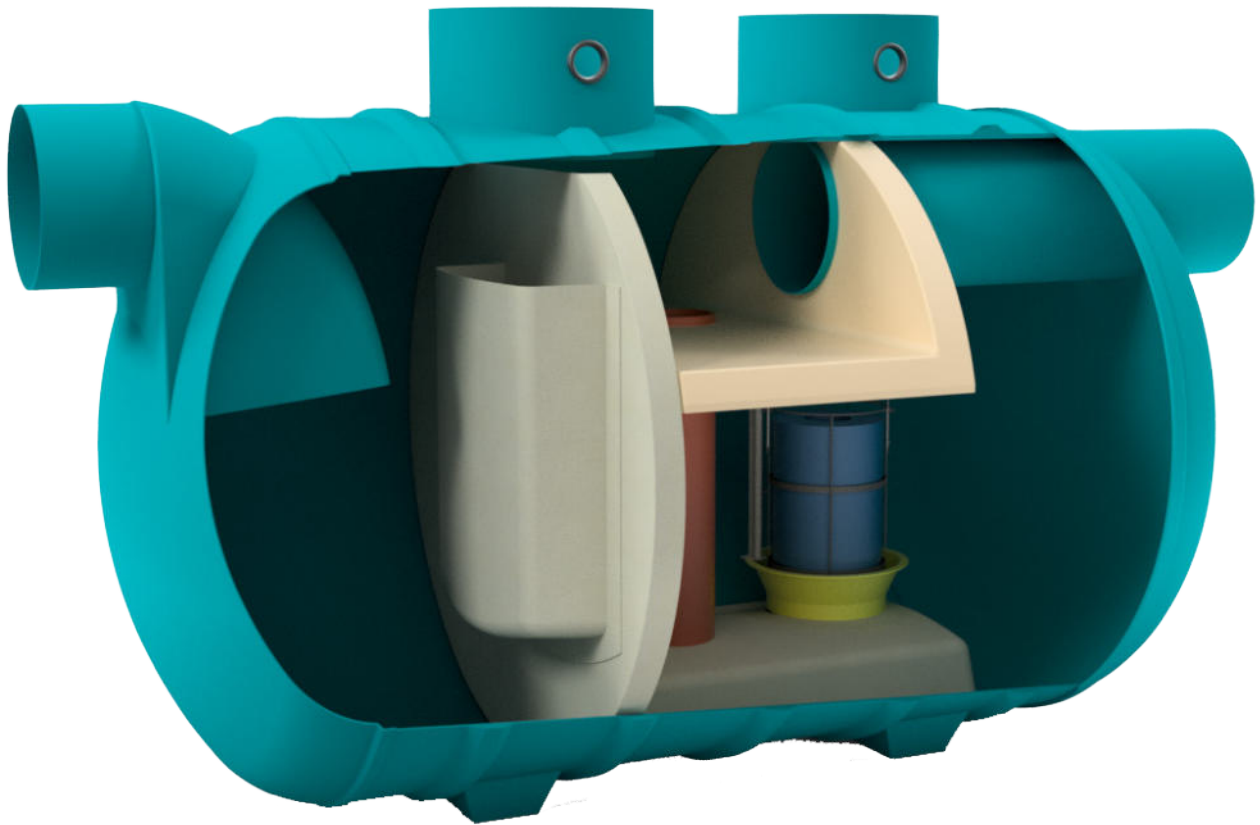
#ZeroPollutionAmbassadors

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SPEL ESR Bypass

SuDS Treatment System

Operation & Maintenance Manual

SPEL ESR Bypass Operation & Maintenance

Introduction

With correct and consistent care, and by following a few simple guidelines, your system will give you many years of dependable service.



Installation

For installation guidance, see SPEL Data Manual, Section 7.

All applicable health and safety regulations must be followed.

IMPORTANT

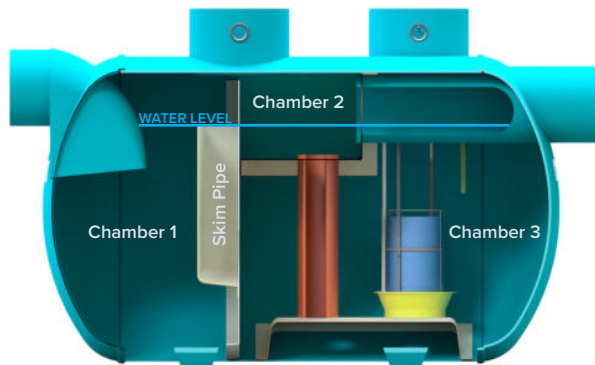
In the unlikely event of the chamber having to be entered ensure absolutely that all Workplace Health & Safety directives and Confined Space Regulations are strictly adhered to.

SPEL ESR Bypass SuDS Treatment System

Operation

The SPEL ESR Bypass system is a SuDS Compliant treatment device designed to treat up to the 1 in 1 year return storm event with the excess flow being allowed to bypass the treatment stage (see diagrams below). Engineers will have specified your ESR Bypass System to cope with and treat the flow from the connected catchment area, with the complete operation being contained within the SPEL system.

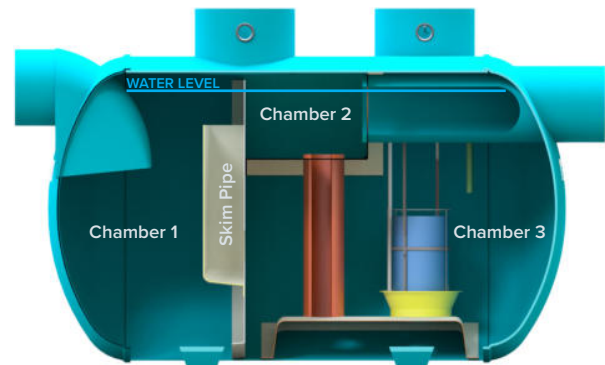
The installation of your SPEL ESR system should have included commissioning by a qualified person, SPEL can offer a full commissioning service and/or a post-commissioning system check, together with relevant certification.



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.

Chamber 1

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

Maintenance requires the removal of accumulated silt and other heavy pollutants, 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 ESR Bypass Systems, where the coalescer units are incorporated.

The coalescer units should be removed and cleaned in accordance with the requirements set out on Page 5.

Retained light liquids should be removed from the top and any sediment from the bottom. Smaller Bypass systems generally need to be completely emptied.

SPEL ESR Bypass SuDS Treatment System

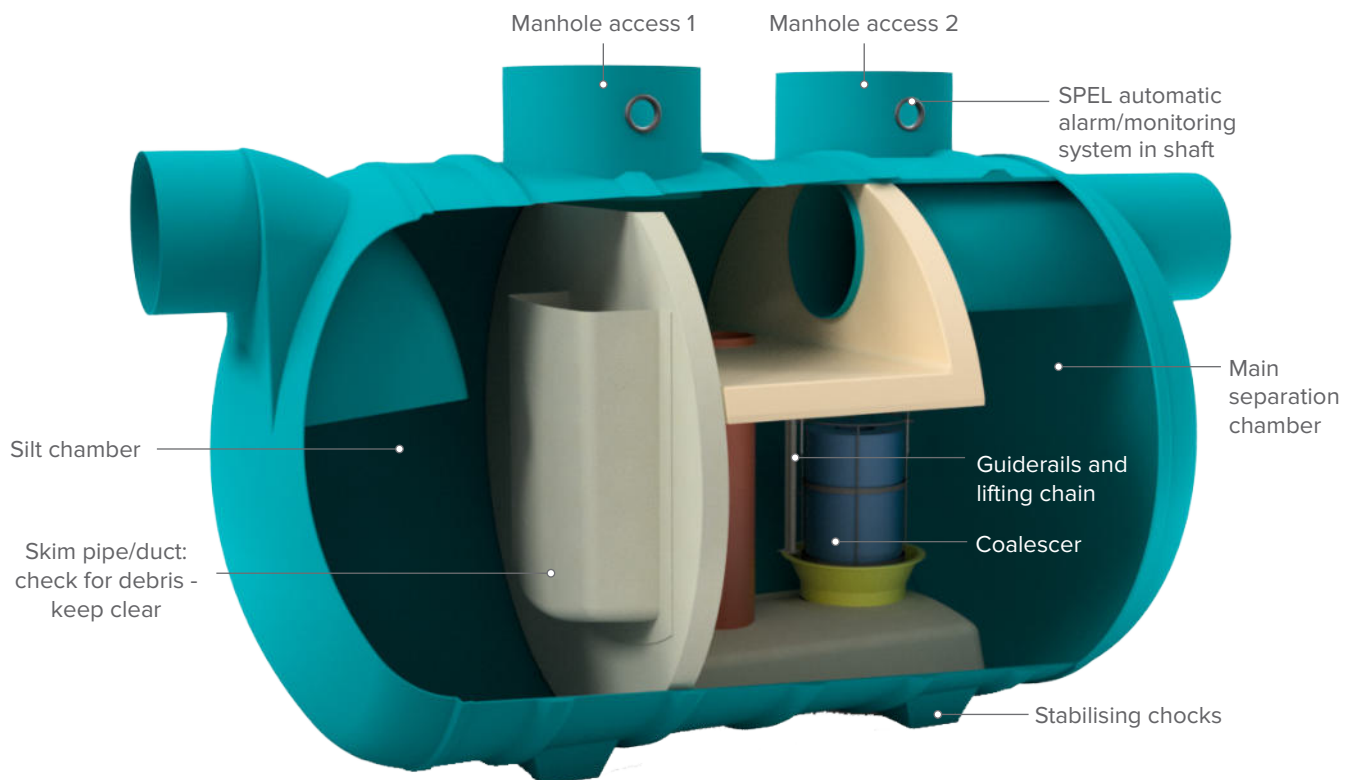
The SPEL ESR Bypass System is fully certified to meet the CIRIA SuDS Mitigation Index. It has been tested by WRC to the British Water Code of Practice for Manufactured Treatment Devices. This unit is also certified to the British and European Standard BS EN 858 by HR Wallingford. SPEL ESR Bypass systems are designed for long term performance and with SPEL high volume coalescer units, low maintenance.

SPEL ESR Bypass Systems are manufactured in class 1 models and with silt capacity in accordance with BS EN 858-1. The range of models is listed in the SPEL Data Manual or on the SPEL website.

SPEL automatic alarm/monitoring systems will automatically warn you when the SPEL ESR Bypass System requires emptying of light liquids and/or silts (depending on the alarm system chosen). However, regular inspections are recommended at intervals to suit the site conditions. We recommend the SPEL ESR Bypass System is checked at 3, 6, or 12 monthly intervals to ensure correct operation of the treatment device, alarm and check the pollutant levels.

Where a SPEL automatic alarm/monitoring system is not fitted, the SPEL ESR Bypass System 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.

Maintenance Access



A wide range of SPEL ESR Bypass treatment devices are 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.

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

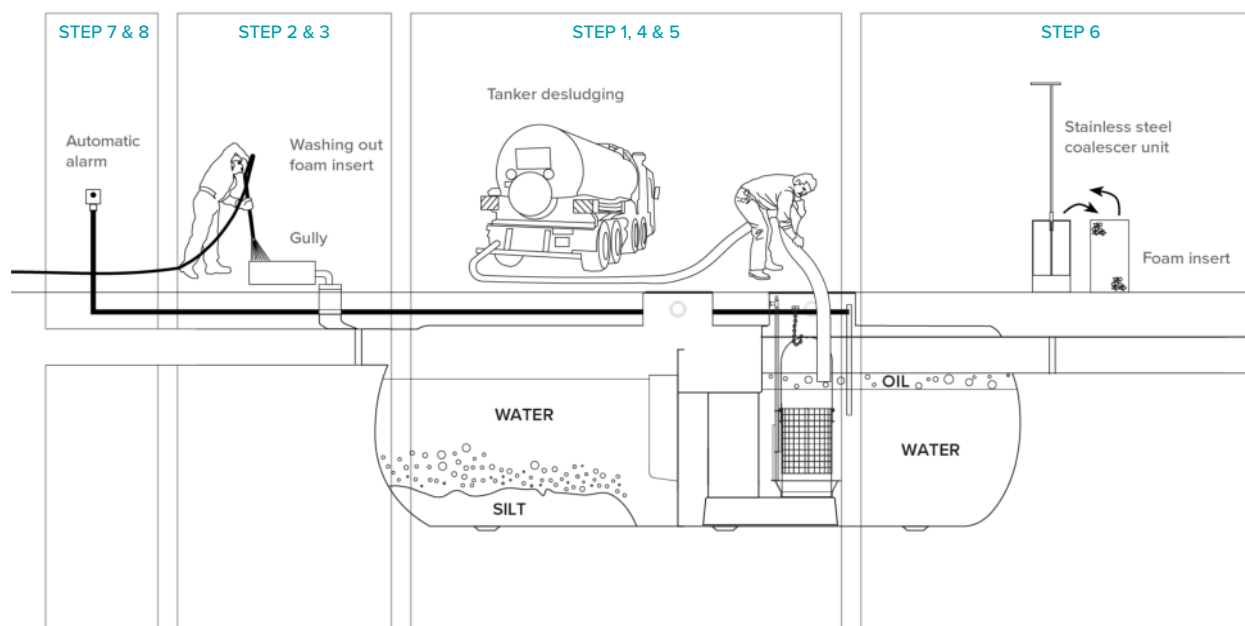
Manhole access 2

This provides 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 in a probe protection tube in this access shaft (see section on alarms).

This is an example, exact number and location of access shafts will depend on exact model chosen.

SPEL ESR Bypass SuDS Treatment System

Maintenance



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

STEP 1

Sucking out oil/fuel

Suck off as much retained oil from both chambers of the ESR System as possible. This prevents oil coating the surface of the coalescer if this is removed first.

STEP 2

Coalescer Unit

Using the lifting handle, chain or wire rope, lift the coalescer unit out of the tank and place upstream of the ESR System.

STEP 3

Cleaning
Foam Insert

Remove foam insert and wash with normal water pressure ensuring the dirty water runs into the ESR System.

STEP 4

Sucking out silt

For Intermediate Maintenance, the use of a tanker with a rigid suction pipe can suck out the silt from the base of the system, without the need to empty the complete unit.

Note: For Intermediate Maintenance, go to Step 6.

STEP 5

Sucking out
complete contents
(if necessary)

For a Full Maintenance (at least once every 5 years, as recommended by EA, SEPA and NRW) the complete contents will need to be emptied and a structural and component check conducted.

Note: SPEL Recommend the replacement of coalescer unit(s) at all Full Maintenance intervals.

STEP 6

Re-insert coalescer unit

Re-insert the foam insert into the stainless steel coalescer basket and re-insert the coalescer unit into the ESR System. Re-position the lifting handle, chain or wire rope.

STEP 7

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 Section 8 (Alarms) in the SPEL Data Manual.

STEP 8

Test SPEL automatic alarm

To test an alarm is working, ensure the previous step has been carried out.

Following this, an oil/silt alarm should sound when clean and dry and in contact with air, therefore, holding it in the air should set off the alarm on the control panel. For high level liquid alarms, putting them in water should set off the alarm.

SPEL Coalescer System

Important: ensure all coalescers are correctly seated in the coalescer cone following maintenance. The SPEL Coalescer Guide Rail or 3L System helps ensure correct seating.

SPEL Coalescer

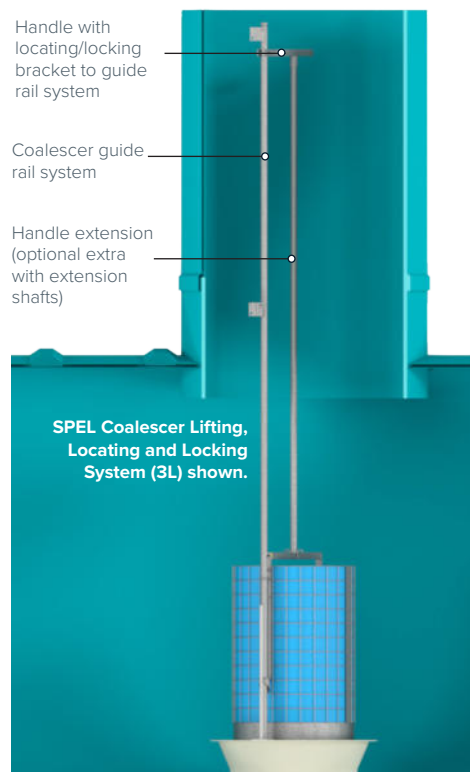
Normal servicing of the smaller SPEL systems frequently requires emptying the unit completely providing access for the coalescer units to be taken out, cleaned and returned and guided accurately to their seating positions. However larger SPEL systems may only require the hydrocarbon pollutants and silt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



SPEL Coalescer Lifting, Locating and Locking System (3L)

The SPEL 3L System has all the benefits of the below SPEL Guide Rail System and includes a locking mechanism and rigid lifting handle, this locks the coalescer in position and makes for easier lifting and locating.



SPEL Coalescer Guide Rail Systems

SPEL Guide Rail Systems are optional but strongly recommended for all tanks with deeper inverts or larger than 300 Series (1.8m dia.).



SPEL Coalescer System without Guide Rails

Optional lifting chains available for ease of maintenance.

Automatic Alarms/Monitoring Systems

Alarm systems are available for all SPEL separators. These include probes for oil, silt and high level. There are also a range of control panels including solar power, more detail on our alarm systems can be found in Section 8.

Maintenance procedure

The SPEL automatic alarm/monitoring system will automatically warn you when the treatment system requires emptying. Where a SPEL automatic alarm/monitoring system is not fitted, SPEL systems 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. 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.

Control Panels



Mains Powered Separator Alarms

For silt, oil and high level detection, compatible with the below alarm probes.

Solar Alarms

Available with optional flashing beacon, and GMS/ SMS communication, also compatible with the below alarm probes.

Alarm Probes



idOil-OIL oil probe

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

This probe is required in order for a treatment device to comply with BS EN 858.



idOil-SLU silt probe

Monitors the silt layer in the treatment system and indicates when the silt layer has reached its maximum level.



idOil-LiQ high liquid level probe

Indicates when the liquid level in the treatment system rises excessively e.g. in an outlet blockage situation.

Kiosks for externally mounted alarm/control panels are available. See Section 8 of our Data Manual for further detail.



Warranty

SPEL Underground Tank Shells

We warrant that our SPEL Tankstor® and Separator underground tank shells, as identified by the serial number, if installed strictly in accordance with the company's relevant installation procedure – installation instructions TSII or as detailed in the SPEL Data Manual and verified with an 'as built' installation drawing prepared by a qualified design consultant or an approved person and stage photographs to show the methods adopted from start to completion having in mind particularly:- ground conditions, invert depth, water table depth in winter, external loading, type and quality of backfill material, will

1. meet our published specifications and will be free from material defects in materials and workmanship for a period of one year following date of original delivery.
2. not fail for a period of twenty-five years from the delivery/collection date due to external corrosion; and
3. not fail for a period of twenty-five years from the delivery/collection date due to internal corrosion provided the tank is solely used for:-

Rainwater storage

Potable water at ambient temperatures

Fuel/oil contaminated surface rainwater

Domestic sewage

For other applications the life expectancy will be determined by the contents, the operating conditions and the resin system/reinforcement specification used.

Our liability under this warranty is set out in SPEL General Conditions of Sale available on request. In brief they shall be limited to, at our option,

- (1) repair of the defective tank
- (2) delivery of a replacement tank to the original site or
- (3) refund of the original purchase price.

We shall not be liable for any labour or other installation costs, indirect or consequential loss, damage or other damages in connection with such tanks.

Accessory warranties do not extend beyond the warranty period by our suppliers. This applies to such items as access covers and frames, monitoring equipment, Bauer type connections for emptying, pumping equipment or any accessories as defined in the company's official order acknowledgement/invoice.

The foregoing constitutes our exclusive obligation and we make no express or implied warranties, or any warranty of merchantability or fitness for any particular purpose whatsoever, except as stated.

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

Date	Visual Check	Oil Probe Clean/ Check	Silt Probe Clean/ Check	Control Panel Check/Test	Tank Empty	Coalescer Check/ Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations Date of Next Service:								

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations Date of Next Service:								

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations Date of Next Service:								

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations Date of Next Service:								

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations								
Date of Next Service:								

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations								

Date of Next Service:

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

Date	Visual Check	Oil Probe Clean/ Check	Silt Probe Clean/ Check	Control Panel Check/Test	Tank Empty	Coalescer Check/ Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations Date of Next Service:								

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations Date of Next Service:								

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply								
Comments/Observations Date of Next Service:								

Operation & Maintenance

With SPEL Products

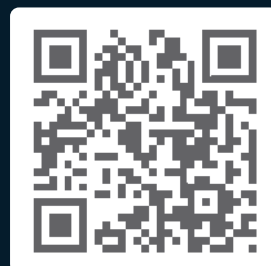
A guide that outlines the best practices, ensuring your SPEL system is achieving the best results for longer.



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spelproducts.co.uk

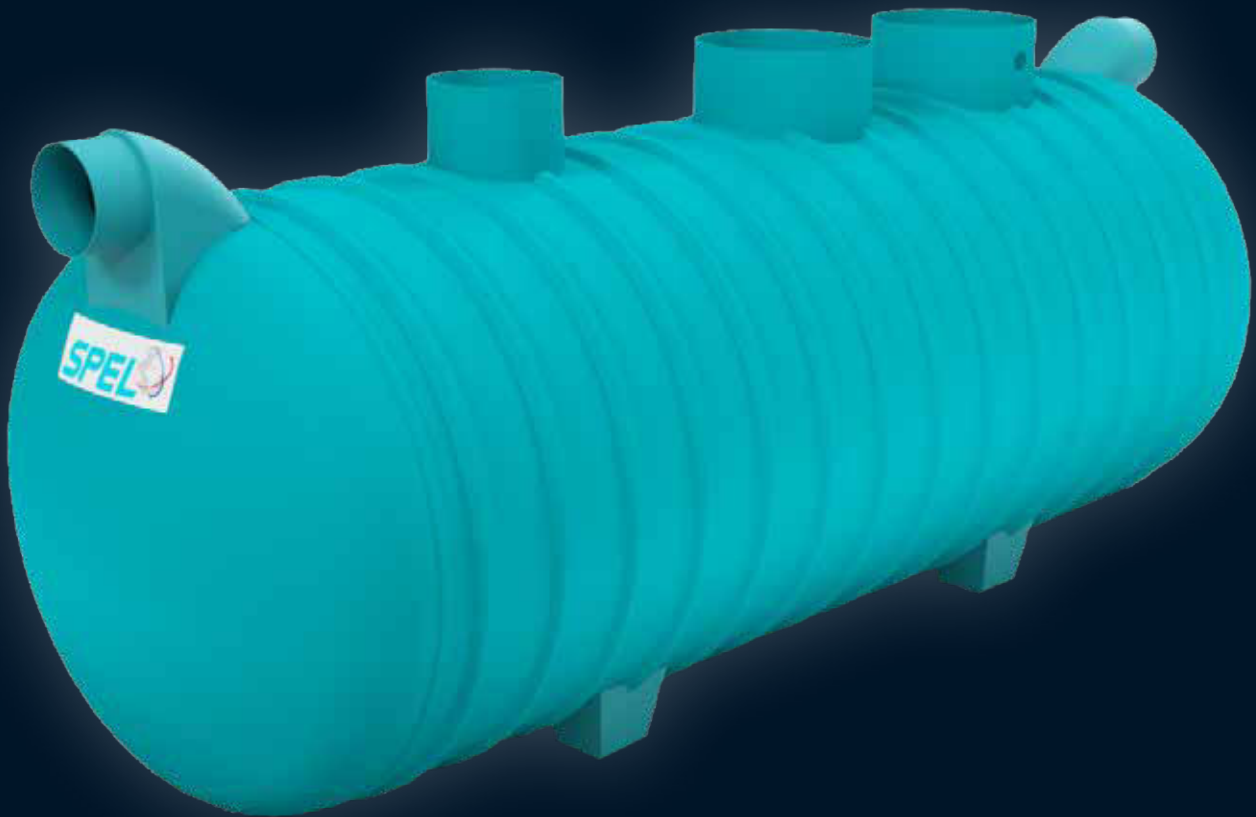
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Appendix C



The **safest answer** for **pollution control** and our **environment**

Quality solutions protecting our global environment



SPEL Puraceptor

ESR (Enhanced Silt Retention)

Total Treatment SuDS Compliant ESR Range

SPEL Puraceptor ESR Range

Full Flow Treatment System

The **total** treatment solution for SuDS

The new SPEL Puraceptor ESR System is designed to treat the full flow from the catchment area and includes the important Automatic Closure Device (ACD). This device will close off the outlet of the separator when captured oil exceeds the maximum oil storage volume.

Fully certified to meet the CIRIA SuDS Mitigation Index, this system has been tested by WRc (for TSS and Metals) to the British Water Code of Practice for Manufactured Treatment Devices*, and by HR Wallingford to the British and European Standard BS EN 858.

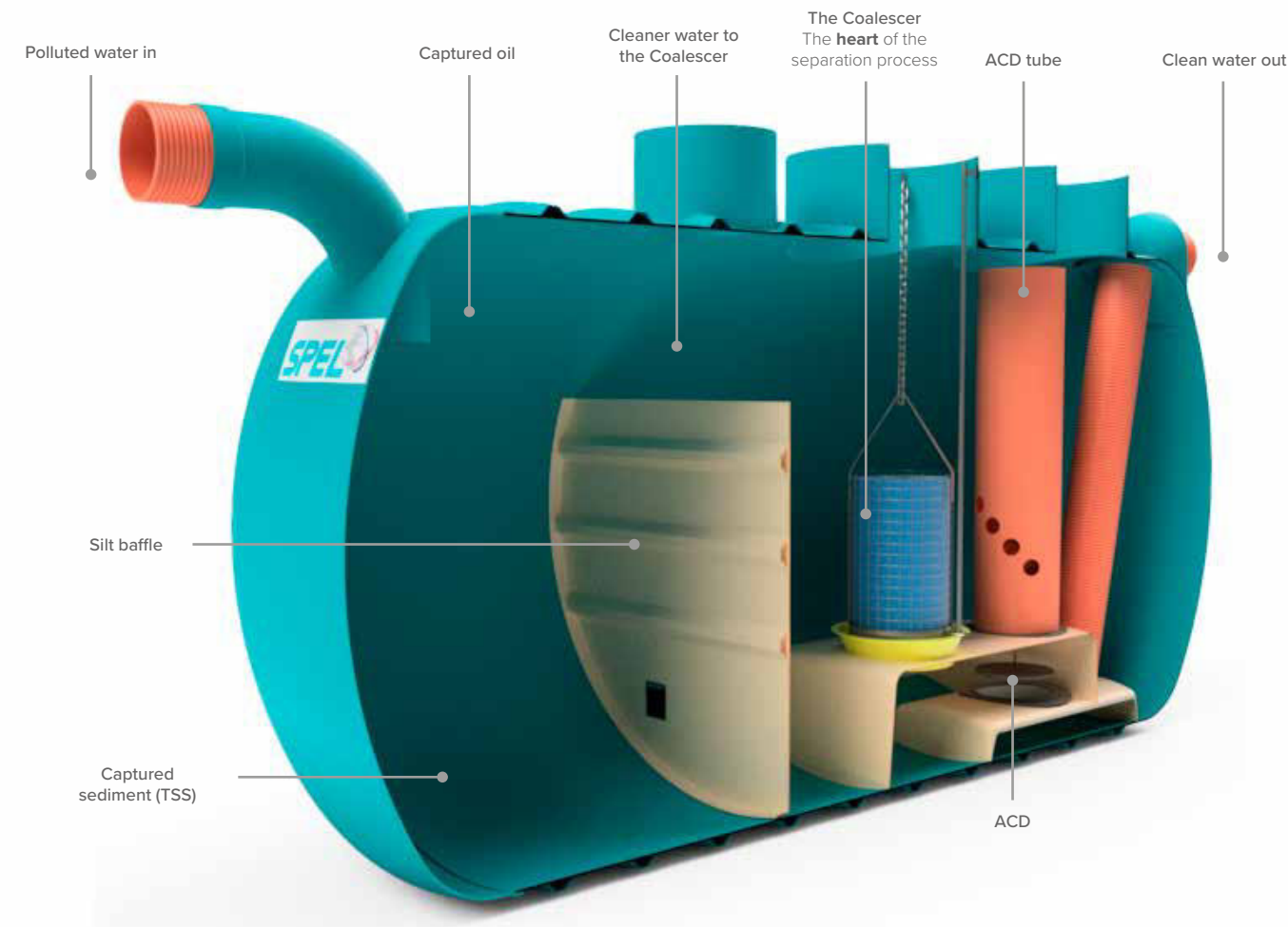
SPEL's ESR range is a total treatment system removing Hydrocarbons, Total Suspended Solids (TSS) and Metals (particulate) from stormwater. It's a highly efficient, single unit, SuDS water quality device.

SPEL ESR Puraceptor Certified Mitigation Index

TSS	0.8
Metals	0.6
Hydrocarbons	0.99*

**H R Wallingford test results to BS EN 858: tested to it's maximum designed flow rate*

SPEL ESR Puraceptor



SPEL Puraceptor ESR Range

Full Flow Treatment System



Surface Water Treatment Device Performance Declaration

Testing carried out according to British Water Code of Practice*

Product Details	Description
Manufacturer	SPEL Products
Treatment Device Name/Model	Puracaptor Type ESR P010/1C
General description	Full Retention Class 1 Separator with Silt Capacity
Envisaged application	Treatment of Surface Water Run-off
Pollutant(s) captured	Total Suspended Solids

Parameter	Value	Unit
Treatment device capacity	3200	litres
Sediment Storage capacity	1000	litres
Treatment Flow rate	10	l/s
Connected Area	1,333	m ²
Pollution retention flow rate	10	l/s

Parameter	Value	Unit
Maximum capacity flow rate	10*	l/s
Device head loss (at treatment flowrate)	0.286	m
Device head loss (at maximum capacity treatment flowrate)	0.286*	m
TSS capture and retention efficiency (Milsil W4 test sediment)	80	%
Zinc capture efficiency (if tested)	Not tested for dissolved metals	%
Zinc retention efficiency (if tested)	Not tested for dissolved metals	%
Copper capture efficiency (if tested)	Not tested for dissolved metals	%
Copper retention efficiency (if tested)	Not tested for dissolved metals	%
Dissolved Metals reduction	0.0	%
Particulate metals reduction*	60.3*	%
Total Metals reduction*	60.3*	%

4. Maximum test flow for a Full Retention device equates to the device maximum design flow.

* Extrapolated value in accordance with British Water How to Guide: Applying the CIRIA The SuDS Manual (C753) Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices. Version 7, Section 4.3. (2021 - under pre-publication review).

Research and Development

Research and development is at the heart of what we do at SPEL, our passion as Zero Pollution Ambassadors is to be at the cutting edge of clean surface water technology.

Months of rigorous testing has resulted in the new SPEL ESR Treatment System, available in both by-pass or full flow.

Certificates of compliance from WRc and HR Wallingford for the SPEL Puraceptor ESR Range



SPEL's Head of Technical Development alongside the WRc testing officer.

Protecting our environment for over 45 years

The SuDS Manual is leading good practise in drainage design, SPEL are endorsing this with the new SPEL Purceptor ESR range

Total Suspended Solids (TSS)	Metals	Hydrocarbons
0.8	0.6	0.99*

*H R Wallingford test results to BS EN 858

Added to these class-leading Mitigation Indices, the ESR range benefits from:

- British/European Standard BS EN 858-1 2002 certification.
- The SPEL 25 year shell Warranty.
- 50 year+ life expectancy.
- ISO9001 quality assurance.
- ISO14001 committed to environmental improvement
- Generously sized for high performance and low maintenance over a long life span.

26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Tables from The SuDS Manual (C753), p568-569

For reference notes, please see the full manual: https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

SPEL Puraceptor ESR Range Full Flow System

Specification Chart

Full flow devices must be sized on modelled flow rate



IMPORTANT: It is essential to cross-check the catchment-based flow rate from the chart below with the modelled flow rate to ensure the separator is correctly sized to treat the peak flow without causing restriction or overstressing the system.

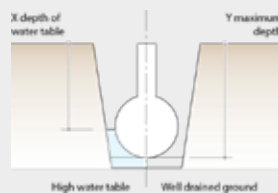
Model	Series	Max. Flow	Catchment Area	Overall length (mm)	Oil storage (L)	Silt capacity (L)	Overall diameter (mm)	Inlet Invert (mm)	Base to inlet (mm)	Base to outlet (mm)	Max in/out pipe diameter (mm)	Number of access shafts (dia. mm)			
		(l/s)	Based on 65mm/hr					A	B	C		600	750	900	1200
P004 1C/ESR	200	4	222	1,720	40	400	1,225	630	1,110	1,050	160	-	1	-	-
P006 1C/ESR	200	6	333	2,310	60	600	1,225	630	1,110	1,050	160	-	1	-	-
P010 1C/ESR	200	10	556	3,410	100	1,000	1,225	630	1,110	1,050	160	-	1	-	-
P015 1C/ESR	300	15	833	3,200	150	1,500	1,875	350	1,800	1,740	225	-	1	-	-
P020 1C/ESR	300	20	1,111	3,540	200	2,000	1,875	350	1,800	1,740	225	1	1	-	-
P030 1C/ESR	300	30	1,667	4,420	300	3,000	1,875	390	1,760	1,700	300	1	-	1	-
P040 1C/ESR	300	40	2,222	5,760	400	4,000	1,875	390	1,760	1,700	300	1	-	1	-
P050 1C/ESR	300	50	2,778	7,060	500	5,000	1,875	390	1,760	1,700	300	1	-	1	-
P065 1C/ESR	400	65	3,611	4,810	650	6,500	2,700	425	2,625	2,525	300	1	-	2	-
P080 1C/ESR	400	80	4,444	5,700	800	8,000	2,700	425	2,625	2,525	300	1	-	2	-
P100 1C/ESR	400	100	5,555	7,400	1,000	10,000	2,700	475	2,575	2,475	450	1	-	2	-
P125 1C/ESR	400	125	6,944	8,580	1,250	12,500	2,700	475	2,575	2,475	450	-	1	2	-
P150 1C/ESR	400	150	8,333	10,180	1,500	15,000	2,700	475	2,575	2,475	450	-	1	2	-
P165 1C/ESR	400	165	9,166	11,200	1,650	16,500	2,700	500	2,550	2,450	450	2	1	1	-
P200 1C/ESR	400	200	11,110	13,710	2,000	20,000	2,700	660	2,390	2,290	600	2	1	1	-
P250 1C/ESR	400	250	13,888	16,750	2,500	25,000	2,700	660	2,390	2,290	600	2	1	2	-
P280 1C/ESR	400	280	15,555	18,800	2,800	28,000	2,700	660	2,390	2,290	600	2	1	2	-
P300 1C/ESR	500	300	16,665	12,410	3,000	30,000	3,650	805	3,070	2,970	750	1	2	2	-
P400 1C/ESR	500	400	22,220	15,760	4,000	40,000	3,650	805	3,070	2,970	750	2	2	2	-
P500 1C/ESR	500	500	27,775	20,530	5,000	50,000	3,650	955	2,920	2,820	900	2	2	1	1
P500 1C/ESR	600	500	27,775	16,040	5,000	50,000	4,150	925	3,250	3,150	900	2	2	1	1
P600 1C/ESR	600	600	33,330	19,080	6,000	60,000	4,150	925	3,250	3,150	900	2	2	-	2
P700 1C/ESR	600	700	38,888	21,460	7,000	70,000	4,150	925	3,250	3,150	900	3	2	3	-
P800 1C/ESR	600	800	44,440	23,020	8,000	80,000	4,150	925	3,250	3,150	900	3	2	2	1
P900 1C/ESR	600	900	49,846	24,658	9,000	90,000	4,150	925	3,250	3,150	900	3	2	-	3

Tank shell specifications

The 'standard' specification is normally adequate for most installations but Heavy, Extra Heavy and Special specifications are available depending upon the burial depth and water table level, in winter. The concern is when the system is emptied completely and remains empty for a period of time.

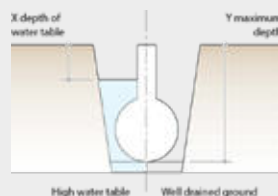
Standard tanks

Series	WT (m)	D (m)
100/200	1.0	4.0
300	0.9	4.0
400	1.3	5.0
500	1.9	5.7
600	2.4	6.2



Heavy tanks

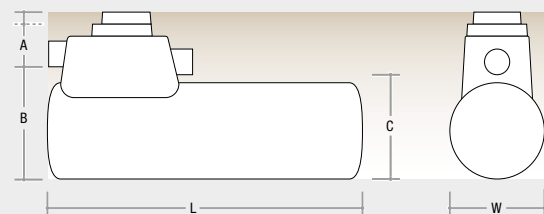
Series	WT (m)	D (m)
100/200	2.0	6.0
300	2.8	5.6
400	3.5	6.0
500	4.5	7.25
600	4.7	7.3



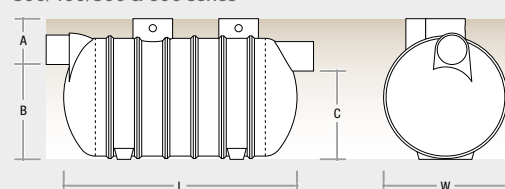
Based on installation in concrete with concrete surround.
For pea gravel surround, see SPEL Data Manual p13.5

200 Series ESR – Inside diameter 1200mm, outside diameter 1225mm.
300 series ESR – Inside diameter 1800mm, outside diameter 1875mm.
400 series ESR – Inside diameter 2600mm, outside diameter 2700mm.
500 series ESR – Inside diameter 3500mm, outside diameter 3650mm.
600 series ESR – Inside diameter 4000mm, outside diameter 4150mm.

200 series



300/400/500 & 600 series



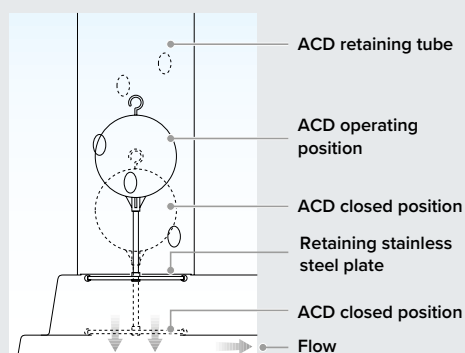
Commissioning, Installation and Maintenance

Automatic Closure Device: Protection in an event of a major spillage

The purpose of the automatic closure device (ACD) is to close the separator off automatically when the maximum oil storage capacity is attained. The ACD ensures that in the event of a major spillage, pollutants do not enter the drainage system, however the ACD should not be regarded as a substitute for an automatic alarm/monitoring system.

Automatic Closure Device

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.



SPEL Puraceptor® Class 1 Separators Single Chamber Models Models P004/1C/ESR to P050/1C/ESR

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 slot and shaft. 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. Ensure the ACD automatically remains in the 'operating position'.

Installation

SPEL Separators can be installed with a concrete or pea gravel surround, dependent upon ground conditions and water table level. Detailed installation instructions are provided with each unit, see Installation TSII or SPEL Data Manual Section 13.

Site access and conditions

It is the responsibility of the contractor to ensure suitable access to good hard ground that is safe and suitable for off-loading.

Off-loading/handling

The contractor is responsible for off-loading. The tank must be handled with care to prevent accidental damage from impact or contact with sharp objects.

Tanks should be lifted using slings, not chains or wire ropes. Do not drag tanks along the ground for any distance and avoid jarring or bumps. Do not lift with water in the tank.

Health and safety

Installation should be carried out by a competent contractor in accordance with Health & Safety at Work legislation and good building practice.

A warning notice should be visible at the top of each access shaft – 'danger, harmful fumes' and 'respirators must be worn in this tank'. Before entering persons must be qualified in accordance with 'confined space' requirements.

Maintenance Requirements

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

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.

SPELGuard Commissioning & Maintenance



SPELGuard contracts available.

For more information contact us:

info@spelproducts.co.uk | 01743 445 200

Optional extras

SPEL coalescer unit guide rail systems

To facilitate easy insertion of coalescer units, the SPEL guide rail system manufactured in stainless steel can be incorporated into SPEL Puraceptors and class 1 Stormceptors.

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 unit is then lowered in the normal way, being guided at the correct angle into the conical base.

Lifting chains are available for the larger coalescer units and where extension shafts are fitted.

Extension guide rails can be incorporated into SPEL extension shafts to suit.

SPEL coalescer unit lifting, locating and locking system

The SPEL lifting, locating and locking system is manufactured in stainless steel and replaces the standard coalescer unit handle.

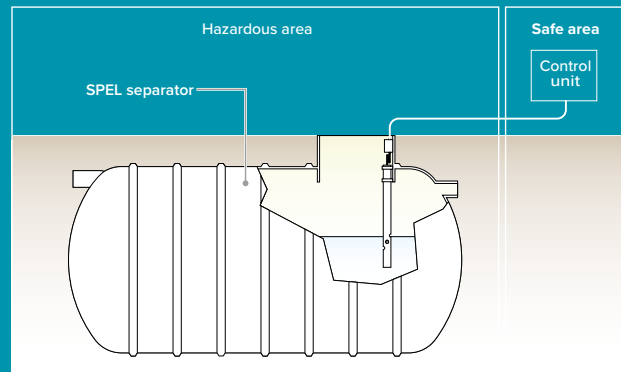
The locating/locking handle ensures the coalescer unit is seated and locked in its correct position after maintenance.



Above left:
Lifting, locating and locking system with guide rail system.

Above right:
The SPEL coalescer unit with lifting chain.

SPEL Automatic Alarm/Monitoring Systems



SPEL offer a range of alarms, for full details refer to the *SPEL Data Manual Section 3*. Kiosks with beacons and provision for BMS and remote information via browser user interface.

SPEL Model Alarm-DY14400

Oil alarm only – not BMS compatible

SPEL Model IdOil-20

Oil, silt and/or high level alarm with volt free terminal for beacon and BMS capability

SPEL Model IdOil-30

For oil, silt and/or high level as required. This alarm provides a range of options for BMS and remote information to on or off-site monitoring facilities.

SPEL Model IdOil Solar Oil Separator Alarm

for remote off-grid areas.

SPEL extension access shafts

Extension access shafts are available for deep invert applications.

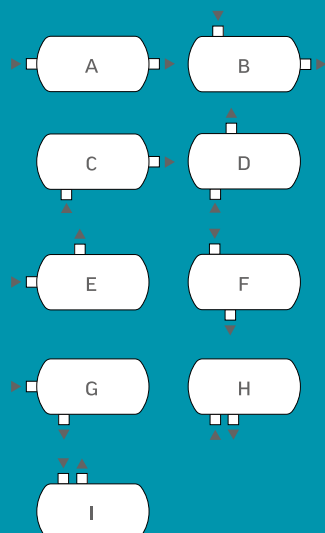


See tripod drawing below for other extension adjustments

Double seal if required

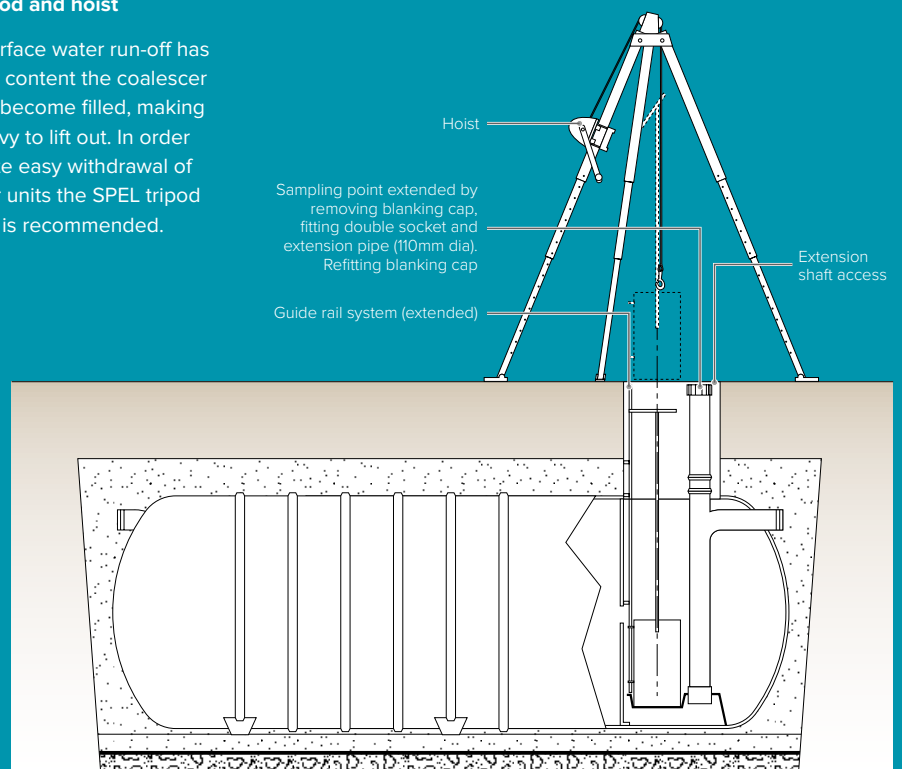
SPEL ESR Range – Inlet/outlet orientation

Dependent upon model and diameter of connections, these nine different orientations are available. However on the larger models it is important to check with our technical department.



SPEL tripod and hoist

Where surface water run-off has a high silt content the coalescer units can become filled, making them heavy to lift out. In order to facilitate easy withdrawal of coalescer units the SPEL tripod and hoist is recommended.



Puraceptor ESR

Enhanced Silt Retention

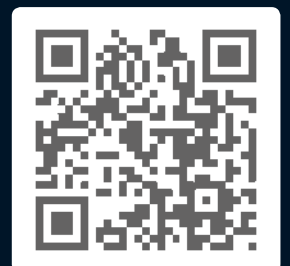
SPEL's ESR range is a total treatment system removing Hydrocarbons, Total Suspended Solids (TSS) and Metals (particulate) from stormwater. It's a highly efficient, single unit, SuDS water quality device.



Lancaster Road, Shrewsbury, Shropshire SY1 3NQ

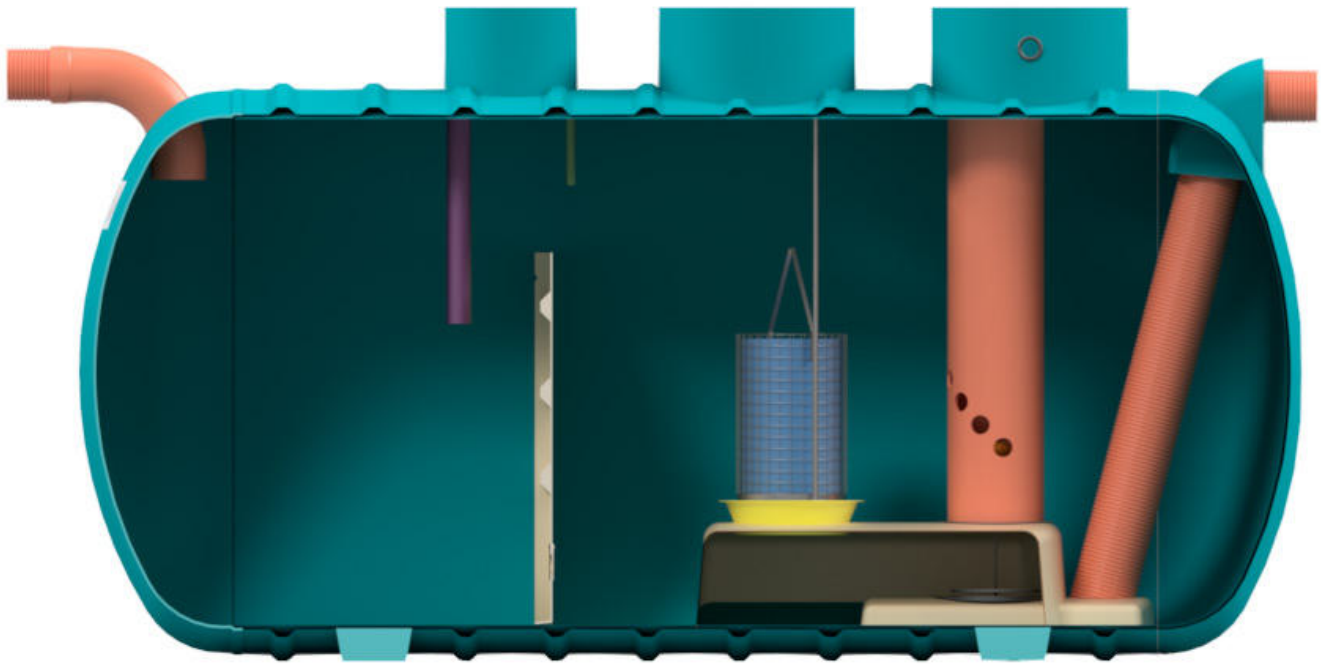
Phone: +44 (0)1743 445200

Email: info@spelproducts.co.uk / sales@spelproducts.co.uk



spelproducts.co.uk

08/22



SPEL ESR Full Flow

SuDS Treatment System

Operation & Maintenance Manual

SPEL ESR Full Flow Operation & Maintenance

Introduction

With correct and consistent care, and by following a few simple guidelines, your system will give you many years of dependable service.



Installation

For installation guidance, see SPEL Data Manual, Section 7.

All applicable health and safety regulations must be followed.

IMPORTANT

In the unlikely event of the chamber having to be entered ensure absolutely that all Workplace Health & Safety directives and Confined Space Regulations are strictly adhered to.

SPELGuard Maintenance Available:

SPEL offer technical support, site visits, commissioning and servicing/maintenance on equipment.

Contact the SPEL technical team:

 **01743 445 200**

 **sales@spelproducts.co.uk**

 **spelproducts.co.uk**



SPEL ESR Full Flow SuDS Treatment System

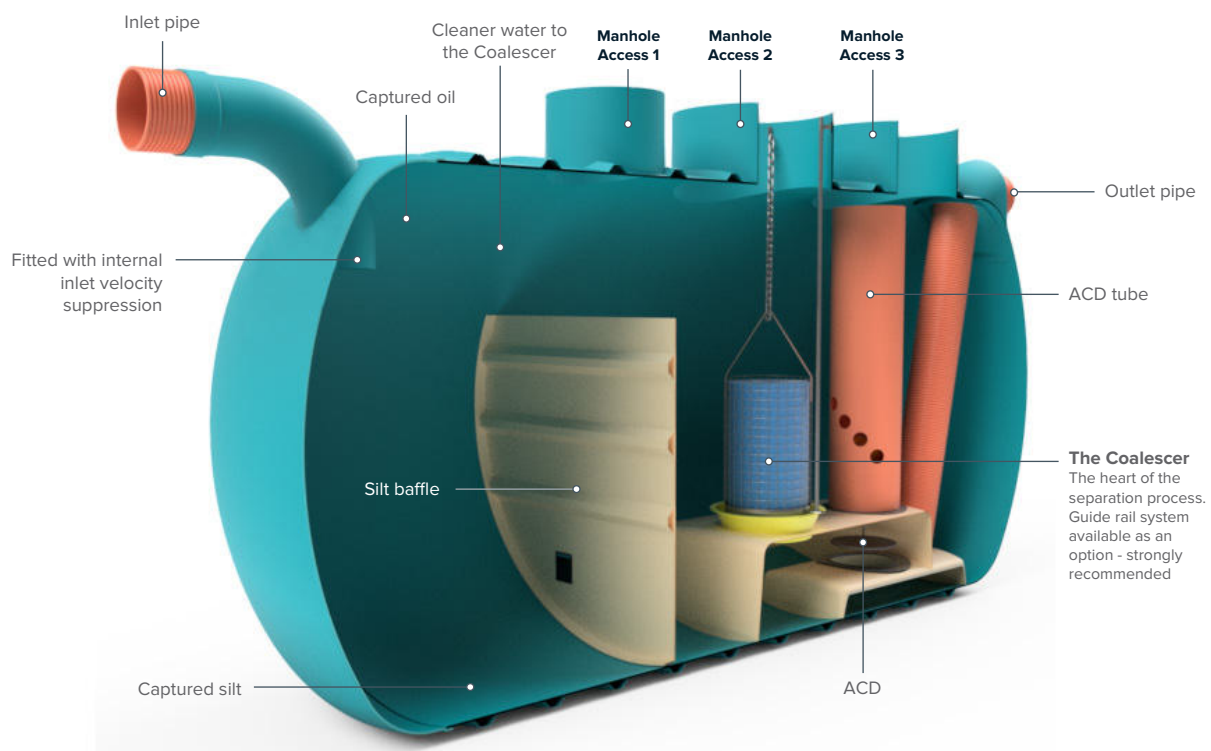
The SPEL ESR Full Flow Treatment System is fully certified to meet the CIRIA SuDS Mitigation Index. It has been tested by WRC to the British Water Code of Practice for Manufactured Treatment Devices. This unit is also certified to the British and European Standard BS EN 858 by HR Wallingford. SPEL ESR Full Flow systems are designed for long term performance and with SPEL high volume coalescer units, low maintenance.

SPEL ESR Full Flow Systems are manufactured in class 1 models and with silt capacity in accordance with BS EN 858-1. The range of models is listed in the SPEL Data Manual or on the SPEL website.

The SPEL Automatic Closure Device (ACD) will automatically close off the outlet when the captured oil exceeds the maximum oil spill capacity. However, regular inspections are recommended at intervals to suit the site conditions. We recommend the SPEL ESR Full Flow System is checked at 3, 6, or 12 monthly intervals to ensure correct operation of the treatment device, alarm and check the pollutant levels.

Where a SPEL automatic alarm/monitoring system is not fitted, the SPEL ESR Full Flow System 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.

Maintenance Access



A wide range of SPEL ESR Full Flow treatment devices are available incorporating coalescer unit/s for small to large catchment areas.

When emptying ensure both chambers/sides of the silt baffle are emptied equally to prevent unequal pressure.

Manhole access 1

This is the access to the primary chamber for removal of silt.

The SPEL automatic alarm/monitoring system probe is generally situated in a probe protection tube in this access shaft (see section on alarms).

Manhole access 2

This provides access for the inspection, the removal and reinsertion of the coalescer units and the removal of hydrocarbons and further silt.

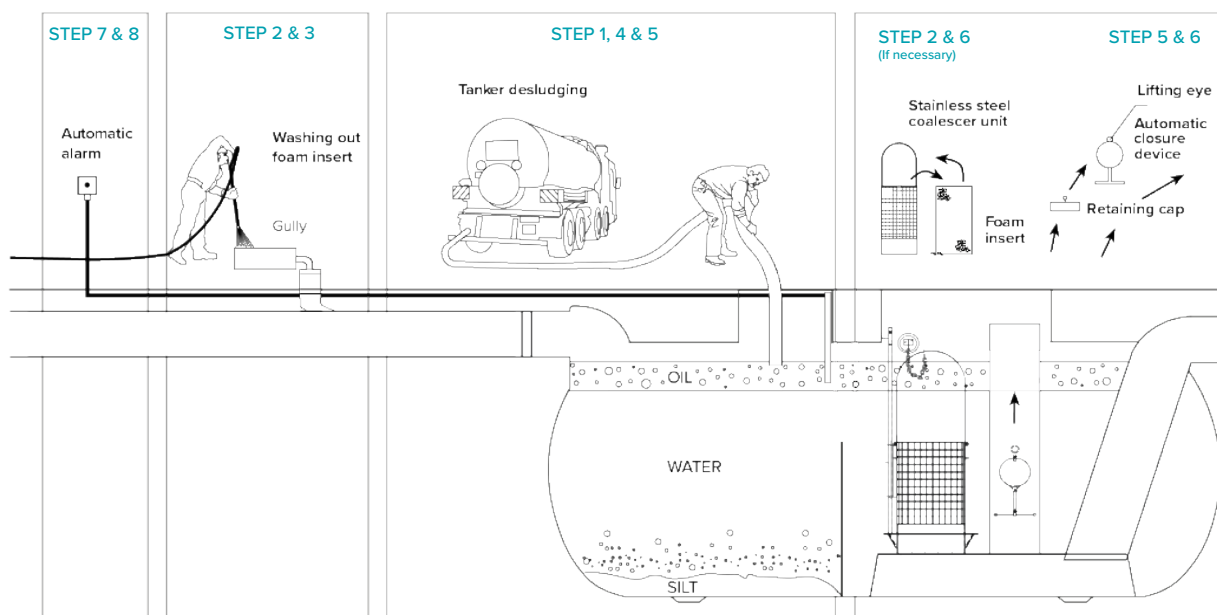
Manhole access 3

This provides access to the Automatic Closure Device (ACD).

This is an example, exact number and location of access shafts will depend on exact model chosen.

SPEL ESR Full Flow SuDS Treatment System

Maintenance



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

STEP 1 Sucking out oil/fuel	Suck off as much retained oil from both chambers of the ESR System as possible. This prevents oil coating the surface of the coalescer if this is removed first. Leave sufficient water to ensure the ACD remains floating.
STEP 2 Coalescer Unit	Using the lifting handle, chain or wire rope, lift the coalescer unit out of the tank and place upstream of the ESR System.
STEP 3 Cleaning Foam Insert	Remove foam insert and wash with normal water pressure ensuring the dirty water runs into the ESR System.
STEP 4 Sucking out silt	For Intermediate Maintenance, the use of a tanker with a rigid suction pipe can suck out the silt from the base of the system, without the need to empty the complete unit, leaving sufficient water to ensure the ACD remains floating. <i>Note: For Intermediate Maintenance, go to Step 6.</i>
STEP 5 Sucking out complete contents (if necessary)	For a Full Maintenance (at least once every 5 years, as recommended by EA, SEPA and NRW) the complete contents will need to be emptied and a structural and component check conducted. After sucking out completely, remove the ACD in the ACD retaining tube by first removing the retaining cap (this is to safeguard against its removal 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. <i>Note: SPEL Recommend the replacement of coalescer unit(s) at all Full Maintenance intervals.</i>
STEP 6 Re-insert coalescer unit and ACD	Re-insert the foam insert into the stainless steel coalescer basket and re-insert the coalescer unit into the ESR System. Re-position the lifting handle, chain or wire rope. Partially fill the ESR Full Flow Treatment System 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. The complete contents will need to be removed in order to release the ACD. Precaution: never try to pull the ACD off its seating by force.
STEP 7 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 Section 8 (Alarms) in the SPEL Data Manual.
STEP 8 Test SPEL automatic alarm	To test an alarm is working, ensure the previous step has been carried out. Following this, an oil or silt alarm should sound when clean and dry and in contact with air, therefore, holding it in the air should set off the alarm on the control panel. For high level liquid alarms, putting them in water should set off the alarm.

SPEL Coalescer System

Important: ensure all coalescers are correctly seated in the coalescer cone following maintenance. The SPEL Coalescer Guide Rail or 3L System helps ensure correct seating.

SPEL Coalescer

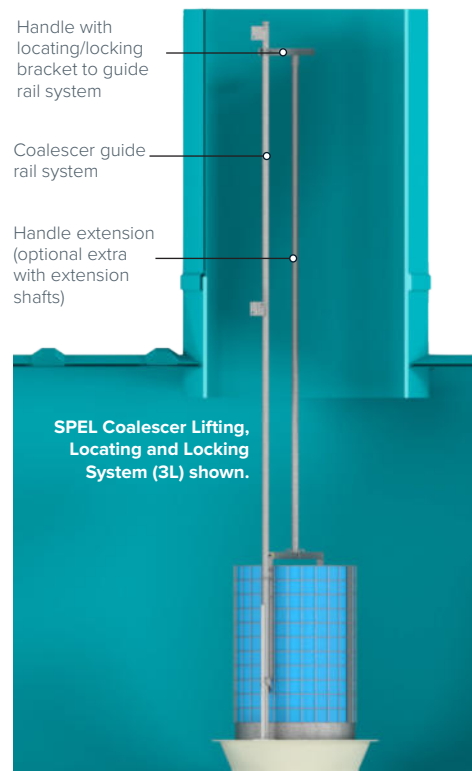
Normal servicing of the smaller SPEL systems frequently requires emptying the unit completely providing access for the coalescer units to be taken out, cleaned and returned and guided accurately to their seating positions. However larger SPEL systems may only require the hydrocarbon pollutants and silt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



SPEL Coalescer Lifting, Locating and Locking System (3L)

The SPEL 3L System has all the benefits of the below SPEL Guide Rail System and includes a locking mechanism and rigid lifting handle, this locks the coalescer in position and makes for easier lifting and locating.



SPEL Coalescer Guide Rail Systems

SPEL Guide Rail Systems are optional but strongly recommended for all tanks with deeper inverts or larger than 300 Series (1.8m dia.).



SPEL Coalescer System without Guide Rails

Optional lifting chains are available for ease of maintenance.

SPEL Automatic Closure Device (ACD)

Overview

The purpose of the Automatic Closure Device (ACD) is to close the separator off automatically when the maximum capacity of light liquid/oil is reached.

The ACD ensures 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. The oil alarm and ACD are both required to comply with BS EN 858.

If the tank should fill with light liquid/oil the ACD, which is calibrated for a specific gravity of 0.85, will automatically sink and close off the SPEL ESR Full Flow System.

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

In such an event the SPEL ESR Full Flow System should be completely sucked out/emptied and the ACD lifted out.

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 cause a malfunction.

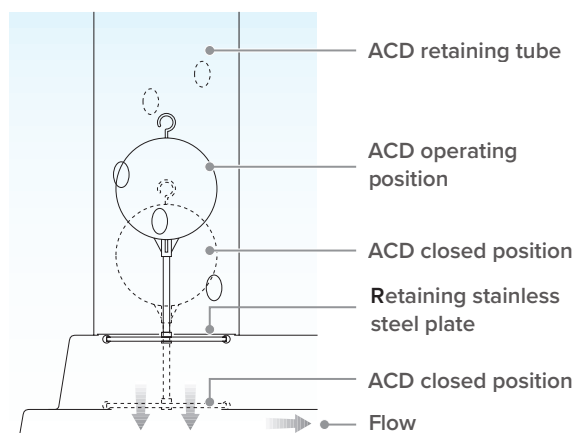
For Installation see Section 7.33 and 7.34 of SPEL Data Manual

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 it 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.

‘Companies who pollute the environment can be hit with unlimited financial penalties from the Environment Agency from today (11 December 2023).’ *gov.uk, ‘Unlimited penalties introduced for those who pollute environment’ (11 December 2023)*

Automatic closure device **Type R** (Retained)
SPEL ESR Full Flow System.





Warranty

SPEL Underground Tank Shells

We warrant that our SPEL Tankstor® and Separator underground tank shells, as identified by the serial number, if installed strictly in accordance with the company's relevant installation procedure as detailed in the SPEL Data Manual, Section 7, Installation Guidance and verified with an 'as built' installation drawing prepared by a qualified design consultant or an approved person and stage photographs to show the methods adopted from start to completion having in mind particularly:- ground conditions, invert depth, water table depth in winter, external loading, type and quality of backfill material, will

1. providing our published specifications and installation requirements are fully met the shell laminate integrity will last for a period of twenty-five years following date of original delivery/collection.
2. not fail for a period of twenty-five years from the delivery/collection date due to external corrosion; and
3. not fail for a period of twenty-five years from the delivery/collection date due to internal corrosion provided the tank is solely used for:-

Rainwater storage

Potable water at ambient temperatures

Fuel/oil contaminated surface rainwater

Domestic sewage

For other applications the life expectancy will be determined by the contents, the operating conditions and the resin system/reinforcement specification used.

Our liability under this warranty is set out in SPEL General Conditions of Sale available on request. In brief they shall be limited to, at our option,

- (1) repair of the defective tank
- (2) delivery of a replacement tank to the original site or
- (3) refund of the original purchase price.

We shall not be liable for any labour or other installation costs, indirect or consequential loss, damage or other damages in connection with such tanks.

Accessory warranties do not extend beyond the warranty period by our suppliers. This applies to such items as access covers and frames, monitoring equipment, Bauer type connections for emptying, pumping equipment or any accessories as defined in the company's official order acknowledgement/invoice.

The foregoing constitutes our exclusive obligation and we make no express or implied warranties, or any warranty of merchantability or fitness for any particular purpose whatsoever, except as stated.

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	ACD Check	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	ACD Check	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Date	Visual Check	Oil Probe Clean/ Check	Silt Probe Clean/ Check	Control Panel Check/ Test	ACD Check	Tank Empty	Coalescer Check/ Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	ACD Check	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	ACD Check	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	ACD Check	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

Date	Visual Check	Oil Probe Clean/ Check	Silt Probe Clean/ Check	Control Panel Check/ Test	ACD Check	Tank Empty	Coalescer Check/ Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Date	Visual Check	Oil Probe Clean/Check	Silt Probe Clean/Check	Control Panel Check/Test	ACD Check	Tank Empty	Coalescer Check/Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Date	Visual Check	Oil Probe Clean/ Check	Silt Probe Clean/ Check	Control Panel Check/ Test	ACD Check	Tank Empty	Coalescer Check/ Clean	Coalescer Replacement	Structural Check
Tick all that apply									
Comments/Observations Date of Next Service:									

Operation & Maintenance

With SPEL Products

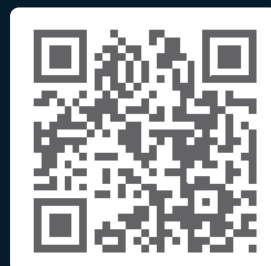
A guide that outlines the best practices, ensuring your SPEL system is achieving the best results for longer.



Lancaster Road, Shrewsbury, Shropshire SY1 3NQ

Phone: +44 (0)1743 445200

Email: info@spelproducts.co.uk / sales@spelproducts.co.uk



spelproducts.co.uk

15/07

Appendix D

SPEL Forecourt Separators

Designed for Spill Control

Overview

SPEL Forecourt Separators treat 100% of the flow and have been designed and tested to meet the stringent British/European Standard BS EN 858-1.

Forecourt separators are sized to ensure the maximum spill risk can be controlled within the separator. Normal road tankers have compartments no larger than 7,600 litres which is the designed spill capacity for a forecourt separator.

All SPEL Forecourt Separators are fitted with a special automatic closure device (ACD) which shuts the separator down when the contained oil exceeds the maximum oil spill capacity.

Larger Forecourt type models are available for larger spill risk areas such as airport fuelling zones.

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

Product Range

Series 300

(1.2m inside diameter):
NS 20
Catchment area: 1111m²

Series 400, 500 & 600

2.6m, 3.5m, 4m inside diameter
are available for larger NS
and spill capacities to suit site
requirements.

**Contact the technical team for
more information:**
(01743) 445 200
sales@spelproducts.co.uk



Applications

Petrol station forecourts

Refuelling facilities

Fuel storage sites

Shell Design

Designed with reference to BS EN 13121.
All tank shells carry the SPEL 25 Year
Warranty and life expectancy in excess
of 50 years.

Shell Specifications

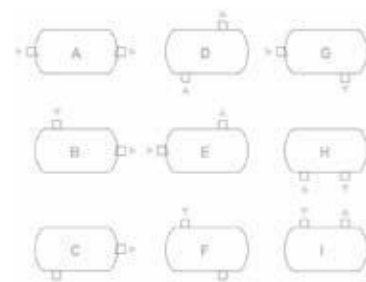
Different tank shell specifications are available
dependent upon tank invert levels, ground
conditions and ground water levels

Inlet/Outlet Connections

160/225/300mm diameter PVCU socket/
spigot.

450, 600, 750, 900 and 1200mm diameter
GRP spigot available. For connecting to site
pipework via Flex-Seal/Band-Seal or similar
flexible couplings.

The nine inlet/outlet options below are
available to assist with design and installation.



*This graphic shows indicative locations
only. For accurate location, please
contact our technical team.*

SPEL Forecourt Separators

Product Table

Model	Series	Nominal Size (NS)	Catchment area (m ²)	Oil storage (litres)	Silt capacity (litres)	Overall length* (mm)	Overall diameter (mm)	Inlet Invert (mm)	Base to inlet (mm)	Base to outlet (mm)	Optimum in/out pipe diameter* (mm)	Number of access shafts (dia. mm)		
		Flow (l/s)				L		A	B	C		750	900	1200
FP 1C/SC Class 1 Forecourt Separator Single Chamber with Silt Capture	300	20	1,111	200	2,000	4,290	1,875	350	1,800	1,740	225	1	-	-
FP 2C/SC Class 1 Forecourt Separator Two Chamber with Silt Capture	300	20	1,111	200	2,000	5,500	1,875	350	1,800	1,740	225	2	-	-
FS2 SC Class 2 Forecourt Separator Single Chamber with Silt Capture	300	20	1,111	200	2,000	4,290	1,875	350	1,800	1,740	225	-	-	1

Larger spill capacity models available upon request

*SPEL Separators are designed for a maximum flow (NS/NSB) but can be fitted with larger than the recommended maximum connection size IN/OUT or with the addition of adapters providing the maximum flow (NS/NSB) cannot be exceeded or any increase in the operating level in the SPEL Separator to cause the captured pollutants to escape into the vent connections or through access shaft connections. Any overriding of the above criteria could jeopardise performance to the European Standard BS EN 858-1.

‘Companies who pollute the environment can be hit with unlimited financial penalties from the Environment Agency from today (11 December 2023).’ [gov.uk](https://www.gov.uk/government/news/unlimited-penalties-introduced-for-those-who-pollute-environment), ‘Unlimited penalties introduced for those who pollute environment’ (11 December 2023)

Appendix E



Installation & Maintenance

SDS Aqua Swirl™ Hydrodynamic Separator

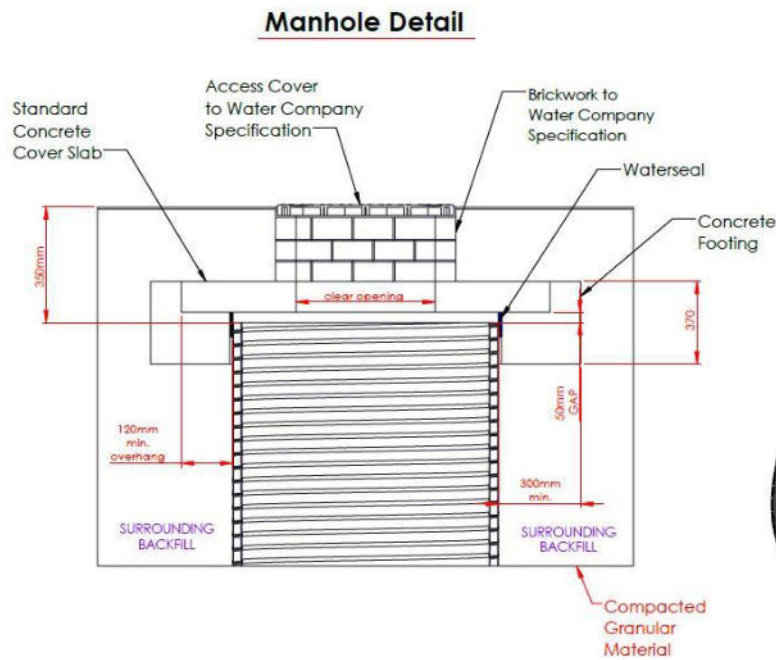
Aqua-Swirl™ systems are fabricated from high performance HDPE materials; they are durable lightweight and can be installed without use of heavy lifting equipment.

Lifting support Straps are provided to allow easy off loading and installation, resulting in significantly reduced installation costs.

Installation:

- 1) Excavation to required size and depth allowing for 600mm around each side of the unit
- 2) Prepare the bed with 20-40mm clean stone to a depth of 300mm
- 3) Compacted in 150mm layers to ASTM D 2321 to a proctor density of 95%
- 4) Install the unit and backfill with 20-40mm clean stone in 150mm layers to ASTM D 2321 enough backfill should be placed over components prior to using heavy compaction or construction equipment to prevent damage.
- 5) Connect to drainage network pipework with rubber couplings like Fernco, Flex Seal or Band Seal.
- 6) The Aqua Swirl has a round base box section plate extending 100mm from the outside diameter to provide mitigation against buoyancy, concrete can be poured directly over and into the base plate if required to provide additional resistive force.
- 7) Aqua Swirls of AS-6 and above have both a base plate and top plate
- 8) The riser pipe is supplied to the required length to allow for a standard UK man hole installation detail and can be cut to size on site to the required depth.
- 9) Where traffic loading is required a reinforced concrete pad must be placed over the entire Aqua swirl as per design calculated by engineer.
- 10) If traffic loading is not required, it's recommended that bollards are placed around access risers in non-traffic areas to prevent inadvertent loadings by maintenance vehicles.

Product illustration:



BBA HAPAS Approval:

- 11) Aqua Swirls & Filters are made from a structured wall HDPE pipe. The pipes are produced by extrusion of a hollow box section in polyethylene which is continuously wound onto a mandrel; successive turns being welded together by hot polyethylene melt supplied by an auxiliary extruder. Weholite is a Kitemarked product, license number KM 560128 which, is backed up with a quality management system to BS EN ISO 9000 : 2008, Certificate No. FM 12306. The HDPE pipe is manufactured in accordance with BS EN 13476 -2 : 2007 and carry BSI Kitemark and WRC accreditation to this standard. All fittings are manufactured from the same material and in the same stiffness as the pipes, in accordance with BS EN 13476 – 2:2007. Weholite pipes, fittings and fabrication (systems) have BBA HAPAS certification (18/H283).

System Operation:

The Aqua-Swirl®

Can be installed in an “off-line” configuration. Or, depending on local regulations, an “in-line” (on-line) conveyance flow diversion system can be used. The CFD model allows simple installation by connecting directly to the existing storm conveyance pipe thereby providing full treatment of the “first flush,” while the peak design storm is diverted and channelled through the main conveyance pipe

The patented Aqua-Swirl® Stormwater Treatment System provides a highly effective means for the removal of sediment, floating debris, and free oil. Swirl technology, or vortex separation, is a proven form of treatment utilized in the Stormwater industry to accelerate gravitational separation.

The treatment operation begins when Stormwater enters the Aqua-Swirl® through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminants to settle to the base of the unit. Since Stormwater flow is intermittent by nature, the Aqua-Swirl® retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms.

A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

The treated flow then exits the Aqua-Swirl® behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.

Maintenance:

Long term performance of the Aqua Swirl or any other device depends on inspection and maintenance program.

Recommended schedule in line with Ciria C753 guidance

On hand over – 3 months -6 months -12 months and then annually or as deemed necessary from details obtain from previous inspections.

Each site sediment loadings will be different and at its highest just after the build phase, hence why a more frequent visit is required at the start of the programme.

The Aqua-Swirl® has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free- floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

Inspection:

To inspect the Aqua-Swirl[®], remove the manhole cover.

The only tools needed to inspect the Aqua-Swirl[®] system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water. When the sediment pile is within 42 to 48 inches of the water surface (or sediment pile thickness is 18 to 24 inches as measured from the base), the system should be maintained. The maximum Sediment storage capacity of the Aqua-Swirl[®] is reached when the sediment pile is within 30 inches of the water surface (or sediment accumulation is 36 inches thick as measured from the base).

It should be noted that to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

The Aqua-Swirl[®] design allows for the sediment to accumulate in a semi-conical fashion as illustrated above. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

Removal:

Cleaning the Aqua-Swirl[®] is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 750mm service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the

Aqua-Swirl[®] design is that the entire sediment storage area can be reached with a vacuum hose from the surface (reaching all the sides). Since there are no multiple or limited (hidden or “blind”) chambers in the Aqua-Swirl[®], there are no restrictions to impede on-site maintenance tasks.

Disposal:

All removed products should be disposed of in line with local council requirements

STORMWATER TREATMENT

SDS Aqua-Swirl®

Hydrodynamic Vortex Separator

SDS Aqua-Swirl® is a custom engineered, flow-through water quality device that utilises hydrodynamic separation technology to maximise the removal of coarse sediment, debris and free-floating oil from surface water runoff.

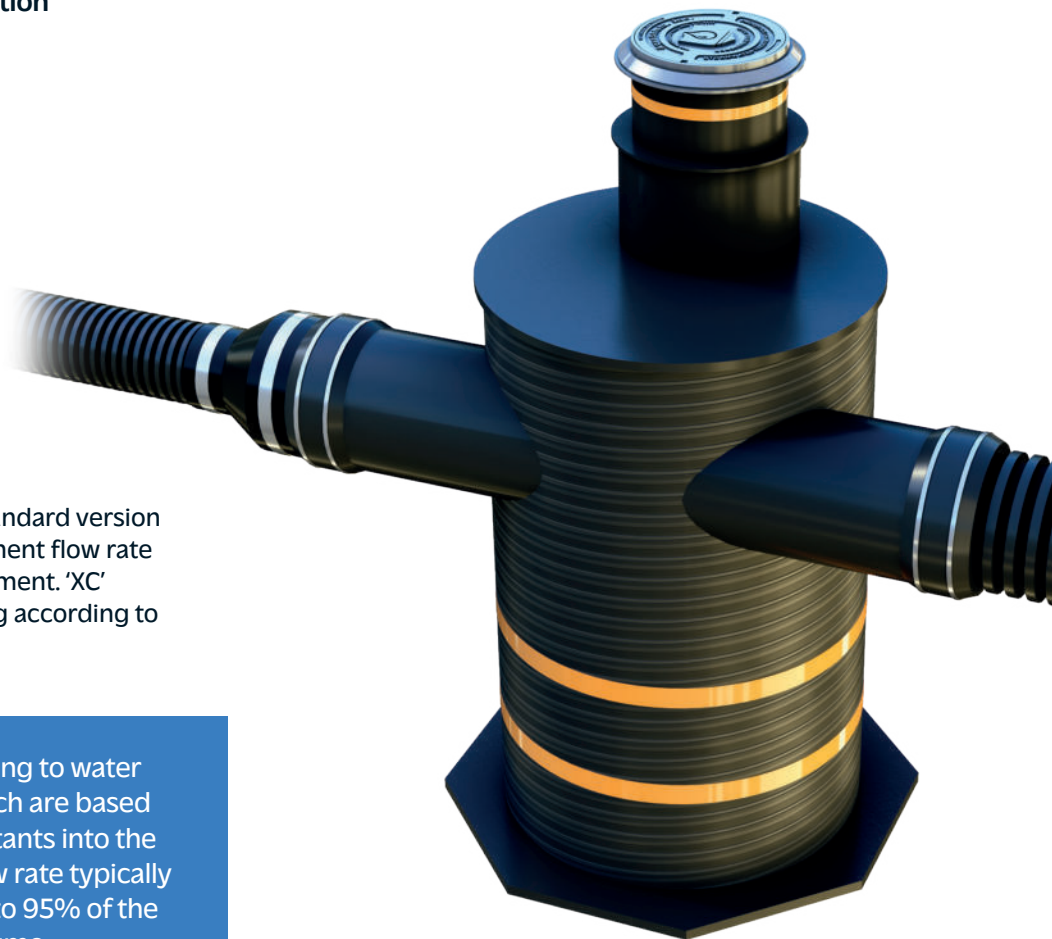
When connected to a SDS SYMBiotIC™ system, SDS Aqua-Swirl® provides real time data on a broad range of key operating factors such as pollutant loads and silt capture level.

SYMBiotIC™

- BBA HAPAS approved
- HDPE plastic modular construction
- No moving parts
- Sealed baffle
- Large debris storage chamber
- Lifting supports
- Compact dimensions
- Available in 9 different sizes
- Bespoke sizing available

SDS Aqua-Swirl® is supplied in the standard version when sizing to its water quality treatment flow rate according to OK-110 (coarse) test sediment. 'XC' versions are also available when sizing according to the NJDEP (finer) test sediment.

SDS Aqua-Swirl® is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume. The treatment flow rate of the SDS Aqua-Swirl® system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution.



Features	Benefits
Performance monitoring available via SDS SYMBiotIC™.	Provides bespoke suite of operating data, such as silt levels and pollutants, viewable via a secure web portal dashboard with live notifications via email and text.
BBA HAPAS certified.	Approved for installation under roads and pavements; adoptable by National Highways.
NJCAT/NJDEP-verified performance for sediment removal and retention.	Verification accepted by the Environment Agency (as cited in the CIRIA C753 SuDS Manual).
'XC' models meet NJDEP testing protocol.	Ensures that particulates and adhered pollutants are not mobilised during major storm events, maximising the capture of floating debris, oil and hydrocarbons.
Manufactured from HDPE high strength plastic Weholite.	Offers a durable, light weight and low-cost alternative to concrete. Easy and quick to install resulting in substantial cost savings.
Bespoke construction.	No on-site assembly required.
Specialised sealed baffle.	Prevents captured floatables from escaping.
Internal bypass with pollution retention.	Able to treat localised rain and larger storm events while retaining captured pollutants.
Single easy-access chamber for pollutant removal and storage.	Simplifies inspection and maintenance facilities with no special equipment required.
Compact dimensions.	Reduces ground excavation and product installation costs.
Small footprint design.	Can be retro-fitted with minimal disruption to existing infrastructure utilities or surface features, extending the ability to meet new regulations.
Certified installation lifting supports.	Easy installation without the need for large, expensive cranes.
Suitable for use during site construction programme.	Can be put into operation prior to completion of the site build, with the inclusion of a planned maintenance schedule.
Available in 9 different standard sizes and also bespoke.	Provides greater design flexibility and assists the removal of sediments at a greater rate than comparable systems.

Specifications

Aqua-Swirl® Model No.	Maximum ID Pipe Connection (mm) BYP ¹	Chamber Internal Diameter (mm)	Water Quality Treatment Flow Rate OK-110 Coarse (l/s) Model AS- ²	Water Quality Treatment Flow Rate NJDEP Fine (l/s) Model XC-	Oil/ Debris Storage Capacity (litres)	Sediment Storage Capacity (m³)	Aqua-Swirl® Weight (kg)
AS-2/XC-2	375	750	30	16	136	0.3	300
AS-3/XC-3	500	1050	53	31	416	0.6	700
AS-4/XC-4	600	1200	77	40	644	0.8	1000
AS-5/XC-5	750	1500	120	63	1382	1.3	1100
AS-6/XC-6	900	1800	173	91	1439	1.8	1400
AS-7/XC-7	1050	2100	235	123	1987	2.5	1700
AS-8/XC-8	1200	2400	307	161	2612	3.3	2200
AS-9/XC-9	1350	2800	418	220	3596	4.4	2600
AS-10/XC-10	1500	3000	480	252	4164	5.1	3100

¹ BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.

² Based on the Tennessee Tech University 'Laboratory Evaluation of TSS Removal Efficiency for the Aqua-Swirl® Concentrator Stormwater Treatment System'.

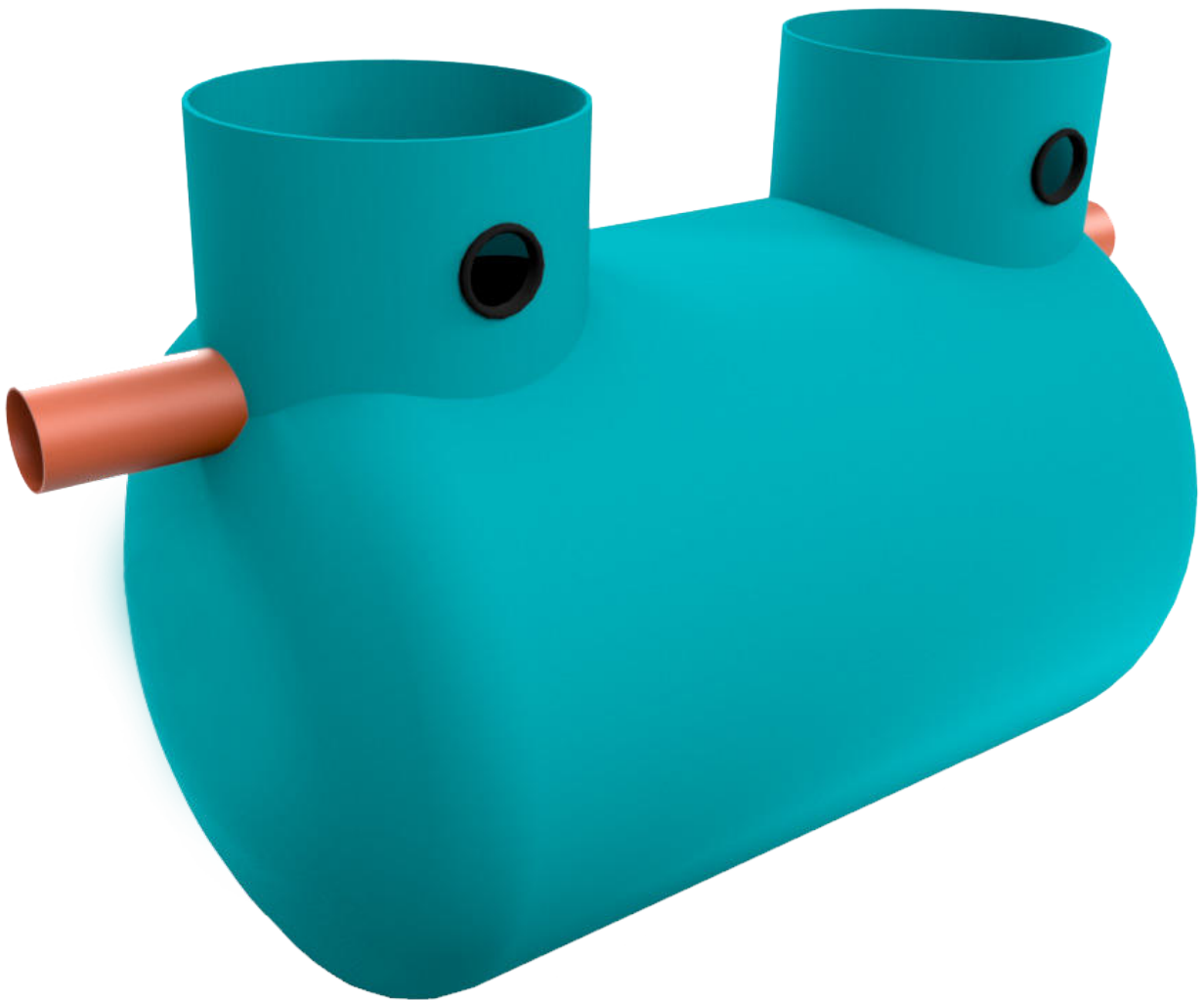
Notes: **Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.**

The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.

For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0125

Appendix F



SPEL Grease Separator

Operation & Maintenance Manual



SPEL Grease Separator

Operation & Maintenance

Introduction

With correct and consistent care, and by following a few simple guidelines, your system will give you many years of dependable service.



Installation

For installation guidance, see SPEL Data Manual, Section 7.

All applicable health and safety regulations must be followed.

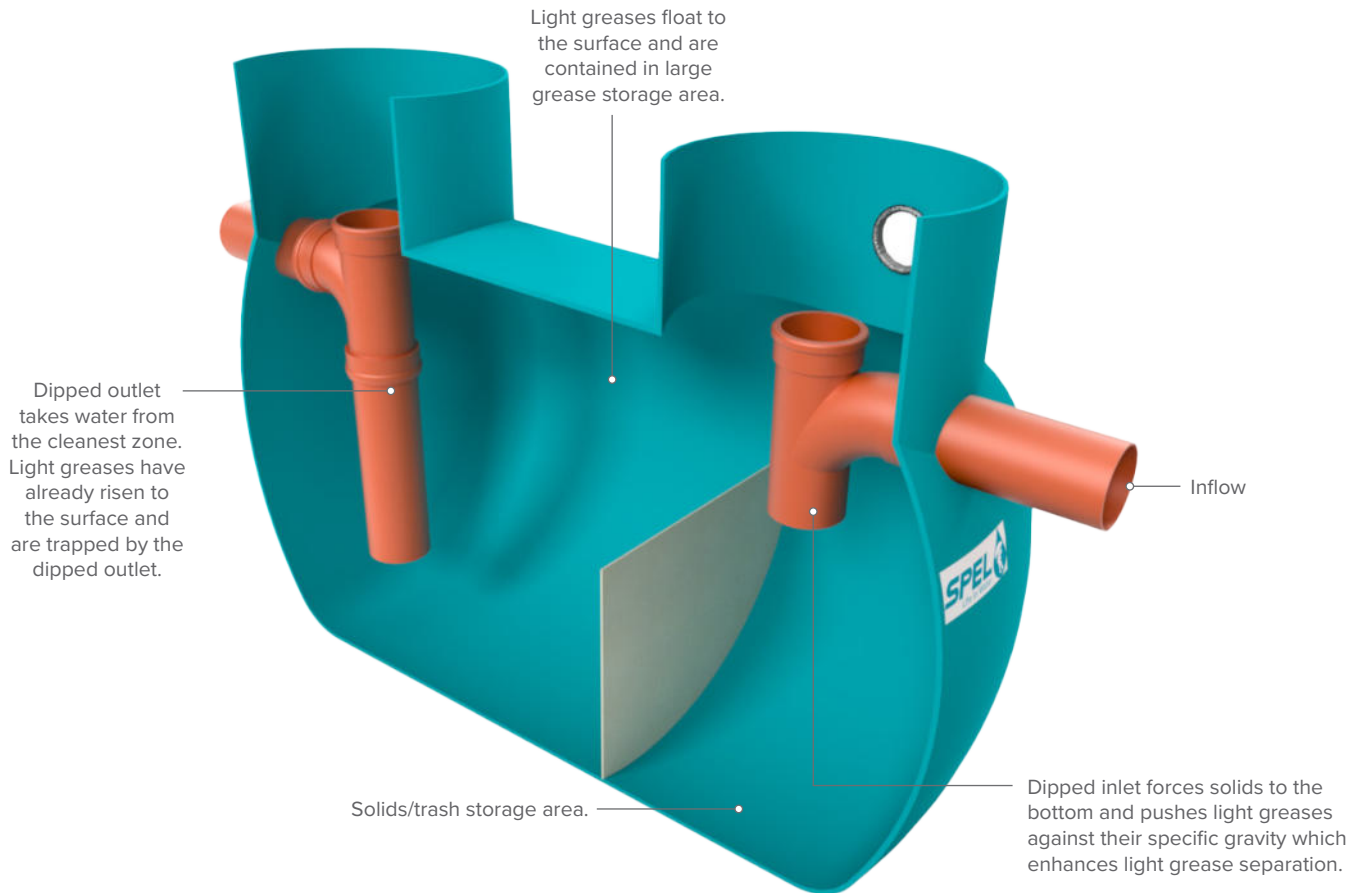
IMPORTANT

In the unlikely event of the chamber having to be entered ensure absolutely that all Workplace Health & Safety directives and Confined Space Regulations are strictly adhered to.



SPEL Grease Separator

Operation



Maintenance

SPEL automatic alarm/monitoring systems will automatically warn you when the SPEL Grease Separator requires emptying. However, regular inspections are recommended at intervals to suit the site conditions. We recommend the SPEL Grease Separator is checked at 3, 6, or 12 monthly intervals to ensure correct operation of the separator, alarm and check the pollutant levels.

Where a SPEL automatic alarm/monitoring system is not fitted, the SPEL Grease Separator should be checked at 3, 6, 12 monthly intervals, depending upon site conditions, to determine the depth of retained pollutants because there is no alarm that will automatically alert the client that the unit requires emptying. This is where the SPEL Automatic alarm/monitoring system is a huge time and cost saving as it automatically monitors the pollution build up within the system. When the depth of grease retained has reached the predetermined design level, or if excessive solids has accumulated, it should be emptied.

Maintenance is simply undertaken by emptying the complete contents of the unit. There are two access shafts (for access to either side of the solids baffle) to allow the level on both sides of the baffle to be lowered equally. The level on either side of the baffle must be lowered together otherwise excess pressure on one side of the baffle will likely break the baffle from its position.

Where SPEL Automatic Alarm/Monitoring System is installed

The SPEL automatic alarm/monitoring system probe should be lifted out of the tank, wiped clean and re-inserted, ensuring the monitoring probe is lowered to the same level as previously set. The system should now be reset according to instructions. See Section 8 (Alarms) in the SPEL Data Manual.

To test an alarm is working, ensure the previous step has been carried out.

Following this, a grease alarm should sound when clean and dry and in contact with air, therefore, holding it in the air should set off the alarm on the control panel.

Alarm for SPEL Grease Separator

Alarm systems are available for all SPEL treatment systems. There are also a range of control panels, for more detail on our alarm systems, please see Section 8 of the SPEL Data Manual.

GA-1 Grease Alarm



Dedicated alarm system for the full range of SPEL Grease Separators.

Using Your Grease Alarm with a SPEL Grease Separator

The GA-1 is purpose-built for grease separators. It consists of a wall-mounted control unit and a probe. The probe sits inside the separator and triggers an alarm when the grease layer builds up, signaling when it's time to empty the unit, preventing grease from entering our waterways. The control panel provides visual/audible alarms and a relay output for external systems.

SPEL supply the GA-1 as the dedicated alarm for their grease separator range. The alarm probe is installed at the depth recommended for the specific SPEL model. When the grease layer reaches the sensor, the GA-1 raises an alarm. The GA-1 panel can be sited away from the tank, and is available with additional options like a flashing beacon or BMS for call-outs.

Maintenance Requirements

We recommend that SPEL systems are checked at regular intervals to ensure the ongoing functionality of the system.

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

Our engineers are fully trained in operation, maintenance and compliance.

SPELGuard contracts available.
For more information contact us:
info@spelproducts.co.uk | 01743 445 200



SPELGuard Commissioning & Maintenance



Warranty

SPEL Underground Tank Shells

We warrant that our SPEL Tankstor® and Separator underground tank shells, as identified by the serial number, if installed strictly in accordance with the company's relevant installation procedure as detailed in the SPEL Data Manual, Section 7, Installation Guidance and verified with an 'as built' installation drawing prepared by a qualified design consultant or an approved person and stage photographs to show the methods adopted from start to completion having in mind particularly:- ground conditions, invert depth, water table depth in winter, external loading, type and quality of backfill material, will

1. providing our published specifications and installation requirements are fully met the shell laminate integrity will last for a period of twenty-five years following date of original delivery/collection.
2. not fail for a period of twenty-five years from the delivery/collection date due to external corrosion; and
3. not fail for a period of twenty-five years from the delivery/collection date due to internal corrosion provided the tank is solely used for:-

Rainwater storage

Potable water at ambient temperatures

Fuel/oil contaminated surface rainwater

Domestic sewage

For other applications the life expectancy will be determined by the contents, the operating conditions and the resin system/reinforcement specification used.

Our liability under this warranty is set out in SPEL General Conditions of Sale available on request. In brief they shall be limited to, at our option,

- (1) repair of the defective tank
- (2) delivery of a replacement tank to the original site or
- (3) refund of the original purchase price.

We shall not be liable for any labour or other installation costs, indirect or consequential loss, damage or other damages in connection with such tanks.

Accessory warranties do not extend beyond the warranty period by our suppliers. This applies to such items as access covers and frames, monitoring equipment, Bauer type connections for emptying, pumping equipment or any accessories as defined in the company's official order acknowledgement/invoice.

The foregoing constitutes our exclusive obligation and we make no express or implied warranties, or any warranty of merchantability or fitness for any particular purpose whatsoever, except as stated.

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

	Periodically to suit site requirements			As required	Suggested every 5 years
Date	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

	Periodically to suit site requirements			As required	Suggested every 5 years
Date	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

	Periodically to suit site requirements			As required	Suggested every 5 years
Date	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

Date	Periodically to suit site requirements			As required	Suggested every 5 years
	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

Date	Periodically to suit site requirements			As required	Suggested every 5 years
	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

Date	Periodically to suit site requirements			As required	Suggested every 5 years
	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

Maintenance Log

Site Visit and Maintenance Carried Out

Company		Address	
Model Number		Asset Number/Location	
Serial Number		Installation Date	

	Periodically to suit site requirements			As required	Suggested every 5 years
Date	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

	Periodically to suit site requirements			As required	Suggested every 5 years
Date	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

	Periodically to suit site requirements			As required	Suggested every 5 years
Date	Visual Check	Grease Probe Clean/Check (if applicable)	Alarm Control Panel Check/Test (if applicable)	Tank Empty	Structural Check
Tick all that apply					
Comments/Observations Date of Next Service:					

Operation & Maintenance

With SPEL Products

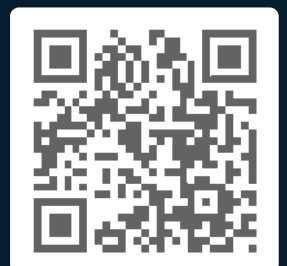
A guide that outlines the best practices, ensuring your SPEL system is achieving the best results for longer.



Lancaster Road, Shrewsbury, Shropshire SY1 3NQ

Phone: +44 (0)1743 445200

Email: info@spelproducts.co.uk / sales@spelproducts.co.uk



spelproducts.co.uk

Appendix H

General Maintenance Wildflower / Biodiverse Systems

WB blanket, Bauder Flora seed mixes and
wildflower plug planted systems



General maintenance procedures

Bauder biodiverse green roof systems

These practises should be carried out annually as part of a structured maintenance regime.

General Maintenance

Maintenance is necessary to keep biodiverse green roof systems in good condition. After installation, regular watering and minor upkeep will be needed until the planting has rooted into the growing medium and adapted to its location. The level of ongoing maintenance will depend on the species of vegetation included and the purpose for which it was initially installed. Whilst the intent may have been a naturalised biodiverse roof, this can cause problems with the build-up of dead or unwanted vegetation and its potential fire risks if not correctly maintained.

Bauder biodiverse green roofs include a selected species mix to provide a balanced plant community on the roof. They are currently installed to meet BREEAM or Biodiversity Net Gain targets and require maintenance to remain sustainable. Maintenance is best carried out annually, during springtime and in late autumn. This may include strimming and the removal of dead organic matter.

Please note: Designated biodiverse areas should be disturbed as little as possible during maintenance to minimise the upset of any micro-habitats that may have colonised.

Preliminary Maintenance Procedures

The following procedures should be carried out in order to ensure the roof is maintained in good condition and to protect the validity of the waterproofing system guarantee:

- Ensure that relevant health and safety procedures are followed when working at roof level, this includes making sure that safe access can be gained to the roof. It is advised that the contractor should always seek proof of current maintenance for any man-safe roof access systems prior to proceeding with the work on site.
- Ensure all dead vegetation is removed with a strimmer and provision made for the debris to be safely lowered to the ground and disposed of.
- Bauder recommends removing unwanted leaf litter that has fallen onto the roof surface from overhanging trees both in the spring and autumn, to ensure that this does not smother the vegetation beneath.
- Remove the lids of all inspection chambers, ensure that all rainwater outlets and downpipes are free from blockages and that water can flow freely away.
- Ensure that any protective metal flashings and termination bars remain securely fixed in place. Renew or repair as necessary.
- Examine all mastic sealant and mortar pointing for signs of degradation. Repair or replace as necessary.
- Check that all promenade tiles and paving slabs remain in position, secure and in good condition.
- Ensure that any new items of plant/equipment that may have been introduced to the roof are mounted on suitable isolated slabs and that any fixings used to secure the plant/equipment in place do not penetrate the waterproofing. If in doubt, please contact Bauder for further advice.
- The building owner should keep a record of all inspections and maintenance carried out on the roof. Any signs of damage, contamination or degradation to the waterproofing should be reported to Bauder immediately, in order for arrangements to be made to carry out remedial work if necessary.
- When carrying out any maintenance to adjoining roof areas, care must be taken not to damage either the green roof landscaping or the waterproofing system. If considered that either element has been effected, Bauder should

General maintenance procedures

Bauder biodiversity green roof systems

be contacted for advice. Any waterproofing damage caused after completion of the original installation may invalidate the guarantee.

- Any unauthorised alterations to the waterproofing system will invalidate the guarantee. If such a situation should arise, Bauder should be contacted to advise on the alteration and how it should be incorporated without effecting the guarantee.

Plant Related Maintenance Tasks

Plant encroachment

- Any vegetation which has invaded into drainage outlets, inspection chambers, walkways and the vegetation barriers (pebbles) should be removed. Additional washed stoned pebbles, similar to existing, can be added if movement or settlement of the pebble vegetation barrier has occurred.

Plant Maintenance

In the absence of a management plan for the green roof, the following activities should be carried out:

Maintenance of the Bauder Native Wildflower Planting

- In the late autumn the vegetation should be strimmed back to a height of 50-70mm and unwanted waste matter raked up and removed.
- To promote growth, an application of 80mg/m² of slow release organic fertiliser to the vegetation may be required.

Weeding

- In a biodiverse green roof, with the exception of saplings which should always be removed, weeds are only considered as an aesthetic problem. If weeds become invasive, they can be manually removed.

Irrigation

- The need for irrigation in a biodiverse green roof system is determined through a client's visual requirements of the vegetation.
- If it is intended that the roof should have colour and interest for the longest period through the growing season, then irrigation will significantly aid in achieving this. Should the requirement be only to deliver biodiversity, then the provision of sufficient watering points at roof level to allow for only occasional watering in periods of prolonged drought can be considered sufficient.

Support

Modern biodiversity green roof installations will normally require only minimal maintenance. Bauder is happy to offer advice on any green roof challenges. Enquiries should be forwarded to the Technical Department at the address below.

Please note: In the event of any query arising which it is thought may affect the condition of the system, then contact Bauder. Bauder cannot accept responsibility for any problem or failure due to use outside those parameters for which the system was designed or 'acts of god' beyond our control e.g. extreme weather conditions or damage through pests.

General maintenance procedures

Bauder biodiversity green roof systems

Bauder Green Roof Maintenance Service

Green roof maintenance service is carried out by Bauder's preferred maintenance providers. These experienced green roof maintenance companies have worked closely with Bauder carrying out maintenance services throughout mainland Britain for several years.

A typical maintenance programme includes:

- **Roof evaluation** - a comprehensive review of a Bauder green roof to determine what remedial work, if any, needs to be completed.
- **Removal of weeds and unwanted items** - over time a green roof can become congested with leaves, debris and other unwanted vegetation, which can be removed.
- **Inspection** - examination of roof outlets and removal of any encroaching vegetation to enable water to flow freely to rainwater pipes.
- **Application of fertiliser** - to help restore a green roof to its best, an organic slow release granular fertiliser will encourage growth.
- **Testing** - after all work has been performed, the irrigation system will be examined to ensure it works as expected.

This work can be undertaken by the companies detailed below, who directly manage the maintenance of green roofs and will cover all aspects of the service from quotations through to invoicing. Bauder and our preferred suppliers are committed to the arrangement and will ensure a continued high standard of expert care and advice for our customers.

Green roof maintenance contractors currently recommended to maintain green roof elements for the Bauder system

Green Maintenance in England and Wales:

The Urban Greening Company

Mr Mike Cottage
105 Ridgeway
Marlow
Buckinghamshire
SL7 3LH
07515 887868
greenmaintenance@tugc.co.uk
tugc.co.uk

Green Maintenance in Scotland:

Urban Utopia Landscapes

Mr Gavin Gale
Mayville Gardens East
Edinburgh
Lothian
EH5 3DW
0800 061 4353
office@urbanutopialandscapes.com
urbanutopialandscapes.com

If you would like Bauder to forward your details to one of the preferred maintenance companies, please email **c.rodick@bauder.co.uk** giving the details of the green roof and contact information with explicit permission for your details to be shared with the preferred supplier.

Appendix G



PACKAGE PUMPING STATION O&M MANUAL

CONTENTS

- 1) Company Details
- 2) System Details & Design
- 3) Key System Equipment List
- 4) Maintenance Schedules & Information
- 5) System Operation
- 6) System Start Up
- 7) Removal Of Equipment Instructions
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1) Company Details

Advantage pumping solution is a division of Harro Group and specialises in the supply, installation and servicing of pumps and pumping systems.

We provide our extensive services to all types of clients from commercial to manufacturing and retail industries; some being household names including a number of blue chip companies.

Our engineers pride themselves in the finished products and endeavour to prevent failure due to neglect. This simply is the reason for maintenance and will always be our main objective.

At Harro Group we provide service, maintenance and installation to pumping systems with engineers qualified for electrical work and confined spaces.

As with all electromechanical equipment, pump sets benefit from periodic inspection and adjustment. Our annual service contract charges vary according to UK area and are available on request on the contact details detailed below.

If you do not have a service contract with ourselves please call us on 01482 213550 to discuss your requirements. The benefit of a service contract with Harro Group includes:

- Priority call out facility becomes available.
- Beneficial rates to contracted customers.
- Reliable equipment, resulting in higher efficiency and less breakdowns.

Please find the below contact details for Harro Group.

Monday to Friday	07:00 – 16:30
Tel No:	0844 414 6646
E-mail:	sales@harrogroup.com

2) System Details & Design

The pump system we have provided comprises of a pump station complete with a control system.

Pump Station Layout

The typical layout of the pump stations would comprise of two pumps installed within a pump chamber supplied by Advantage and installed by the civils contractors. Advantage would terminate the pipework a short distance outside the chamber. The pump system would have the valve and pipework pre-installed inside the chamber for the ease of installation.

Hydraulic Calculation and Pump Selection

We have undertaken our own head loss calculations and have selected pumps based on the information provided.

Cabling

The pumps would be supplied complete with 10m of cable allowing the termination of the cables into the control panel. The float switches will be connected into the control panel. Advantage will terminate the cables on site. All of the cable ducts are to be installed by the civils contractor.

Control Equipment

Automatic level control would be provided via 4no floats as per the Advantage standard specification.

The pumps and control equipment will be wired back to a central control panel to the Advantage standard specification. The control panel will be a wall mounted control panel. The control panel will include a common BMS fault signal for the system.

It will be the responsibility of others to provide and connect a suitably rated power supply to the control panel.

Pump Station Pipework & Valves

The pipework within the pump chamber and valve chamber will be heavy duty pipework. The valves will be standard gate and swing check valves.

Pumps

The pumps we have specified are extremely heavy duty pumps, however to maintain reliability and operation of the pump station we advise any rags, fibrous materials, sanitary disposables and other such materials are bagged and disposed of elsewhere.

3) Key Equipment List

The system we have supplied comes complete with the following key pieces of equipment.

Description	Qty	Manufacturer
Submersible pump	2	See pump manual attachment
Underground tank unit	1	Advantage
PVC pipework	1	Advantage
Cast iron isolation gate valves	1	Advantage
Cast iron swing check valves	2	Advantage
Control Panel	1	Advantage
Level control float switches	4	Triton Controls

PASSWORD LIST

Description	Password

4) Maintenance Schedules & Information

Advantage systems have been designed to keep major maintenance requirements to a minimum. Planned maintenance of the pumps and other principal components should therefore be undertaken at the intervals recommended in the manuals referenced below. In addition, the operator in charge should routinely make visual checks of the equipment during use, noting particularly any unusual noises or vibrations. This will give an immediate indication of any irregularity in the operation of the system.

IMPORTANT - DO NOT COMMENCE WORK UNTIL YOU ARE DRESSED IN THE CORRECT PROTECTIVE CLOTHING AND HAVE ALL NECESSARY SAFETY EQUIPMENT TO HAND

ROUTINE MAINTENANCE INTERVAL SUMMARY

Interval	Maintenance Required
Weekly	Check the system visually to ensure there are no fault lights present.
Monthly	Check the system visually to ensure the float switches/level controls are in the correct position and there is no build-up of deposits.
	Carry out a visual check of the system watching the operation of a full cycle
	Observe the running of the pump(s) and note any unusual vibration etc.
6 Monthly	Check the level controls and ensure these are operating correctly – clean if required.
	Take electrical readings on the motors of the pump to ensure there has been no breakdown.

Pump(s)

Please refer to the maintenance section of the pump manual – see attached manual.

Accessories

Please refer to the maintenance section of the manuals attached for other equipment.

We would also recommend the pump system is serviced on a six-monthly basis by a trained engineer to maximise the performance and reliability of the unit. For installation where a large volume of fibrous material enters the pump station we would recommend using a vacuum tanker to remove the fibrous waste as required

5) System Operation

SYSTEM OPERATION

The system is designed to be left in automatic mode and will work automatically without users having to operate the system. Please see the below details for how the system works.

- 1) The liquid enters the chamber by gravity through the inlet pipe(s).
- 2) When the liquid reaches the 'Start' float switch the pump will start and will pump the liquid out of the pump station through the rising main pipework. The pump will stop automatically when the 'Stop' float switch has de-activated.
- 3) If there are two pumps fitted the pumps alternate on each start ensuring that pump pumps wear evenly and preventing pumps from seizing from not operating for long periods of time.
- 4) If the main duty pump was to fail the liquid would continue to rise and activate the 'standby' or 'assist' float switch. This will start the second pump and when the level drops to the 'stop' float this pump will stop running.
- 5) If the liquid continues to rise the high-level alarm float switch will be operated which will show a light on the main panel and flash a beacon. If a alarm alert unit is fitted the alarm will trigger the signals to be sent.
- 6) The pump system comes with a control panel to control the pumps with the following features:
 - a. Hand/Off/Auto switches for each pump which should normally be set it the auto position. The hand position is on a spring return to prevent the pump being left in hand and burning out.
 - b. A running indicator for each pump showing when the pump is running.
 - c. A tripped indicator light for each pump showing on the overload has tripped for the pump. This happens when the pump becomes jammed or blocked with debris and will prevent the pump from running.
 - d. Trip-reset buttons to reset the pumps if they have tripped. If the pump continues to trip there is an issue with the pump unit.
 - e. High level alarm light showing that the pump station is at a high level and could overflow if not actioned.
 - f. Power on light which shows that there is power at the control panel.

6) System Start Up

COMMISSIONING CHECK LIST

Having checked the pump station is installed in accordance with the installation guide and requirements set out work through the following points to ensure the system is commissioned correctly.

- 1) Remove the access cover(s) from the pump station.
- 2) Check to ensure that the isolation valves within the pump station are fully open.
- 3) Check to ensure that any inlet isolation is fully open.
- 4) Turn on the control panel and pump isolators and turn both pumps to the automatic position.
- 5) Check the operation of the float switches by lifting up the float switches and turning upside down to ensure the sequence of the pump is operating correctly.
- 6) Let the level rise within the chamber and ensure that this starts the first pump and then this pumps downs and stops on the stop switching point.
- 7) Run a second cycle to ensure that the second pump starts and stop correctly.
- 8) Check the cycle for a standby application by turning the duty pump to off position and wait for the standby/assist pump so start.
- 9) Ensure there is no water spraying from the pump connection onto the pipework and re-seat the pump if necessary.
- 10) Check the high level alarm and ensure that this flashes the beacon and sends a message if required.

PROGRAMMING THE CONTROLLER(S)

Sometimes Advantage fit a number of different makes and types of Controllers - the choice depends on the most suitable for the design duty of the system - and each has a slightly different set of procedures for initial setting-up. Hence it is not possible to generalise here and reference must be made to the appropriate Controller manual under section 12.

However, it can be said that each model will have a step-by-step setting-up procedure which should be followed carefully, ensuring that remaining data required to be entered by the end user is accurately inserted where requested. If in doubt please call Advantage Technical Support for advice.

NOTE: No manual operation or attendance is required other than for routine servicing and maintenance checks - see Sub-section 4 later in this Section. Other than for maintenance purposes, the supply to the Controller(s) and the Pump motor(s) should never be switched off.

7) Removal Of Equipment Instructions

HEALTH & SAFETY NOTICE

The pump chains can be reached from the surface around the pump system. When lifting the chains this must be done carefully and the operator's body must not be above the opening – only the operator's arm should be. If any further works that require further reaching and stretching a portable fall arrest system should be utilised to ensure it is safe to carry out the works.

Before any task is carried it must check against the safe system of work and it is safe to carry out the work.

PUMP REMOVAL

- 1) Isolate the affected pump by selecting OFF at the pump HAND/Off/AUTO switch on the control panel.
NOTE: If the pumping station is to remain in service – with the other pump working on its own – it is essential that the affected pump controls are disabled by isolating or switching the circuit breakers
- 2) Disconnect the affected pump motor cables at the control panel terminals, noting carefully the terminal positions for each wire. Plug off the cable entry hole at the panel.
- 3) Close the control panel door and return the main isolator to ON.
- 4) Lift the affected pump clear of the chamber by means of the lifting chains provided.
NOTE: Check the pump weight before attempting a manual lift. The coupling fitted to the pump permits it to be removed and refitted simply by lifting it clear with the chain, the pump assembly sliding up and down the its guide rail. No manual disconnection of the pipework is required, and thus it is not necessary for personnel to enter the chamber to remove a pump for servicing.
- 5) Hose off the pump thoroughly.

PUMP REFITTING

- 1) Check the affected pump HAND/Off/AUTO switch on the Control Panel facia is still in the OFF position. Switch the main isolator to OFF.
- 2) Lower the pump back down into the chamber on its guide rail, using the lifting chain provided. When in position on its pedestal, its own weight will 'lock' the pump discharge connection into position.
- 3) Re-connect the pump cable at the panel terminals, taking care the gland entry is properly re-sealed.
- 4) Refit or reconnect fuses as appropriate – see NOTE under paragraph 1 of 'Pump Removal' above.
- 5) Close the panel door and switch the main isolator back to ON. Reset the pump switch to AUTO mode and check for correct operation of both pumps through a complete set of cycles in accordance with the procedures in Section 6 of this manual.

8) Health & Safety Guidance

United Kingdom Health & Safety at Work Act 1974

Section 6 (a) of this Act requires manufacturers to advise their customers on the safety and the handling precautions to be observed when installing, operating, maintaining and servicing their products. The user's attention is therefore drawn to the following:

- 1) The appropriate sections of this manual must be read before working on the equipment.
- 2) Installation, operating and maintenance must only be carried out by suitably trained/qualified personnel
- 3) Normal safety precautions must be taken and appropriate procedures observed to avoid accidents.

Refer to Advantage Pumps for any technical advice or product information.

NOTE: It is the responsibility of the customer and/or the contractor

- to ensure that anyone working on the equipment is wearing all necessary protective gear/clothing,
- is aware of appropriate health & safety warnings
- has read the information in this section of the manual.

WARNING: PUMP SYSTEM SERVICING

Before attempting to open or service a pump system:

- 1) Familiarise yourself with the relevant contents of this manual.
- 2) Installation, maintenance and repair work must only be carried out by trained, skilled and suitably qualified personnel.
- 3) Disconnect or lock-out the power source to ensure that the pump(s) will remain inoperative. NOTE: locking out the equipment by switching off the release mechanism or set value cannot prevent accidental starting of the motor.

LEPTOSPIROSIS

Leptospirosis comes in two forms within the UK with the main form being Weil's Disease which is transmitted by the urine of infected rats.

Infection is generally as a result of the bacterial entering the body through cuts, ears, mouth and throat and contact with an infected liquid. The disease has symptoms that to influenza with a severe headache.

To prevent infection cover all cuts using a waterproof covering and wear protective clothing. Wash through after handling any potentially contaminated liquid and sewage and especially before eating, drinking and smoking.

Report any illness to you doctor and inform them of the nature of the work you have been carrying.

SEWAGE GASES

Sewage gases can be very explosive and toxic. The equipment and the area surrounding the pump station subject to the following safety precautions.

- NO SMOKING.
- No naked flames or sparks.
- Only qualified people may carry out maintenance / service work on the system.
- Temporary barriers and signs should be erected around the area.
- Nobody should enter the chamber until the air has been checked using a portable gas detector.
- Nobody may enter the chamber until the equipment and is switched off/isolated electrically and locked off.

ELECTRICAL SAFETY WARNINGS

1. High Voltages - Especially When Electronic Equipment Is Fitted

When electronic equipment is connected to the power supply the components of the power unit - as well as certain components of the master control unit - are also connected to the power supply. **TOUCHING THESE COMPONENTS CAN SERIOUSLY ENDANGER LIFE!**

Before removing the frequency inverter cover, the system must be disconnected from the power supply. After switching off the power supply wait at least 5 minutes before starting work on or in the inverter drive head - the capacitors in the intermediate circuit must be given time to discharge completely via the discharge resistors.

Up to 800 volts can be present - if there are faults this can be higher.

All work carried out when the frequency inverter is open must be performed only by suitably qualified and properly authorised personnel. When connecting external control wires care must be taken not to short circuit adjacent components. Bare cable ends which are not in use must be insulated.

THE SYSTEM MUST ONLY BE OPERATED WHEN IT HAS BEEN PROPERLY EARTHED AND PIPES BONDED TO EARTH IN ACCORDANCE WITH IEE REGULATIONS

2. Electronic Safety Devices

The equipment used in Advantage's systems contain electronic safety devices which switch off the control element in the event of a fault developing: the motor has zero current but remains energised and comes to a stop. The motor can also be stopped by 'mechanical blocking'. If it is switched off electronically, the motor is disconnected from the mains voltage supply via the electronics in the frequency converter, but it is not voltage-free in the circuit itself.

NOTE: as well as voltage fluctuations, power failures (temporary outages) can cause the motor to switch itself off.

Repair of faults can cause the motor to start up again unexpectedly!

3. High Voltage Testing May Damage Electronic Components

High voltage tests of the inverter or the motor may damage the electronic components. Bridge before the incoming and outgoing terminals L1 - L2 - L3 and U - V - W.

NOTE: To avoid incorrect metering by capacitors incorporated in the electronic circuits, isolate the motor from the inverter drive head (if applicable).

9) Fault Finding

Please see the below table to assist with fault finding on the pump system. If in doubt please call Advantage as detailed in Section 1 in the manual.

Item / Fault	Possible cause/s	Recommended action
Pump will not run	Power Failure	Check the main isolator is ON.
		Check that a power supply exists prior to the control panel (e.g. at the Distribution Board).
	Electrical/Mechanical Fault (If an overload condition exists, the appropriate pump TRIPPED lamp will be illuminated)	Check to identify the exact cause by overriding the auto control of the pump/s and trying to run in HAND mode. Reset overload if appropriate. If the pump motor does not start – or runs for a very short time – press the RESET button on the panel facia (or inside the panel as appropriate), and try again. If the motor still does not run correctly, proceed as follows:
		Switch off at the control panel. Remove pump.
		Check that the pump is free to rotate and that there is no pipe blockages and try again.
		If still unsuccessful, switch off at the main isolator and call Advantage to check all motors and electrical circuits.
High Level Alarm	Pump/s will not run.	See under 'Pumps will not run' above
	Pump/s or piping blocked.	See under 'Pump runs for longer than normal'
	Surge flows.	Re-check design flows and conditions
	Float switch settings disturbed.	Stop the inlet flow and use the HAND mode to pump out the contents of the chamber as far as possible.
		Check switching point positions and rectify as necessary.
	Air-locked Pump (no visible sign)	Proceed as for 'Partially blocked pump', partially lifting pump releasing air from the volute.

Pump starts too frequently	Duty Start switching point set too low	Reset the switch position higher.
		Stop the inlet flow to the chamber.
		If applicable, check the float switch setting mechanism is re-tightened and replace the access cover. Double-check that the mode switch is returned to AUTO.
		Reset the level of the Duty Start switching point, raising it by approx. 50mm (2"). This will increase the retention time in the chamber.
	Non-return valve	Stop the inlet flow and use the HAND mode to pump out the contents of the chamber as far as possible.
		Look for signs of liquid flowing back into the chamber around the inlet to the (one of the) non-running pump.
		Remove the suspect non-return valve, check and replace the seal as necessary. NOTE: Isolate any back flow and release pressure before attempting to disconnect pipework joints.
		Re-assemble and re-fill with water via a hose.
		Open any closed valves on the discharge side and set the pump switches to AUTO.
		Run the unit using water and check for correct operation of the repaired/replaced non-return valve.
Pump runs for longer than normal	Partially blocked pump.	Proceed below, but in addition, lift the affected pump using the guiderail and clear the blockage.
	Hydraulic load changes.	Re-check design flows and conditions
	Non-return not sealing properly.	See 'Pump starts too frequently'
	Discharge pipe blockage.	Stop the inlet flow and switch the pumps off.
		Remove the access cover and close the isolating valve.
		Disconnect the discharge (outlet) pipe, check for any obvious blockages and rod out locally as necessary to clear. NOTE: Any blockages may cause a build-up of liquid in the pipework, so ensure that the pressure is relieved before attempting to disconnect any pipework joints. If a blockage is suspected further up the discharge line, gain access via a suitable manhole and rod out using conventional tools.
		Re-assemble the pipework and switch back to AUTO mode.
		Run the system and check for correct operation

Flooded Pumping Station		Isolate the electrical power supply to the Pumping Station.
		Stop the inlet flow to the chamber.
		Using a separate portable pump, reduce the liquid level in the chamber as far as possible.
		If a junction box is fitted in the chamber, open the cover and clean and dry thoroughly. Insure that all cable ends are completely dry and check for any liquid ingress into cables and sheaths. Carry out electrical insulation tests prior to switching it 'on'.
		Switch on the main isolator again and unstop the inlet flow. If a pump 'trips', switch off again and re-check the integrity of all electrical components. If in doubt, call Advantage.
		Check for the cause of the 'flooding' and rectify as appropriate.
Pump station smells	Liquid retention time too great	Stop the inlet flow to the chamber.
		Use Pump No.1 in HAND mode and pump out the contents of the chamber as far as possible.
		Reset the level of the Duty Start switching point, lowering it by approx. 150mm (6"). This will reduce the retention time in the chamber by running the pump more frequently. NOTE: The maximum number of 'pump starts' per hour is 15. Check the cycle time after resetting the switching to ensure the pump does not re-start more frequently than once in 4 minutes.
		If applicable, check the float switch setting mechanism is re-tightened and replace the access cover. Double-check that the mode switch is returned to AUTO.
	Total System Failure	Call Advantage Pumps

Controller(s)

Please refer to the fault-finding section of the controller manual at the end of this manual.

10) Drawings

11) Manufacturers Information

