

SuDS Management and Maintenance Plan

Proposed Residential Development
Land at Woodend, Netherley Road
Tarbock Green, Knowsley
L35 1QE

CLIENT

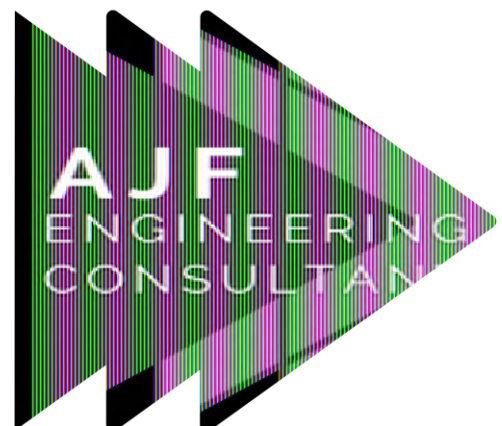
DOWLS CONSTRUCTION LTD

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1. INTRODUCTION

- 1.1. This report has been prepared to set out the principles for the post completion management and maintenance of the proposed surface water Sustainable Drainage Systems (SuDS) and serviceable drainage infrastructure at the proposed residential development at land on Woodend, Netherley Road, Tarbock Green, Knowsley, L35 1QE.
- 1.2. The purpose of this document is to outline the roles and responsibilities of the adopting managing company for the robust inspection and maintenance programme, ensuring the optimum operation of the surface water drainage network is continually maintained for the lifetime of the development and therefore prevent the any increasing risk of flooding (both on- and off-site) over time as a result of drainage elements losing functionality.
- 1.3. This plan has been comprised of and is directly referenced from the latest technical SuDS guidance within the CIRIA Report C753 The SuDS Manual (2015) and other applicable guidance.
- 1.4. This document will include the following specific sections in the order stated below:
 - A description of the SuDS components present on site, their capacities/controls and intended uses.
 - Details of the intended arrangements for managing/maintaining of the SuDS elements and access arrangements.
 - Maintenance requirements for each SuDS component and frequencies.
 - Inspection requirement and frequencies.
- 1.5. The listed activities are generic to the relative SuDS types and represent the minimum maintenance and inspection requirements, however additional tasks or varied maintenance frequency may be instructed by the maintenance company as required. In any case, the manufacturers manual and warrantee information of the specific SuDS feature should be provided to the maintenance company. Specific maintenance needs of the SuDS elements should be monitored and maintenance schedules adjusted to suit requirements. In some cases, this may require personnel to attend site from the SuDS manufacturing company and sign-off from their behalf.
- 1.6. All those responsible for maintenance should follow relevant health and safety legislation for all activities listed within this report (including lone working, if relevant) and risk assessments should always be undertaken.
- 1.7. A copy of the Health & Safety File should be made available to the prospective property owners and managing company for their guidance and background information.
- 1.8. This plan is to be read in conjunction with drawings 25085-AJF-ZZ-ZZ-DR-D-001 - Proposed Foul & Surface Water Drainage, and as well as the relevant construction details.

2. SuDS Layout and Design

2.1. The main SuDS components with the surface water drainage strategy are:

- SuDS Geocellular Storage Crates/Tank
The rest of the development's new drainage for the roofs, external pavements, parking areas and private road drainage via the use of permeable & impermeable macadam and block paved surfaces into the below ground surface water system before discharging into surface water tanks formed from pre-formed crates with 95% air void ratios. The main drainage then discharges into an existing private surface water sewer within the site at a restricted rate of 7.42 l/s. The attenuation tanks have a combined storage volume of 435m³. The upstream and downstream manholes will have a 400mm - 600mm catchpit sump to aid cleaning and inspection. The responsibility of inspecting the catch pit and identifying any drainage systems that are not operating properly lies with the property owners or management company.
- Inspection Chambers and Rodding eyes.
Inspection Chambers and rodding eyes are used on bends or where pipes come together or at the head of drainage runs. They allow cleaning of the system if necessary.
- Permeable Paving / Diffuser Units
The areas of permeable paving are designed to allow infiltration of surface water run-off through the joints in the block paving surface course and into the subbase below. The water is then attenuated within the subbase and discharged to the new drainage system. As part of the permeable paving systems, diffuser units are used to discharge surface water run-off from roof areas into the sub-base, as well as forming links between areas of permeable paving. These diffuser units are small heavy-duty cellular units which allow more efficient discharge of surface water into the sub-base base of the permeable paved areas. The responsibility of inspecting the permeable paving and identifying any drainage systems that are not operating properly lies with the property owners or management company.
- Soft Landscaped areas
The design includes plenty of open grassed and vegetated areas in the front and rear gardens that will contribute to SuDS. Raingardens and other landscaped SuDS features can also be incorporated within the site. These are to be regularly maintained by the property owners.

2.2. The main components with the foul water drainage strategy are:

- Klargester Bio-disc or similar - Foul Water Treatment Plant
A new foul drainage system will be provided within the site to pick up proposed internal connections within each plot and will discharge to a new proposed Klargester Bio-Disc Package Treatment Plant to be located within the land to the south of the plots at the minimum specified distance. The new Bio-disc treatment plant will discharge to new drainage field within the land to the south of the plots. The client / property owner will be entering into a maintenance agreement with one of the local drainage services providers who will empty and maintain the Bio-Disc throughout their lifespan.
- Inspections Chambers, Floor gullies, Non-Return Valves and Rodding Eyes
A new foul drainage system will be provided within the site to pick up proposed internal connections within each building and will discharge to a new below ground foul drainage system. The foul drainage system will include, new chambers, pipework, floor gullies, rodding eyes and non-return valves. The property owners / management company will need to enter into a maintenance agreement with one of the local drainage services providers can inspect/rod/clear/jet the foul drainage system throughout its lifespan.

3. SuDS Management & Maintenance

3.1. The sustainable drainage management and maintenance plan should include arrangements for the sustainable drainage systems to be adopted by an appropriate management and maintenance body. In this case, as the development comprises several dwellings in the form of houses, the property owners or residents will need to appoint an appropriate management company to manage and maintain the SuDS within the development. This will be no different to any other maintenance arrangements within the development such as landscaping, street-lighting. The property owners or residents will be liable for the maintenance of the system as set out in their title documents or maintenance schedule / arrangements. The property owners shall be supplied with this SuDS document as

part of the information provided to them upon completion of the construction works. The table below outlines the adopting body for the site SuDS elements.

- 3.2. The Property owner in this instance will be the developer until the new houses are sold to individual private owners. They will manage and maintain the drainage on the development. The Developer's contact information is as follows;

Dowls
Mere Grange, Leaside Road, St Helens,
WA9 5GG
0800 193 0151
hello@dowls.co.uk

- 3.3. There are several companies in the area who offer drainage maintenance services particularly emptying of the treatment plant / bio-disc, below are the details of a couple companies that the client will be advised to engage and enter into a maintenance agreement with;

Lanes for Drains PLC
Lancing House, Broughton Mill Road, Bretton CH4 0BY
0800 526 488

Metro Rod
Unit 6, The Bridge Water Complex, Canal St, Bootle, Liverpool L20 8AH
0151 909 2807

SuDS Feature	Management/Maintenance Responsibility
Pipework and Chambers	Property Owner / Management Company
Geocellular Storage Tanks & Soakaways / Rainwater Harvesting Tanks	Property Owner / Management Company
Drainage outfall from hardstanding areas to positive drainage network within site	Property Owner / Management Company
Soft Landscaped areas (grasses, shrubs)	Property Owner / Management Company
Foul treatment Plant / Bio-Disc and other foul drainage infrastructure.	Property Owner / Management Company
Existing Drainage Outside of site boundary	Statutory Undertaker / Owner of Existing Assets

- 3.4. The management and maintenance plan should also include arrangements for inspection and ongoing maintenance of all elements of the sustainable drainage system to secure the operation of the surface water drainage scheme throughout its lifetime.
- 3.5. CIRIA C753 provides guidance on the operation and maintenance requirements of sustainable drainage systems and shall be referred to during the detailed design for the proposed development. The Construction (Design and Management) Regulations 2015 also requires designers to consider all maintenance risks and ensure they are eliminated, reduced, or controlled where appropriate. The project health and safety file will be required to contain this information.
- 3.6. The design life of some SuDS elements and drainage elements of the proposed system is shorter than the predicted design life of the development. Therefore, the design and maintenance regime account for any potential replacement works (such as replacing permeable paving).
- 3.7. Though not a SuDS feature as such, rodding eyes have also been allowed for in accordance with Building Regulation Part H to allow for the unblocking of lateral drains via rodding.

3.8. There are three categories of maintenance activities referred to in this report:

- **Regular maintenance (including inspections and monitoring).**
Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter, and debris removal, and inspections.
- **Occasional maintenance**
Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).
- **Remedial maintenance**
Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

3.9. The tables below outline the regular operation and maintenance regimes recommended for the site in accordance with CIRIA C753.

Operation and Maintenance Recommendations for Surface Water Systems (pipes, chambers, etc)		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspection for sediment and debris in catchpit manholes and gullies. Clean out as required.	Twice Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required base on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional Maintenance	Remove sediment and debris from catchpits, gullies, attenuation devices and inside of concrete manhole rings	As required, based on inspections
Remedial Actions	Reconstruct and/or replace components, if performance deteriorates or failure/blockage occur	As required
	Replacement of clogged components (flow restriction)	As required
Monitoring	Inspect silt traps/gullies/catchpits and note rate of sediment accumulation	Monthly in the first year and then annually
	Check flow control chamber and attenuation devices	Annually

Operation and Maintenance Recommendations for Attenuation tanks		
Maintainance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockages by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually (or as required)
Remedial Actions	Repair/ rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Operation and Maintenance Recommendations for Flow Control Devices		
Maintainance Schedule	Required Action	Typical Frequency
Monitoring	Initial inspection	Monthly for 3 months after installation
	Inspect silt accumulation rates	Annually
	Monitor inspection and hydrobrake chambers	Annually, 48h after large storms

Operation and Maintenance Recommendations for Channel / Slot Drains		
Maintainance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from channel drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect channel drain surface, inlet/outlet pipework and control systems for blockages, clogging standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six Monthly

Operation and Maintenance Recommendations for Pervious Paving Systems		
Maintainance Schedule	Required Action	Typical 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 manufacturer's recommendations

Occasional Maintenance	Stabilise and mow any contributing and adjacent areas.	As required, based on inspections
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	
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 considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
Monitoring	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly for the first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

- 3.12. The maintenance arrangements for the Klargestor Bio-Disc or similar Package Treatment are to be confirmed by the supplier of the unit.

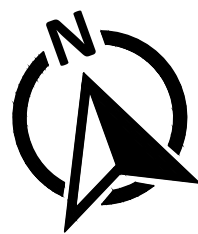
4. Future Alterations to the Development

- 4.1. Any future alterations to the proposed drainage systems should be confirmed by a specialist and / or engineer. The property owner is to liaise with the drainage engineer and any specialist suppliers to ensure any changes to the drainage will not impact the operation of the drainage systems.
- 4.2. All alterations are to be carried out in line with the latest specifications and guidance.

5. APPENDICES

Appendix A

Proposed Drainage Foul & Surface Water Layout



MH F12
EFFLUENT PUMPING STATION P801
10000 GRP
Twin Pumps (duty/standby)
Max pump rate: 5.0 l/s
Design head = 2m (TBC)
Cover level: 14.154
Invert level: 11.200
Surge Level: TBC

CONTROL PANEL, VENT PIPE, AND
DUCT ROUTE LOCATIONS BY
OTHERS (SUPPLIER), TO HAVE 24
HR STORAGE & ALARM



LOCATION AND DEPTH OF
EXISTING STREAM TO BE
CONFIRMED

DIRECT CONNECTION 1

Proposed Foul Water Outfall into Existing Ditch

Outfall 1
IL: 11.220 Outgoing 1000 (TBC)
(Contractor to confirm existing Invert level prior to commencing drainage works.)

Non-return Valve to be installed on incoming pipe.
Contractor to make good manhole construction upon completion of works.

PPIC F13
RECEPTION CHAMBER
3000 IC (Type E)
B125 LOAD CLASS
CL: 14.178
IL: 13.245

KLARGESTER
BIODISC BB
DOMESTIC SEWAGE
TREATMENT PLANT

PPIC F29
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.567
IL: 12.210

PPIC F30
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.424
IL: 11.820

PPIC F28
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.424
IL: 12.700

PPIC F10
3000 IC (Type E)
D400 LOAD CLASS
CL: 13.500
IL: 11.470

PPIC F09
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.572
IL: 11.470

PPIC F08
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.618
IL: 11.520

PPIC F21
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.508
IL: 11.510

PPIC F20
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.467
IL: 11.530

PPIC F27
3000 IC (Type E)
D400 LOAD CLASS
CL: 13.467
IL: 12.385

PPIC F26
3000 IC (Type E)
D400 LOAD CLASS
CL: 13.467
IL: 12.500

PPIC F25
3000 IC (Type E)
D400 LOAD CLASS
CL: 13.467
IL: 12.715

PPIC F06
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.495
IL: 12.145

PPIC F05
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.425
IL: 12.305

PPIC F04
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.480
IL: 12.505

PPIC F03
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.449
IL: 12.675

PPIC F02
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.349
IL: 12.900

PPIC F01
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.427
IL: 13.000

PPIC F15
3000 IC (Type E)
B125 LOAD CLASS
CL: 12.978
IL: 12.235

PPIC F14
3000 IC (Type E)
B125 LOAD CLASS
CL: 12.948
IL: 12.340

PPIC F16
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.222
IL: 11.900

PPIC F17
3000 IC (Type E)
D400 LOAD CLASS
CL: 13.315
IL: 11.785

PPIC F18
3000 IC (Type E)
D400 LOAD CLASS
CL: 13.320
IL: 11.735

PPIC F22
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.234
IL: 12.550

PPIC F23
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.193
IL: 12.390

PPIC F24
3000 IC (Type E)
B125 LOAD CLASS
CL: 13.206
IL: 12.185

ATTENUATION FACILITY AF01
CL: VARIES (MIN 13.325m)
IL: 11.450m
SL: 12.695m

POLYSTORM PSM1A UNITS (3 LAYERS) - STORAGE VOLUME REQUIRED : 152.0m³
1 IN 100 YEARS PLUS 40% CLIMATE CHANGE
18.5m x 13.0m x 1.2m TANK SIZE (37 x 13 x 2 UNITS)
UNIT DIMS: 1.000m x 0.500m x 0.400m DEEP WITH 95% NOMINAL VOIDS.

MODULAR UNITS TO BE WRAPPED WITH 1mm THICK IMPERMEABLE GEO-MEMBRANE
REFER TO DRAINAGE MODELING CALCULATIONS.

NON RETURN VALVES TO BE PROVIDED ON ALL TANK ENTRIES.

NOTE: MODULAR UNITS REQUIRE 450mm MINIMUM BACKFILL COVER PRIOR TO
DRIVING OVER WITH SMALL EXCAVATORS OR PLANT.

DIRECT CONNECTION 2
Proposed Combined Connection into existing Surface Water Manhole
Contractor to confirm ownership of manhole
As per Section 106 Approval

SW-A (Exig MH03)
12000 MH (ASSUMED)
B125 LOAD CLASS
CL: 12.994
IL: 11.220 Outgoing 7500 (TBC)
IL: 10.620 (Existing Incoming / Outgoing 750mm pipe)
(Contractor to confirm existing Invert level prior to commencing drainage works.)

Non-return Valve to be installed on incoming pipe.
Contractor to make good manhole construction upon completion of works.

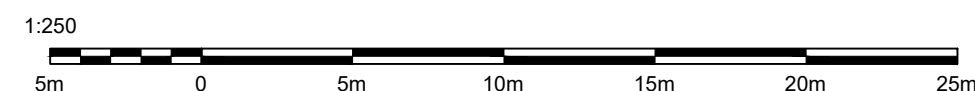
PPIC SW09
12000 MH
D400 LOAD CLASS
CL: 12.662
IL: 11.325
Type B
HYDRO-BRAKE
Discharge Rate restricted to 7.42l/s.
As Per the Drainage Strategy.



INFILTRATION TANK DESIGN HAS ALLOWED FOR SUBSEQUENT
ALL RWP'S DISCHARGE DIRECTLY INTO THE TYPE 3 SUB BASE
BLEW THE PERMEABLE PAVING AREAS.
SUB-BASE TO BE SURROUNDED BY IMPERMEABLE MEMBRANE
WITH OUTLETS PROVIDED TO DRAINAGE SYSTEM

KEY

- SITE BOUNDARY
- PROPOSED SURFACE WATER DRAIN
- PROPOSED FOUL WATER DRAIN
- EXISTING PRIVATE SEWERS
- PROPOSED SW OUTLET PIPE
- PROPOSED SURFACE WATER PRECAST MANHOLE - (1200mmØ - 2100mmØ)
- PROPOSED SURFACE WATER POLYPROPYLENE INSPECTION CHAMBER - TYPE D/E (300mmØ - 600mmØ)
- RAINWATER PIPE DOWNPIPE
- ROAD GULLY
- PROPOSED FOUL WATER (PRIVATE) POLYPROPYLENE INSPECTION CHAMBER - TYPE E (300mmØ - 600mmØ)
- SOIL VENT PIPE / SOIL STACK
- PROPOSED TANKED PERMEABLE PAVING (0.3m DEEP MINIMUM WITH 30% VOIDS)
- PROPOSED ATTENUATION TANK



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NOTES

- DO NOT SCALE FROM THIS DRAWING. USE ONLY WRITTEN DIMENSIONS.
- ALL PIPE DIAMETERS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES UNLESS OTHERWISE STATED.
- LOCATIONS AND LEVELS OF CONNECTIONS TO EXISTING SEWERS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO COMMENCING WORKS. ANOMALIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
- COVER LEVELS FOR MANHOLES AND INSPECTION CHAMBERS ARE INDICATIVE ONLY - THEY SHALL BE LAID FLUSH WITH THE ADJACENT SURFACING.
- ALL WORKS TO COMPLY WITH 'DESIGN & CONSTRUCTION GUIDE LATEST EDITION'. ALL WORKMANSHIP TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) UNLESS OTHERWISE STATED.
- PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
 - PROPOSED PIPEWORK WITH <1.2m DEPTH TO SOFFIT IN ROAD/SERVICE AREAS.
 - OR <0.9m DEPTH TO SOFFIT IN PEDESTRIAN AREAS & DOMESTIC DRIVEWAYS WITH 7.5T VEHICLE WEIGHT LIMIT.
 - OR <0.5m DEPTH TO SOFFIT IN PEDESTRIAN AREAS & DOMESTIC DRIVEWAYS WITH NO VEHICLE WEIGHT LIMIT.
 - OR <0.35m DEPTH TO SOFFIT IN LANDSCAPED AREAS REQUIRES CLASS 2 BEDDING.
- PIPEWORK BUILT THROUGH STRUCTURAL WALL SHALL HAVE 50mm CLEARANCE AND A SUITABLE LINTEL INSTALLED TO OPENING.FLEXIBLE JOINTS EITHER SIDE OF THE WALL SHOULD BE LOCATED NOT MORE THEN 150mm FROM THE FACE.
- TYPE E AND D PPIC'S ARE BY WAVIN OR SIMILAR APPROVED.
- ANY 100mm DIA PIPE WITHOUT A WC CONNECTION SHOULD NOT BE FLATTER THAN 1:40
- ALL RWPS ARE TO OUTFALL VIA PLASTIDRAIN INLET HOPPER GULLY - BN 110 PIE OR SIMILAR APPROVED.
- A 30mm REDUCTION IN LEVEL HAS BEEN ALLOWED FOR IN THE CALCULATION OF INVERT LEVELS FOR ALL BRANCH CONNECTIONS TO PLASTIC INSPECTION CHAMBERS (AS PER WAVIN DETAILS). INVERT LEVELS REFER TO MAIN CHANNEL. IF ALTERNATIVE CHAMBERS ARE PROPOSED THIS VALUE MAY VARY AND THE DESIGNER SHOULD BE CONSULTED.
- ALL AREAS TO BE SCANNED FOR EXISTING BURIED SERVICES OR OTHER OBSTRUCTIONS PRIOR TO EXCAVATION WORKS.
- PROPOSED FOUL DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH BUILDING REGULATIONS 2010 DRAINAGE & WASTE DISPOSAL - PART H 2015 EDITION.
- ALL MANHOLE COVER LEVELS AND EXTERNAL FINISHED FLOOR LEVELS ARE TO BE CONFIRMED BY THE ARCHITECT. COVER LEVELS FOR MANHOLES AND INSPECTION CHAMBERS ARE INDICATIVE ONLY - THEY SHALL BE LAID FLUSH WITH THE ADJACENT SURFACING.
- CONTRACTOR TO CONFIRM INVERT LEVELS OF PROPOSED CONNECTION ON EXISTING UNITED UTILITIES SEWERS.
- ALL SOIL STACK CONNECTIONS TO BELOW GROUND DRAINAGE TO BE 100mm Ø LAID AT MINIMUM 1:50 GRADIENT (MIN. 1WC), UNLESS OTHERWISE STATED ON DRAWING.
- ANY REQUIRED FOUNDATION PENETRATION DETAILS TO BE PROVIDED BY STRUCTURAL ENGINEER.
- CONNECTIONS UPSTREAM TO SVPS/SS TO BE DESIGNED BY OTHERS.
- THE DEVELOPER MUST SELF-VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THE PROPOSED ADAPTABLE LATERAL DRAIN ARE IN ACCORDANCE WITH THOSE SET OUT IN 'SEWERS FOR ADOPTION' 7TH EDITION, AND THE REQUIREMENTS OF UU AS THE STATUTORY SEWAGE UNDERTAKER.
- FOUL PIPEWORK IS TO BE VITRIFIED CLAY OR PLASTIC. VITRIFIED CLAY PIPES SHOULD COMPLY WITH REQUIREMENTS BS EN 295 FOR FOUL PIPES.
- PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION. ALL THERMOPLASTIC PIPEWORK SHALL COMPLY WITH THE REQUIREMENTS OF E2.21 & E2.22 (PAGE 89) OF SEWERS FOR ADOPTION 7TH EDITION.
- ANY PIPE RUNS WITH LESS THAN 0.9m COVER LOCATED WITHIN NON-TRAFFICKED AREAS ARE TO BE 150mm GEN CONCRETE BED AND SURROUND.
- ANY GREASE DRAINS THAT ARE DIRECTED TO GREASE TRAPS MUST USE CAST IRON PIPING SYSTEMS THAT ALLOW MECHANICAL CLEANING WHEN BLOCKAGES OCCUR.
- ALL SVP LOCATIONS AND DISCHARGE UNITS ARE PROVIDED BY M&E ENGINEER OR ARCHITECT SITE BOUNDARY
- ALL SVPS ARE TO HAVE LOW LEVEL ACCESS PLATES.
- FOUL DRAINAGE REST BENDS TO BE MINIMUM 450mm DEEP.
- DRAINAGE CONNECTIONS TO BE MADE SOFFIT TO SOFFIT FOR SURFACE WATER.
- A SECTION 106 APPLICATION TO CONNECT TO THE FOUL & SURFACE WATER DRAINAGE SYSTEMS MUST BE MADE TO UNITED UTILITIES. THE DEVELOPER SHALL GIVE 21 DAYS' NOTICE PRIOR TO CONNECTION. THE WORKS MAY ONLY BE UNDERTAKEN BY AN SSIP HEALTH AND SAFETY APPROVED CONTRACTOR.

REV	DATE	DESCRIPTION	DRN	CHD	APPD
R1	21/07/25	PLANNING CONDITIONS DISCHARGE		MG	CLS
					AJF

DRG. STATUS

FOR APPROVAL



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PROJECT
NETHERLEY ROAD, TARBOCK
GREEN, PRESCOT, L35 1QE

DRG. TITLE
PROPOSED DRAINAGE
GENERAL ARRANGEMENT

DRG. NO.
25085-AJF-ZZ-ZZ-DR-D-101

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R1

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Appendix B

Appendix B – c753 SuDS Manual Maintenance Inspection Checklist

C753 The SuDS Manual

Appendix B: Maintenance inspection checklist



Table B.25 SuDS maintenance inspection checklist			
General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date								
	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								

C753 The SuDS Manual

Appendix B: Maintenance inspection checklist



Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?)								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								
Infrastructure								
Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								

C753 The SuDS Manual

Appendix B: Maintenance inspection checklist



Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current Increase maintenance Decrease maintenance								
Next inspection								
Proposed date for next inspection								

Appendix C

Appendix C – Manufacturers' Product Maintenance Guidance Sheets

Testing and Maintenance

Osma/Wavin Chambers

Testing

All testing of these non-man entry chambers and connecting pipework must be undertaken at ground level.

For guidance, please use the following:

Air Testing using remote test bags: equipment required

- ② 3 x 1 metre x 8mm Steel Drainage Rods
- ② 50mm Double Worm Screw for use with Steel Drainage Rods
- ② PVC sealing bags fitted with Schrader Valve and 6 metre hose
- ② Steel drain plug with testing point
- ② Bicycle Pump
- ② Tyre pressure gauge to ensure correct inflation pressure of the test bags

Air Testing procedure

1. Assemble drain rods to 3 metres in length with double worm attachment on end.
2. Remove as much air as possible from the PVC Sealing Bag.

Method: hold valve open and squeeze bag flat.

Tip: folding the bag in half to make it as small as possible will make it easier to locate.

3. Twist neck of PVC Sealing Bag into double worm attachment until it has firm grip on bag.
4. Ensure valve end of hose is secure with no danger of falling down the chamber.
5. Hold drain rods and hose from the PVC Sealing Bag together. Start to lower the test bag into the base.

Tip: Keep hose tight while lowering bag. This helps to keep bag in place.

6. When bag is in chamber base, position it into the channel of the run to be tested.
7. By using the channel as a guide, slide test bag into the mouth of the pipe, and as far as possible into the pipe.

Method: use rods to push bag into position.

8. Leave rods attached (this ensures bag is held in position). Start to pump the bag up using a bicycle pump.

NOTE: When inflating the test bags, follow manufacturer's instructions to ensure pressure is not exceeded. Use tyre pressure valve to monitor bag pressure.

9. If required, remove rods by twisting them in an anti-clockwise direction to release the double worm. Check the valve end of hose is safely positioned.
10. Place a similar sealing bag or a steel drain plug at the other end of the pipe length to be tested. (This could be another chamber or a terminal access point.) Both bag and steel drain plug must include a suitable testing point.
11. Attach a manometer. Carry out required air test method.
12. Remove sealing bag.

Method: twist double worm attachment around the hose at ground level. Lower it down the hose, guiding the rods to the bottom of the chamber and once again grip the bag.

NOTE: No requirement to grip bag tightly. This is simply to aid its removal. Release as much air as possible from bag. Then slide bag back out the pipe with the rods. When this is done, lift/remove all test equipment out of the chamber.

Maintenance

As with all Osma/Wavin Chambers, the smooth interior bore of chamber channels and associated pipe systems will aid the flow of water and waste through the system.

Because man-entry of Osma/Wavin chambers is not possible, maintenance work such as Rodding, Jetting and CCTV inspection must be undertaken at ground level.

Always follow the Health & Safety and Operational procedures of equipment suppliers.

Hydro International Warranty, Maintenance and COSHH Statement

This statement covers all Hydro International Hydro-Brake® Optimum, Hydro-Brake® and S-Type Vortex Flow Control units (hereafter referred to as "Flow Control").

Defects Liability Period Warranty

The standard Hydro International warranty covers products for one year from date of purchase and will only be considered for those defects or faults reported directly to Hydro International in writing. Warranties will not be considered for defects or faults caused by accident, acts of vandalism or unauthorised repair/rectification. Please Contact Hydro International for product specific details.

Maintenance

Normally, little maintenance is required as there are no moving parts within the Flow Control. Experience has shown that if blockages occur they do so at the intake, and the cause on such occasions has been due to a lack of attention to engineering detail such as approach velocities being too low, inadequate benching, or the use of units below the minimum recommended size. The Flow Control (where applicable) is fitted with a pivoting bypass door, which allows the manhole chamber to be drained down should blockage occur. The smaller conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

Following installation of the Flow Control it is vitally important that any extraneous material i.e. building materials are removed from the unit and the chamber. After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. If problems are experienced, please do not hesitate to contact the company so that an investigation may be made.

All Flow Control units are typically manufactured from grade 304 Stainless Steel, and if required they can also be manufactured in grade 316 Stainless Steel. Both materials have an estimated life span in excess of the design life of drainage systems.

COSHH

Flow Control units are manufactured from Stainless Steel, which is not regarded as hazardous to health and exhibits no chemical hazard when used under normal circumstances for the stated applications.

Manual Handling

The handling of Flow Control units should be in accordance with the current legislation and regulations:

- The Health and Safety at Work Act 1972
- The Management of Health and Safety at Work Regulations 1999
- The Manual Handling Operations Regulations 1992

All published and printed by the Health and Safety Executive.

CONCRETE BLOCK PERMEABLE PAVEMENTS

Maintenance Guidelines

Ref: 572/1560

Issued: 20th February 2015

Introduction

Concrete Block Permeable Paving (CBPP) technology has proven itself over decades of successful use in the UK and around the world - notably Germany since the mid-1980s.

Experience of CBPP in use in the UK over 15 – 20 years has demonstrated its long-term performance with minimal, if any, maintenance. Routine maintenance should be no more onerous than for impervious paving and the maintenance required for conventional below-ground gully and pipe drainage is eliminated.

The following guidelines aim to ensure that the designed permeability, structural integrity and appearance of the CBPP are maintained throughout its life. They may be varied to suit particular conditions.

Design Detailing and Construction

Correct design, detailing and construction are essential to the long-term performance of CBPP and minimising maintenance. Guidance is available from the Interpave information resource at: www.paving.org.uk

In particular:

- design and detail soft landscaping to prevent soil and mulch being washed onto the permeable pavement.
- prevent impermeable contaminants such as soil and mud from entering the base and paving surface both during and after construction.
- ensure that joints between blocks are completely filled with the correct, permeable jointing material.

Full joints ensure structural integrity and protect the laying course and sub-base from silt, therefore it is essential that:

- **topping-up and vibration should be carried out 3 months after practical completion and also at final completion when site works have finished.** Further significant settlement would not then be anticipated.

Routine Maintenance

Over time, detritus and silt collects in the upper part of the joint material between blocks where a surface 'crust' is formed, protecting the laying course and sub-base

material while allowing infiltration. Research has demonstrated that the infiltration rate of CBPP will decrease due to this build-up in the jointing material, but then stabilise with age.

However, even after allowing for clogging, the long-term infiltration capability of permeable pavements will normally substantially exceed UK hydrological requirements. Also, the performance of CBPP is not significantly affected by moss or weeds in the joints, or by leaves collecting on the surface.

Generally, any problems will be revealed on the surface by ponding (permeability issues) or damaged or displaced blocks (structural issues). **In the absence of these indications, no remedial action is necessary.** Current routine maintenance regimes for other paving can be applied to CBPP as follows:

- **Cosmetic Cleaning** – non-aggressive brushing of the whole surface (avoiding disruption of the jointing material, with suction rates adjusted, based on a trial), either manually or mechanically, will help maintain performance and appearance. This should be carried out annually.
- **Visual inspections** - should be carried out and recorded during maintenance visits. Inspection of piped outfalls (where used) and control structures is also advised.
- **Winter maintenance** - controlled use of standard road de-icing techniques including rock salt may be used without detrimentally affecting the CBPP performance. De-icing chlorides should be used in accordance with suppliers' recommendations and are unlikely to result in an increase in ground chloride levels. CBPP generally requires less de-icing than impervious paving, although it can exhibit hoar frost sooner.
- **Weed control** – excessive weed growth, typically where vehicles do not pass over (trafficking prevents weed growth), can be managed by localised spot-treatment with weed killers containing Glyphosate, in accordance with suppliers' recommendations.

Remedial Actions

Over the longer-term allowance should be made to deal with any permeability or structural issues that might arise.

With the former, action will only be necessary with loss of permeability indicated by ponding on the surface of CBPP. In this event and in affected areas only, water-jetting or agitation brushing (either manually or mechanically with a suction brush set at a 30° angle to the pavement, to prevent aggregate migration) can be used to dislodge the affected jointing material. Joints should then be refilled with the correct, clean material and vibrated.

Information on structural remedial actions and reinstatement for block paving generally can be found on the Interpave information resource www.paving.org.uk

Polystorm Range

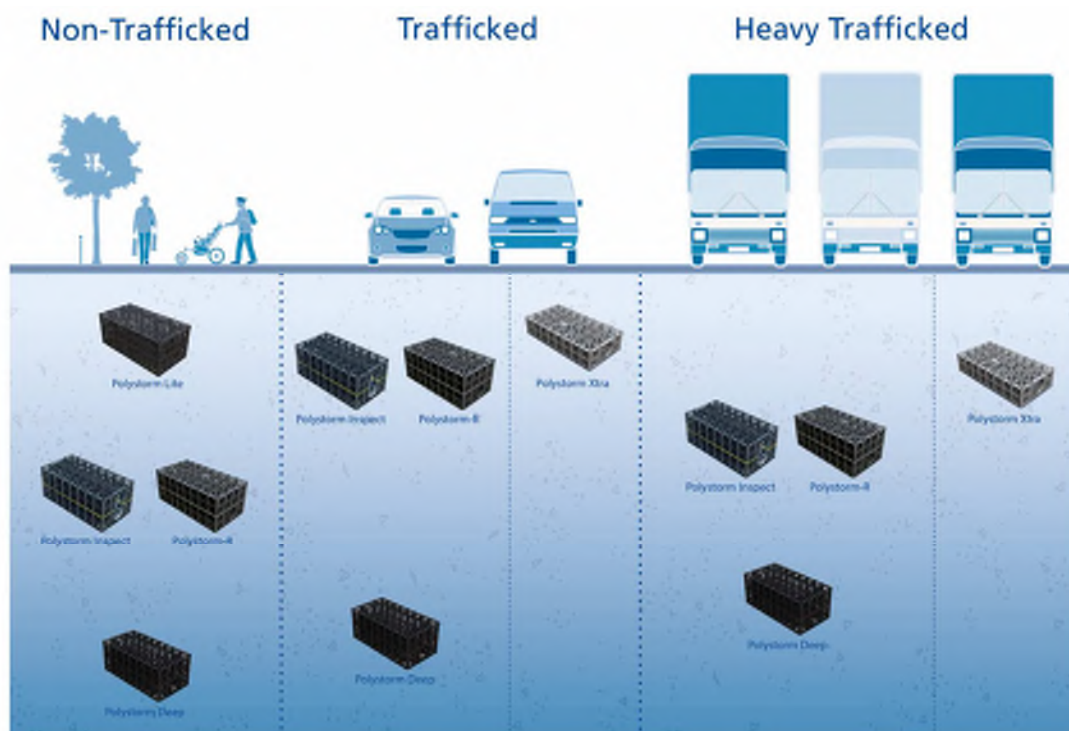
PRODUCT INFORMATION

ISSUE 7 - FEB 19

The tried and tested Polystorm range for the management of surface water is designed to provide retention, attenuation or infiltration at a variety of depths. The Polystorm range can accommodate a wide range of loadings, from pedestrianised areas to large HGV parks. The current range comprises of five modular cells and two access options for both horizontal and vertical inspection.

Key Features and Benefits:

- High void ratio providing greater water storage capacity and reduced excavation and disposal costs
- Suitable for retention, attenuation and infiltration systems
- Light weight yet robust, affording excellent Health and Safety and installation benefits
- Modular units allow flexibility of shape, making them ideal for shallow excavation systems, narrow strips or for restricted areas
- Units available from 20 tonnes per square metre vertical load bearing capacity, up to a maximum of 83 tonnes per square metre vertical load bearing capacity
- Can be utilised in non-trafficked, trafficked or heavily trafficked applications
- Unique rounded corners for ease of handling and reduces likelihood of punctures to membranes
- BBA Approved *Polystorm, Polystorm-R & Polystorm Lite (Polystorm Xtra and Polystorm Deep pending)
- Up to 60 year design life
- Polystorm modular cells are manufactured from polypropylene
- Polystorm Access is manufactured from HDPE
- 100% recyclable at the end of useful life



- Polystorm Xtra is for use in shallow non-sub-base replacement applications
- Our Polystorm (PSM1) modular cell can also be used in place of Polystorm-R (PSM1A)

Polystorm Range

PRODUCT INFORMATION

ISSUE 7 - FEB 19

Polystorm Lite (PSM2)

Specifically designed for non-trafficked applications within landscaped areas, pedestrianised areas or public open spaces such as playgrounds. With 20 tonne per square metre vertical compressive strength, it can take the load of general maintenance vehicles such as grass cutters.



Polystorm (PSM1)

With 44 tonne per square metre vertical compressive strength, made from virgin material, Polystorm is ideally suited for trafficked and loaded areas. It is used frequently for housing developments, car parks and commercial developments.



Polystorm-R (PSM1A)

Similar to the Polystorm cell, Polystorm-R is used for trafficked and loaded applications and has a vertical compressive strength of 61 tonne per square metre. Polystorm-R has the added benefit of having up to 100% recycled material content. It is ideally suited for housing, commercial and infrastructure projects.



Polystorm Xtra (PSM3)

Designed for use in heavily trafficked areas for shallow, non sub-base applications where a reduced cover is required. It has an impressive vertical compressive strength of 83 tonnes per square metre.



Polystorm Deep (PSM5)

Polystorm Deep has been designed for use in trafficked applications such as lorry parks and industrial access roads. It can be buried deeper than any other Polystorm cell and can be value engineered as part of a hybrid system with Polystorm, Polystorm-R and Polystorm Lite.



Polystorm Access (please see datasheet for codes)

Polystorm Access provides a 1m x 0.5m shaft within a Polystorm structure to enable surface access for remote camera inspection and maintenance activities such as flushing and rodding. The system consists of a 500mm diameter shaft which extends from surface level to the top of a Polystorm structure, at which point a turret provides an interface between the shaft and the inspection chamber within the system.



Polystorm Inspect (PSM4)

Polystorm Inspect provides a tunnel along the length of a fully installed Polystorm structure to enable access for inspection and maintenance. Polystorm Inspect can be combined with Polystorm Access for full inspection and maintenance activities such as flushing and rodding.



Geomembranes and Geotextiles

Polystorm Geotextiles are UV-stabilized, polypropylene, continuous filament needle-punched non-woven geotextiles, designed to complement the range of Polystorm modular cells. They are suitable for infiltration applications and can also be incorporated into drainage trenches.



Product code: PSM4

The Polystorm Inspect cell is complementary to the Polystorm range of modular cell solutions. Its primary purpose is to provide a tunnel along the length of a fully installed Polystorm structure to enable access for inspection and maintenance. Polystorm Inspect is a high strength thermoplastic cell which evenly distributes its load through the Polystorm structure. The tunnel end is left open by default but the unit can be closed off if required by clipping into place the moulded end plate. For purposes of identification the cell features a yellow centre section and end plate.



Key Benefits

- Creates a horizontal tunnel running through the middle of the tank to provide access for inspection and maintenance, i.e. jetting and rodding
- Can be used with Polystorm Lite, Polystorm-R and Polystorm (cannot be used in the same layer as Polystorm Xtra as the Polystorm Inspect cell is deeper)
- Tunnel can be used as a flow inlet track achieving greater stormwater flow distribution within the unit
- Large access tunnel (height 320mm and width 172mm nominal) – allows maximum field of vision while maintaining the system's structural performance
- High strength to weight ratio
- Light weight cell allows easier handling and reduced Health and Safety risk
- Utilises the same Shear Connectors and Clips as the Polystorm range
- The tunnel restricts the dissipation of silt in to the overall structure making inspection and maintenance easier
- Polystorm Inspect cells with 225mm (PSM4CRD225) or 300mm (PSM4CRD300) inlets are available

Applications

Polystorm Inspect is designed to work with the rest of the Polystorm range within a layered hybrid system enabling an intelligently engineered attenuation or infiltration structure to be created. It is intended to be used from the inlet point of the Polystorm structure. If used other than along an inlet tract, the Polystorm Inspect end plate should be used to cap off the tunnel entrance. The most cost effective way to create a tank is to use a combination of Polystorm Inspect cells and other Polystorm modular cells.

UNIT TYPE	VALUE
PHYSICAL PROPERTIES	
Length	1m
Width	0.5m
Depth	0.4m
Total volume	0.2m ³
Unit weight	11.6kg*
Cube storage volume	0.188m ³ (188 litres)
Volumetric void ratio	94%
SHORT TERM COMPRESSIVE STRENGTH	
Vertical	Minimum 440kN/m ²
Lateral	Minimum 63kN/m ²
SHORT TERM DEFLECTION	
Short-term vertical deflection	Minimum 70.1kN/m ²
LONG TERM DEFLECTION	
Estimated long term vertical deflection (creep)	0.6113Ln (design life in hrs)

Note: The table above is applicable to PSM4 without the end plate.

*Approximate weight

End plates to be purchased separately as required.

Please note: The use of Polystorm Inspect does not negate the requirement for a Silt Trap to be installed prior to the Polystorm structure. The use of a Silt Trap or other silt prevention device would always be recommended.

Technical Support

Detailed guidance and assistance is available.

For further information, please contact our Technical Team on **+44 (0) 1509 615100** or email civils@polypipe.com

RECOMMENDED MAXIMUM DEPTH OF INSTALLATION (to cell invert) [m]

TYPICAL SOIL TYPE	TYPICAL ANGLE OF SHEAR RESISTANCE	WITHOUT GROUNDWATER (below base of cells) NORMAL CASE		WITH GROUNDWATER AT 1M BELOW GROUND LEVEL AND UNITS WRAPPED IN GEOMEMBRANE	
		Pedestrian	Trafficked (cars)	Pedestrian	Trafficked (cars)
Stiff over consolidated clay e.g. London clay	24°	2.3	2.0	1.8	1.7
Normally consolidated silty sandy clay e.g. alluvium, made ground	26°	2.4	2.2	1.9	1.7
Loose sand and gravel	30°	2.8	2.6	2.0	1.8
Medium dense sand and gravel	33°	3.2	2.9	2.1	1.9
Dense sand and gravel	38°	3.9	3.6	2.2	2.1

- Note:
- 1) Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)
 - 2) Assuming a soil density = 19 kN/m³ water density = 9.81 kN/m³
 - 3) Assumed ultimate limit state (ULS) partial factor of safety applied to: Material = 2.75 Live load = 1.5 Dead load = 1.35

Notes:

1. Unless stated, all values are nominal and may vary within normal production tolerances.
2. Polypipe reserve the right to change product specifications without prior notice.
3. This document is uncontrolled and updates will not be issued automatically.

RECOMMENDED MINIMUM COVER LEVELS [m]

LIVE LOAD CONDITIONS	PEDESTRIAN	LIGHT TRAFFICKED
Minimum cover depth required (m)	0.50	0.60

- Note:
- 1) Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)
 - 2) Assumed serviceability limit state (SLS) partial factor of safety applied to: Material = 1.5 Live load = 1.0 Dead load = 1.0
 - 3) Shallower minimum burial depths may be applicable subject to specific site conditions.

All descriptions and illustrations in this publication are intended for guidance only and shall not constitute a 'sale by description'. All dimensions given are nominal and Polypipe may modify and change the information, products and specifications from time to time for a variety of reasons, without prior notice. The information in this publication is provided 'as is' on January 2016. Updates will not be issued automatically. This information is not intended to have any legal effect, whether by way of advice, representation or warranty (express or implied). We accept no liability whatsoever (to the extent permitted by law) if you place any reliance on this publication you must do so at your own risk. All rights reserved. Copyright in this publication belongs to Polypipe and all such copyright may not be used, sold, copied or reproduced in whole or part in any manner in any media to any person without prior consent. © Polypipe is a registered trademark of Polypipe. All Polypipe products are protected by Design Right under CDPA 1988. Copyright © 2016 Polypipe. All rights reserved.

20.14 OPERATION AND MAINTENANCE REQUIREMENTS

Regular inspection and maintenance is important for the effective operation of pervious pavements. Maintenance responsibility for a pervious pavement and its surrounding area should be placed with an appropriate responsible organisation. Before handing over the pavement to the client, it should be inspected for clogging, litter, weeds and water ponding, and all failures should be rectified. After handover, the pavement should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Extensive experience suggests that sweeping once per year should be sufficient to maintain an acceptable infiltration rate on most sites. However, in some instances, more or less sweeping may be required and the frequency should be adjusted to suit site-specific circumstances and should be informed by inspection reports.

A brush and suction cleaner (which can be a lorry-mounted device or a smaller precinct sweeper) should be used for regular sweeping. Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced. It is also possible to clean the surface using lightweight rotating brush cleaners combined with power spraying using hot water, as shown in **Figure 20.30**. This is done every two years at the site shown.

If the surface has clogged then a more specialist sweeper with water jetting and oscillating and rotating brushes may be required, especially for porous asphalt surfaces, to restore the surface infiltration rate to an acceptable level. The specialist equipment should be adjusted so that it does not strip binder from the aggregate in the asphalt.

The likely design life of grass reinforcement will be dictated by trafficking and is likely to be about 20 years if designed correctly. For concrete block permeable paving the design life should be no different from standard paving, assuming that an effective maintenance regime is in place to minimise risks of infiltration clogging. Porous asphalt will lose strength and begin to fatigue due to oxidation of the binder. This is likely to occur slightly faster in porous asphalt than normal asphalt, so the design life will be reduced slightly. Porous concrete should have a similar design life to a normal concrete slab.



Figure 20.30 Deep cleaning a supermarket car park, Dundee (courtesy Abertay University)

The reconstruction of failed areas of concrete block pavement should be less costly and disruptive than the rehabilitation of continuous concrete or asphalt porous surfaces due to the reduced area that is likely to be affected. Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

- Guidance on waste management is provided in **Chapter 33**.

Table 20.15 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Maintenance Plans and schedules should be prepared during the design phase. Specific maintenance needs of the pervious pavement should be monitored, and maintenance schedules adjusted to suit requirements.

- Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical 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 manufacturer's 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 considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	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

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

► Generic health and safety guidance is presented in **Chapter 36**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

MAINTENANCE

Responsibility

The responsibility for maintenance should be clearly defined before handover of the completed system (see **Section 3**).

Soakaways

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

Large installations

For large installations, or where the receiving waters are environmentally sensitive, a system of regular inspections should be established.

The main aim of these will be to prevent siltation of the system (see **Section 2.3.4**) which, if allowed to develop, would reduce its effectiveness.

Inspection agenda

The following elements should be inspected regularly as part of this preventative routine:

- Catchpits
- Control manholes
- Interceptors
- Inspection chambers.

They should also be inspected after every major storm event.

Catchpits and interceptors should be emptied regularly to prevent them from becoming full. The frequency of this being necessary will be determined on the basis of the regular inspections.

Paved surfaces above any AquaCell installation should be inspected at the same time to ensure the units continue to provide the required structural support.

ACO Water Management:

Civils + Infrastructure

Uniclass L2123 + JR12 + JS10 + L71121 + L731	EPIC J3413
CI/SfB (52.5)	

ACO Maintenance Guide



ACO Maintenance Guide

Channel drainage, ACO KerbDrain® and ACO Qmax®



Introduction to the ACO Group

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

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

ACO Technologies plc

ACO operates as ACO Technologies plc in the United Kingdom. Founded over 30 years ago, the company has grown quickly on a reputation for design innovation and customer service.

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



To help architects, designers and contractors meet the legal requirements that now tightly control the way surface water is managed, ACO has created its unique system chain that combines a 'Surface Water Management Cycle' – Collect, Clean, Hold, Release, with the service support of Train, Design, Support and Care.

These processes enable ACO to offer a combination of product and service expertise necessary for the complete and sustainable management of surface water drainage.

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The ACO Group / www.aco.com



Introduction to channel drainage maintenance

ACO supports effective asset management in channel drainage – from site design through to life-cycle maintenance. ACO have a comprehensive range of gullies and access units for silt management, with easy access for maintenance and cleaning.

What is good channel maintenance?

Inspection routines are essential to maintain efficient performance of drainage channels and they should be carried out at frequent and regular intervals. The frequency will depend upon the location and the environment, and should be based on local knowledge, but inspections should be carried out at least once a year.

Benefits of maintenance

- ▶ Maintains the original hydraulic capacity of the drainage system
- ▶ Maintains the aesthetic appearance of a site
- ▶ Ensures safety issues for pedestrians and vehicle traffic are identified with regular inspections



Health and Safety

Contractors undertaking cleaning activities should consult the Health and Safety at Work etc Act (1974), the Construction (Health, Safety and Welfare) Regulations (1996) and EN 1829: High pressure cleaners, High pressure water jet machines-Safety requirements. The safety aspects to be addressed relating to jetting, are not limited to practices concerning high pressure water, possible infection from the drain contents, working on the highway and in some circumstances, working in confined spaces.

By giving maintenance advice, ACO accepts no liability for injury or loss caused by such activities.



Maintenance of grates

ACO grates are available in a variety of materials; ductile iron, composite, galvanised and stainless steel. Each has their own characteristic oxidisation cycle. The following information documents the expected performance of ACO grates, focusing on the four main grates, which depending on customer aesthetic standards, may require maintenance during the life of the grate types. One piece polymer channels like MonoDrain/RoadDrain/H Range do not have separate grates as the inlets are integral to the channel. This reduces the risk of stolen or incorrectly installed grate types.

	Grate Material Type			
	ACO Ductile Iron	ATec Ductile Iron	Composite	
				
Coating at delivery	Black paint	Electrochemical coating, black	No coating present, no possibility of oxidisation	
Protection achieved	Minimal protection, may require painting to retain black appearance if not frequently trafficked	High protection, may require occasional touch-ups	No possibility of oxidisation	
Possible treatments	Acrylic black paint /rust inhibitor	Acrylic black paint /rust inhibitor	N/A	
Low traffic areas	✔ Ideal*	✔ Ideal*	✔ Ideal	
High traffic areas	✔ Ideal	✔ Ideal	✔ Ideal	

*Application of paint may be preferred over time



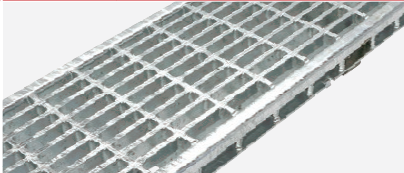
ACO Ductile Iron

Ductile iron has long been used in outdoor drainage situations, as over time oxidation forms an insoluble graphitic layer which protects the iron from further attack. This is a natural process called patination. The structural integrity of a grating made of ductile iron will not be negatively affected by surface oxidation and the formation of a protective surface film. Areas with moderate traffic will help to buff the grates into the characteristic aged cast iron usually seen and do not require painting.

The water based paint with which ACO coat our gratings, is intended to protect the grating for a short period of time after manufacture. It is not intended to be either a long term or architectural finish. In areas of low traffic it may be preferred to apply a proprietary rust inhibitor.



Images showing stages in the process of patination. The period of oxidation depends on the environmental conditions. Photo on the right shows a stable buffed grate

	Polymer*	Galvanised Steel	Stainless Steel
			
	No coating present, no possibility of oxidation	Zinc oxide coating	Inherent protection due to high grade SS
	No possibility of oxidation	High protection from oxidation. Any materials damaged or cut to fit on site will require recoating on their cut or damaged surface	High protection from oxidation
	N/A	Galvanised metal paint	N/A
	✓ Ideal	✓ Ideal	✓ Ideal
	✓ Ideal	✓ Ideal	✓ Ideal

ACO ATec Ductile Iron

ACO ATec coating is a high performance finish offering superior resistance to corrosion and enhanced long term durability in demanding environments. ATec uses an electrophoretic process, which uses current to deposit organic coatings on electrically conductive parts, this is then cured at high temperatures forming a strong and durable coating. The benefit of ATec or KTL coatings is that any scratches or damage will not result in the oxidation undercutting or spreading under the painted surface, and this results in overall lower levels of visible oxidation.

ATec is particularly suited to low trafficked areas, or areas where high aesthetic appearance is required, as it provides an easily maintained system compared to water based surface coatings. ATec provides a chemically stable platform for the application of secondary paint finishes if preferred. In moderate traffic areas the coating will eventually wear away and form the polished ductile iron surface common to architectural ductile iron as discussed above.

ACO Stainless Steel

Stainless steel gives very high protection from oxidation due to the high grade steel used, and the use of pickle passivation process during production. Along with polymer and composite, stainless steel grates are a good choice for coastal applications where environmental salt levels are high. Stainless steel products in coastal applications will require regular cleaning to remove salt build up, and a proprietary protective coating may be advisable depending on the aesthetic required.

In most standard drainage situations stainless steel will not require any maintenance, and will retain a high standard of appearance over the life of the grate.

Maintenance of grates

ACO Galvanised Steel

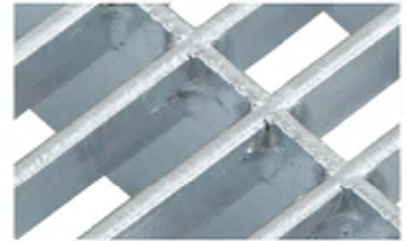
Galvanised grates are hot dipped in zinc, which gives long lasting protection from environmental effects. During the coating process the zinc reacts with the steel, giving a demarcation free transition of alloy layers.

The quality of zinc coating applied by hot dip galvanization is specified in the technical standard EN ISO 1461. For mild steel sheet material thickness >1.5mm and <3mm minimum local coating thickness is required to be 45 microns (to average coating thickness 55 microns). ACO's galvanised steel zinc coating can measure between 60 to 80 microns, giving extra protection to the underlying steel.

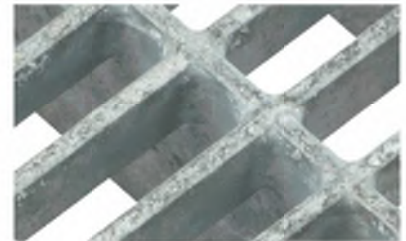
The zinc corrodes in preference to the steel in a process called sacrificial protection.

Zinc will react with the environment, creating a thin white protective layer. Damage to the coating will result in the zinc deposits resealing it from the atmosphere and therefore protecting from corrosion.

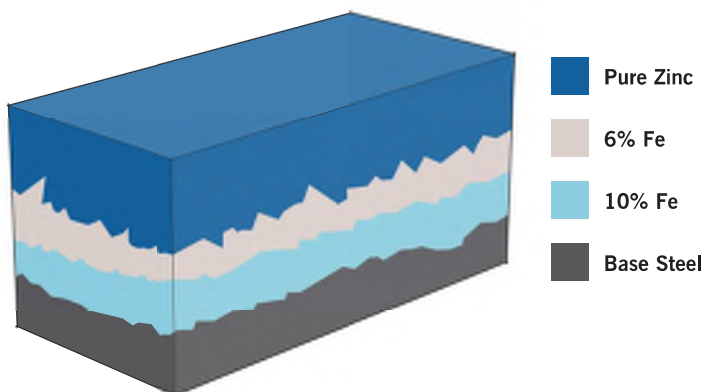
The distance of the installation from the coast will effect the level of protection achieved as the salt accelerates the oxidation process. For more information please refer to the Galvanizers Association website: www.galvanizing.org.uk/corrosion-map/ Divide 60 microns by the microns/ year figure to get a rough estimate on the level of protection. This figure gives a guide to the maximum time before the zinc coating is oxidised due to varying levels of wear. The base metal will still be functional and may require an application of zinc based protection to retain the aesthetic.



Newly galvanised



Protective oxidised layer



6



ACO Channel Edge Rails

Channel edge rails improve the strength and durability of grated channels, and their dimensions and performance must conform to EN1433:2002. There are three types of edge rail available, ductile iron, galvanised and stainless steel depending on the channel system chosen.



Users who wish to have the highest resistance to oxidation should select stainless steel edged channels. These are made from 304 Stainless steel. The percentage of nickel and chromium that is present in 304 stainless steel equips this metal with good corrosion resistance, in particular from moderately caustic and acidic solutions.

Due to the wet nature of their environment and their exposure to chemicals, metal components will naturally oxidise at varying rates depending on wear. Metal edges have been selected for their long term performance, but for customers who demand specific aesthetics, maintenance may be required in the form of painting the edge rails as required. In most cases rails and grates are left untouched for the life of the product, with ACO drainage channels being renowned for their high performance.

Access through grates



Locking systems

BS EN 1433 recommends that all gratings and covers, at or above Load Class C 250, should be locked in position. ACO gratings can be secured by a variety of locking arrangements. These will vary according to the channel system, grating type and Load Class. With the exception of the heavy-duty S system, which is provided with eight bolts per metre length, gratings will generally be locked every 500mm. Part of your maintenance procedure should be to check that all grates are secure and that no bolts or locking mechanisms are missing/broken.

Current locking systems:

1. Drainlock™ bar-less locking; used in the MultiDrain range of grates
2. Bolt direct into integrally-cast frame; used in S Range channels
3. Powerlock® boltless locking system; used on some access covers

Older locking systems:

1. Quicklock® bayonet and bar boltless locking system
2. Bolt and locking bar

Grated and non-grated channel systems will have access to the channels through the sump or access unit. If access is through a grate, ensure that any security locks (where fitted) or bolts are removed prior to lifting the grate.

Bolted grates

Bolts can be removed using a spanner or socket set. Greasing or oiling bolts before refitting is suggested.

Security locks and Drainlock™

Round M6 security screws, mean that the grate has been installed with ACO's security locking system. Both of these screws need loosening before the grate can be removed.

Drainlock™ systems are the standard locking mechanisms identified by black squares.

LIFTING GRATES

When lifting gratings, use the Drainlock™ grating lifting tool (part number 1367). Insert the tool in from the end of the grate as shown, and gently lift the grate until the Drainlock™ clips release taking care not to bend or damage the grate.

Lifting with/without the lifting tool at the end of a grate, may result in damage/bending of the grate (particularly the composite and steel gratings). Always lift closer to the Drainlock™ clips as shown.



Access to Brickslot



To remove the ACO Brickslot access unit tray, insert two lifting tools as shown.



Then lift the tray vertically from the frame.

Be aware that this unit complete with surfacing material, may be very heavy and safety precautions should be taken.

Access units

Other than grates on sumps, there are two types of solid access covers, Ductile iron and Composite. Composite access units are present in all new production of MonoDrain, KerbDrain and RoadDrain.

Ductile iron access unit Powerlock® system



POWERLOCK

Used on the older systems, Powerlock® provides secure locking without bolts or screws and simple, rapid installation, using the ACO locking tool.



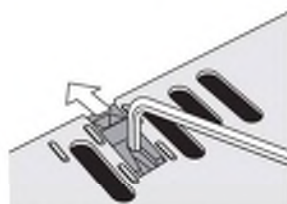
1. **To open:** slip chamfered end of locking tool into the slot behind the back of the Powerlock mechanism as shown.



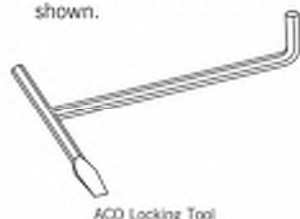
2. Rotate the tool through 90° until the lock mechanism slides across and clicks. Repeat for each lock.



3. Lift grating with the hook at the end of tool.



4. **To close:** fit one side of grating under lugs in channel rail and lower grating into position. Use the hook on the locking tool in the recess of the lock mechanism to push clip back towards the closed position, until a click is heard. Repeat for all locks.



Composite access units



MonoDrain access unit



KerbDrain access unit

COMPOSITE ACCESS UNIT - TO OPEN



1. Using a standard, medium duty drain lifting key, insert the key head through the keyway slot and press down.



2. Rotate the drain lifting key 90° - ensuring the key remains vertical.



3. Lift the key and cover as a complete unit and remove from the frame. (If you wish to remove the key, hold the cover and twist the key 90°.)

COMPOSITE ACCESS UNIT - TO CLOSE



1. If the key is still in the cover, closing is the reverse of opening. If the key is not used see above.



2. To fit the cover in the frame, simply push the cover down onto the frame - The locking pins will retract and snap into place to lock the cover.

The steel crossbar will rise to the top to identify the cover is secure.



Always ensure that access units are securely closed and locked after use.

Access through universal gullies and access chambers

UNIVERSAL GULLYS



▶ Universal gullies may be installed with MultiDrain, MonoDrain, RoadDrain and S Range channels.

▶ There are two types of ductile iron cover, the D400 version will be bolted (remove bolts before lifting), whilst the F 900 version is hinged (open as shown). Care should be taken when lifting the cover.

ACO QMAX® ACCESS CHAMBERS

▶ Access chambers are installed with ACO Qmax® channels. There are three types of access lid depending on the channel system installed. The covers may/may not be bolted in the corners, and these require removing prior to lifting. The cover may be hinged, and opened as shown above.

▶ The top of the screw should not project above the top of the tray, maximum tightening torque 18Nm.

▶ Removal and lifting of access covers will require on-site assessment of H&S manual handling procedures.



▶ Access chambers installed with ACO Qmax® Q-Slot grates will have a recessed steel cover and frame. Remove the M8 screws with an allen key, and lift out the tray using appropriate lifting method. When replacing ensure the screws are fully tightened through the tray and into the frame.



Maintenance of domestic channel systems

Channel systems which have silt buckets can use method 1 or 2, including channels with grates or Brickslot.

Alternatively method 2 can be used for grated systems with or without silt buckets. For instructions on lifting grates please refer to page 7.

Equipment needed: ACO recommend using a domestic pressure jetting machine with jetting hose attachment for method 1, or small trowel for method 2.



ACO RainDrain



ACO HexDrain Brickslot



ACO HexDrain

METHOD 1



1. Remove the grate located over the outlet or sump using an ACO Drainlock™ lifting tool (refer to page 7).
2. Remove the silt bucket, disposing of any contents and clean.
3. Return the silt bucket to the sump, this will catch any flushed out debris.



4. Insert the jetting hose, and push until it reaches the end of the channel system. Cover the channel system to prevent spray or debris damaging nearby vehicles/buildings.
5. Turn on the pressure jet machine and slowly pull out of the channel system. The jetting machine will flush debris into the silt bucket.



6. If cleaning brickslot, pressure jet down through the slot with a standard hand held attachment, and repeat the flushing of the channel.
7. Remove the silt bucket and clean.
8. Replace the silt bucket and grate.

METHOD 2



1. Remove the grates along the entire channel system using an ACO Drainlock™ lifting tool (refer to page 7).



2. Using a trowel remove any debris.
3. Empty the silt bucket if applicable.
4. Replace silt bucket and all grates.

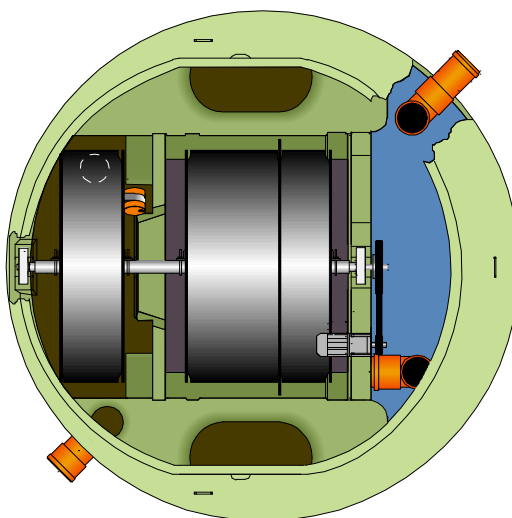


Using boiling water or cleaning agents is not recommended. If you want to use cleaning agents, please consult the cleaning product's manufacturer for information on compatibility with the material properties.

Appendix D

Klargester Bio-Disc Maintenance Guidance

OWNERS HANDBOOK



MANAGED FLOW BIODISC® BA BB BC NB NC

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www.klargester.com
uksales@klargestere.co.uk

HEALTH AND SAFETY

These warnings are provided in the interest of safety. You must read them carefully before installing or using the equipment.

It is important that this document is retained with the equipment for future reference. Should the equipment be transferred to a new owner, always ensure that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following the guidelines supplied with the equipment.

We recommend the use of a dust mask and gloves when cutting GRP components.

A qualified electrician should carry out electrical work.

Sewage and sewage effluent can carry micro-organisms harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

Covers must be kept locked.

Observe all hazard labels and take appropriate action to avoid exposure to the risks indicated.

The correct ongoing maintenance is essential for the proper operation of the equipment. Service contracts are available and recommended. Please contact Klargester for details of your local service provider.

Should you wish to inspect the operation of the equipment, please observe all necessary precautions, including those listed below, which apply to maintenance procedures.

BioDisc units contain rotating machinery and associated drive belts.

Ensure that you are familiar with the safe working areas and accesses.

Ensure that the working area is adequately lit.

The power supply to the equipment must be isolated at the control panel(s) before lifting the covers. Where a specific maintenance procedure requires the equipment to be running with the covers off, all care must be taken to avoid contact with moving parts and electrical components or conductors. Drive guards must be replaced and secured if removed during maintenance.

Once power has been isolated, the control panel must be kept locked shut to avoid accidental re-connection whilst work or inspection is being carried out.

Use only the designated access walkways. Do not walk on the cover or deep well safety mesh(es).

Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary. Keep proper footing and balance at all times. Avoid any sharp edges.

Desludging should be carried out by a licensed waste disposal contractor holding the relevant permits to transport and dispose of sewage sludge. The contractor must refer to the desludge instructions in this Handbook, a copy of the instructions are fastened under the covers.

There are separate installation guidelines available to provide full instructions for installations.

DECLARATION OF CONFORMITY		
Description of Machine Model	B Range BioDisc Sewage Treatment Plant	
Serial Number (see cover label)		
Year of Manufacture		
Name of Manufacturer	Klargester Environmental, College Road North, Aston Clinton, Aylesbury, Bucks, HP22 5EW.	
<u>EUROPEAN DIRECTIVES:</u>	Machinery Directive 89/392/EEC Low Voltage Directive 73/23/EEC Electromagnetic Compatible Directive 89/336/EEC	
We declare that the equipment covered in this manual conforms with the essential Health and Safety requirements.		
 PRODUCT MANAGER WASTE WATER 1 JUNE 1997		
		

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Wiring Diagrams

These are included in the BioDisc® Installation Instructions, supplied with the unit. A copy of the standard single phase BA/BB wiring diagram (510100) is provided at the back of this Handbook.

INTRODUCTION

Thank you for choosing a Klargester product. This manual will help you to keep it operating efficiently over a long service life. Please read this manual thoroughly, preferably before installation.

This manual should be referred to by:

- The installer
- The electrician
- The commissioning engineer
- The maintenance engineer
- The desludge contractor
- The owner/user

Service contracts are recommended. Details on request.

SECTION 1

TECHNICAL DATA

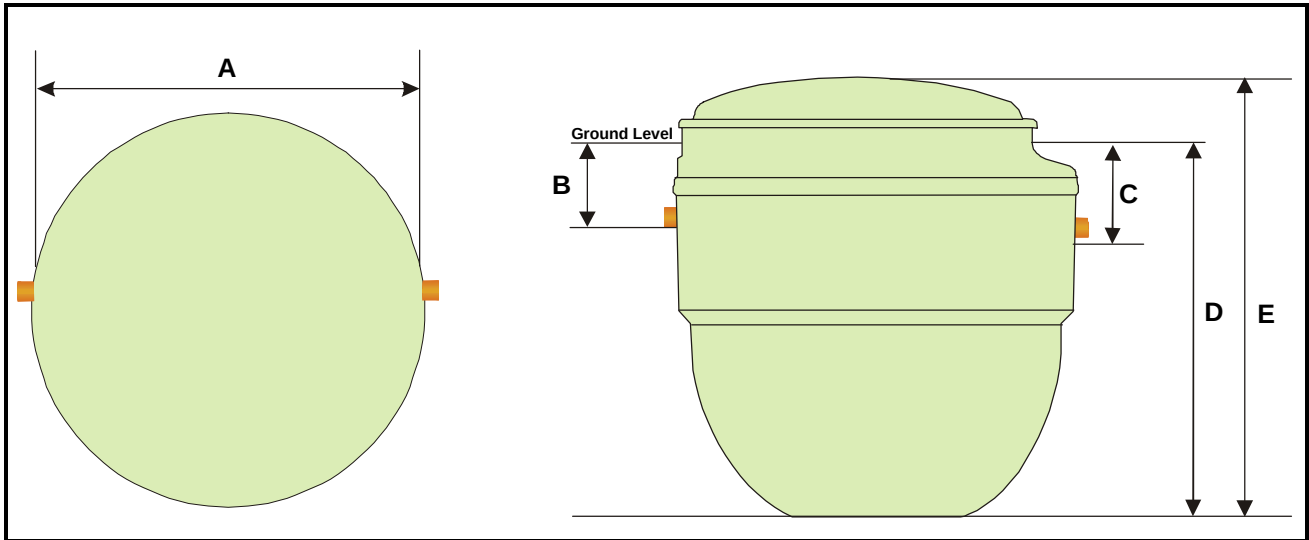


Fig. 1 General Dimensions

UNIT		BA/BB/NB			BC/NC	
Diameter	A mm	1995			2450	
Inlet Invert depth	B mm	450	750	1250	600	1100
Outlet Invert Depth C mm	Gravity discharge	535	835	1335	685	1185
	Pumped discharge	425	425	425	N/A	N/A
Depth Below Ground	D mm	1850	2150	2650	2420	2920
O/A Height	E mm	2160	2460	2960	2825	3325
Standard Power Supply		1 phase				
Optional Power Supply		3 phase				
Drive Motor Rating 1ph/3ph		60/60 watts			75/60 watts	
Sludge Return Pump Rating 1ph		480 watts (NB only)			480 watts (NC only)	
Integral Discharge Pump* Rating		480 watts (Not NB)			N/A	

*Optional

UNIT	BA	BB	BC
Maximum number of properties	1	2	Consult Klargester
Maximum Daily BOD kg	0.36	0.72	1.08
Maximum Daily Flow m ³	1.2	2.4	3.6
Peak Flow Rate * m ³ /hr	0.15	0.3	0.45

(*) For ½ hour max. in any 2 hour period

All surface water must be excluded. These units should be used exclusively for the treatment of sewage from domestic properties. Contact Klargester if your sewage results, wholly or partly, from any commercial function.

SECTION 2

DESCRIPTION AND PROCESS

1. Introduction

BioDisc systems are designed to accept crude domestic sewage and produce an effluent of suitable quality for discharge to a watercourse or soakaway system, subject to the approval of the appropriate regulatory authority. These BioDiscs are self-contained single piece units.

The main casing and cover of the BioDisc are constructed of Glass Reinforced Plastic (GRP). All steel parts are stainless, galvanised or surface coated to protect against corrosion. The discs are vacuum formed polyethylene.

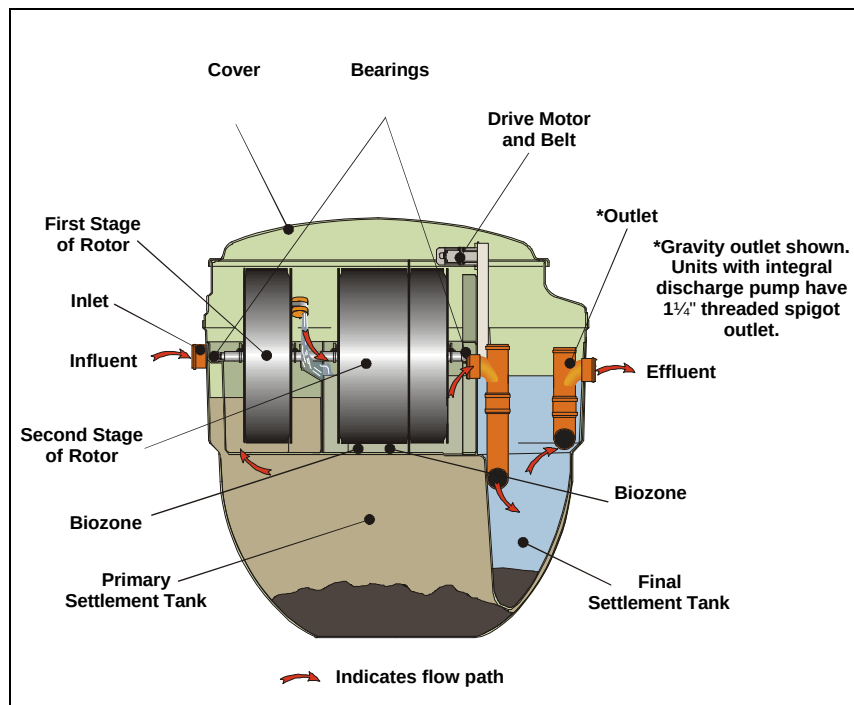


Fig. 2 - General Arrangement of BioDisc System

2. Primary Settlement Tank

Crude sewage enters the Primary Settlement Tank (PST), through an inlet pipe in the side of the BioDisc. Solids are settled out and retained for periodic desludging.

The PST is designed to have sufficient capacity to accept high flows over a short period and the patented Managed Flow System allows the liquid level to fluctuate to accommodate such surges.

3. Biozone

The Biozone contains the Rotor, which consists of corrugated polyethylene discs mounted on a horizontal shaft, supported by a bearing at each end. The rotor is slowly rotated by an electric motor and reduction gearbox with a belt drive.

A flat GRP walkway along either side of the Biozone contains a number of ports which give desludge access to the Primary Settlement Tank.

The surface of the discs becomes colonised by naturally occurring micro-organisms, which form a visible coating known as the Biomass. As the discs rotate, the Biomass is alternately submerged in the settled sewage and aerated by exposure to the atmosphere. Under these conditions the Biomass can efficiently break down the pollutants in the sewage.

The Biozone and discs are divided into two stages, separated by a fixed baffle. Settled sewage enters the first stage of the Biozone through a submerged transfer slot. The liquid level in this stage will fluctuate in the same way as in the PST and the bacteria are exposed both to the fluctuating liquid level and to fluctuations in sewage strength and concentration of domestic chemicals such as washing powders. One of the functions of this stage is to minimise the effect of such shock loads, which could otherwise inhibit the process.

The second stage of the Biozone is hydraulically sealed from the first stage and maintains a constant liquid level. Liquid is transferred from the first to the second stage, at a steady rate, by a series of buckets attached to the rotor. This controlled flow of effluent is at the heart of the patented Managed Flow System, which promotes healthy and balanced growth of the micro-organisms essential for efficient treatment.

Excess Biomass (also referred to as humus) sloughs off the surface of the discs and passes with the flow, to the Final Settlement Tank.

4. Final Settlement Tank

The Final Settlement Tank (FST) is situated under the drive motor and receives a steady flow of treated effluent from the Biozone. The humus settles out and is retained for periodic desludging.

In NB and NC units the settled humus is periodically returned to the Primary Settlement Tank, for co-settlement, by a timer controlled pump system.

Final treated effluent discharges from the FST through a dip pipe (excepting units with an Integral Discharge Pump).

5. Optional Integral Discharge Pump (BA/BB only)

The discharge pump sits within a moulded chamber, positioned in the Final Settlement Tank. Treated effluent flows into the chamber, by gravity from the FST. When the liquid in the chamber reaches a pre-determined level, a float switches on the pump which then pumps effluent out of the chamber. The same float also switches off the pump when the liquid level has been sufficiently lowered, thus protecting the pump from running dry. We do recommend when this option is purchased, that a high level alarm is also fitted to warn against pump mal-operation or failure.

6. Control Panel

The weatherproof control panel should be mounted adjacent to the BioDisc. All Klargest control panels are year 2000 compliant. Panel options are :

- Standard Control Panel: (and all panels) include a 3 amp circuit breaker which protects the installation wiring should there be an electrical problem within the BioDisc.
- Loss of Rotation Alarm Control Panel: This replaces the Standard Control Panel and also includes a Loss of Rotation (LOR) Alarm, which will activate if the rotor stops turning after a delay of 2-3 minutes (other than a failure in the power supply.) It has stop and run lights on the door, and where specified an optional alarm beacon on top. An additional remote slave beacon may also be fitted. The loss of rotation of the rotor is sensed by a reed switch mounted near the BioDisc motor in conjunction with a magnet attached to the rotor.
- Integral Discharge Pump Panel also includes an isolation switch for the discharge pump.
- Nitrification Unit Panels contain a timer and relay to control the operation of the sludge return pump and current overload protection for the pump motor.

All units will restart following a power cut, unless there has been a power surge greater than the pre-set limit of 3 amps. See Section 5, paragraph 3.

7. Alarms

Optional independent alarms are available, suitable for placing in any indoor location, up to 100 metres from the BioDisc and would usually be connected to a power supply independent of the BioDisc. They have an audible alarm, with mute button and a warning light; some independent alarms are fitted with a flashing beacon.

- Independent Remote Loss of Rotation Alarm Panel: This is fitted in addition to the Standard Control Panel and gives warning if the rotor stops turning for any reason.
- Independent High level Alarm: This may be fitted to units with an Integral Discharge Pump and gives warning if the level in the FST rises abnormally, indicating a pump failure.

SECTION 3

INITIAL START UP PROCEDURE

1. Introduction

Every care is taken to ensure that all mechanical components are correctly fitted, adjusted and lubricated prior to leaving the factory. However, subsequent handling during transportation and installation may result in the movement of components and a subsequent need to re-adjust prior to starting the unit. Your installing contractor should have thoroughly checked the unit but if, on inspection, you consider that any components require adjustment, please contact Klargest. We do recommend you purchase a commissioning service from an approved engineer.

Once the unit has been installed it should be left filled with water. Please switch on the motor, following the procedure below and leave the unit running, even if there is no sewage being fed into the plant. **If the unit has been installed with no operational power supply, then remove the motor/gearbox unit and store it in a dry or heated environment until such time as the unit is ready for permanent operation. The**

motor gearbox unit and drive belt should then be replaced and tensioned by Klargestor or an experienced contractor.

We recommend that the system should be commissioned. Please contact Klargestor. Where an immediate start-up is necessary, the following basic procedures should be carried out. Ensure that all Health and Safety precautions are observed.

2. Water

Check that the BioDisc is full of water to the outlet level.

3. Electrical

Check that the power supply is connected to the control panel. Check that all electrical components and conductors are earthed.

4. BioDisc

Check that the BioDisc is in order, with no obvious damage or misalignment of parts. If any problems are discovered, contact Klargestor.

Check that all electrical components: Drive Motor, Sludge Return Pump and LOR Alarm sensor, (where applicable) are connected to the Control Panel.

NB/NC units only: Check that the Sludge Return Timer in the BioDisc Control Panel is set correctly, as Indicated in the diagram



Fig. 3 - Pump Position

Units with optional discharge pump: Check that the pump float and associated pipework are positioned as shown and that the float can move freely.



Fig. 4 - Float Setting

The float cable length is pre-set during assembly to a dimension of 75mm. Check that this dimension has not been altered. If for any reason the cable becomes disconnected from the retaining clip it should be replaced so that there is 75mm of cable between the clip and the float.

Note: Setting less free cable will cause the pump to operate more frequently and may shorten its working life.

Important: With the pump chamber empty of water the float must hang clear of the chamber floor. The correct float position and distance is essential. The float must not be able to either trap or tangle, as this will prevent its correct operation. The float must not jam.

5. Switch On

Open the Panel. Put the isolating switch and/or circuit breaker(s) into the “on” position. Close and lock the panel. Note: If the unit is fitted with a sludge return pump, this will start immediately and will run for the pre-set period.

6. Running Checks

Check that the rotor is running smoothly in the correct direction of rotation and is not contacting any part of the fixed structure.

Check that the forward feed buckets are discharging correctly from the first to the second stage of the Biozone.

Units with optional Discharge pump: Once the rotor is turning, a flow through the FST and into the pump chamber will be generated. Check that the pump switches on at high level and off at low level.

Note: The pump switch-on level must be below the pump chamber inlet.

7. Optional Loss of Rotation Alarm

The alarm sensor (reed switch) is mounted adjacent to the motor/gearbox assembly. The sensor may be supplied out of position, to allow for possible minor rotor movement during transport. Check the sensor position and if necessary adjust to provide a gap of 5 - 10 mm between the sensor and the actuator magnet.

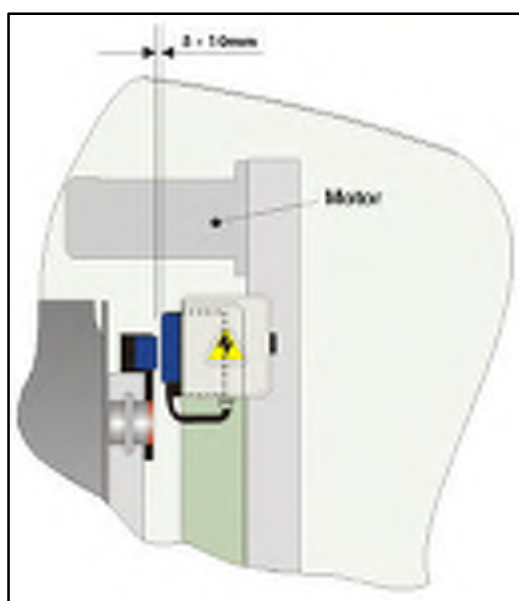


Fig. 5 - Alarm Sensor Adjustment
(position may vary)

Check operation of the Loss of Rotation (LOR) Alarm as follows:

- Open the Control Panel and isolate the drive motor whilst maintaining power supply to the alarm circuit. For units with a combined Alarm Control Panel this can be done either by removing the motor fuse or by operating the motor overload trip (refer to wiring diagram). Where a remote independent alarm is fitted, simply isolate power supply at the BioDisc control panel. After a delay of 2-3 minutes the alarm should activate.
- Push the reset button on the front of the Panel. The alarm beacon or sounder should cease and the red indicator light on the panel front should remain illuminated.
- Re-connect power to the drive motor and close the Control Panel. The alarm should cease after approximately one minute.
- Depress and release the “Beacon Off” button to reset it.

Malfunctioning of the LOR Alarm does not prevent operation of the BioDisc System, but it should be reported to your maintenance engineer for early rectification.

8. Process Initiation

During installation, the unit will have been filled with water. Allow sewage to enter the unit, this will gradually displace the clean water used during installation.

Colonisation by micro-organisms will commence naturally and an operating biomass will develop on the discs after approx. 3-6 weeks, depending on individual site conditions and season.

SECTION 4

OPERATION

1. Introduction

The biological treatment process of your BioDisc is self regulating and it requires no specialised operational knowledge, but it is important that you are aware of the following:

Your BioDisc system uses colonies of live natural micro-organisms (biomass), to break down the pollutants in the sewage. Many chemicals used in households and commercial establishments can inhibit or kill these micro-organisms; particularly if used in excessive amounts.

Bear in mind that treatment plants serving small populations do not have the benefit of dilution that occurs at a large sewage works. A bottle of bleach tipped down the toilet in Birmingham would be virtually lost amongst the millions of gallons of sewage arriving at the city's treatment works; a bottle of bleach in a plant serving one or two houses could be a lethal dose for the biomass.

If the biomass is damaged, it will usually recover in time. But in the meanwhile one of the more obvious symptoms may be an unpleasant smell, so it is in the operators interest to avoid this.

Generally speaking all common household cleaning fluids are acceptable, provided they are used in accordance with the makers instructions and stipulated concentrations. The following "Do's and Don'ts" includes the most common household chemicals, but it is not an exhaustive list and the golden rule is "If in doubt - leave it out."

Bear in mind too that it isn't only the toilet that is connected to the treatment plant; anything that goes down the sink, bath etc., also ends up there.

2. Do's and Don't's

Washing machine and dishwasher detergents, washing up liquids:

These are generally all right to use in the normal concentrations and usage found in domestic housing applications. Problems can occur if, for instance, you are washing the jerseys of the local rugby club's five teams!

BioDisc incorporates a unique flow management system which enhances its ability to handle shock loads of detergent waste, but there are limits even to this, so if you have to do unusual amounts of clothes washing it would be a good idea to spread it over a few days.

Excessive use of Biological washing powders can cause degradation of the biomass. Non-biological detergents, without enzymes, may be substituted.

Floor cleaners, disinfectants and bleaches:

These are safe to use in accordance with the makers recommendations and in the minimum necessary concentration. Do not pour neat disinfectant or bleach down sinks or outside gullies. If these are smelly it usually indicates a build up of decaying material or a plumbing problem and should be dealt with accordingly.

Nappy disinfectants and bottle sterilising fluids e.g. Milton

When disposing of the used fluid, ensure that it is well diluted with water. The easiest way of doing this is usually to flush it away down the toilet.

Waste disposal units:

These do not inhibit the biomass, but, depending on use, they can present the treatment plant with considerable extra load. This can result in the treatment process becoming unbalanced, leading to problems. Much better to compost your vegetable peelings etc - it's cheaper and environmentally friendly.

Home beer and wine making.

This presents a similar problem to waste disposal units. The BioDisc has to work as hard to treat one pint of beer tipped down the drain as it does to treat all the normal waste produced by one person in 24 hours. See also the notes above regarding sterilising fluids.

THE FOLLOWING MUST NOT BE DISCHARGED INTO THE DRAINS

Motor oil, grease, anti-freeze, brake fluid etc.

Cooking oil and fat.

Weed-killers, insecticides, fungicides and other gardening chemicals.

Paint, thinners, white spirit, turpentine, creosote etc.

Chemical drain cleaners.

Acid based brick/stone floor cleaners.

Medicines

Take unused medicines to a pharmacist for safe disposal.

Photographic developing fluids.

Nappies, sanitary towels, rags, soft toys, tennis balls etc.

This may seem obvious, but it is amazing what gets flushed down the loo from time to time. Although such items are not directly damaging to the biomass they can cause problems, not the least of which is simple blockage of the drains.

Even so-called disposable nappies and sanitary towels often do not degrade fully in the treatment plant and can lead to malfunction, so it is best to dispose of them by other means.

3. Desludging and Maintenance

These are vital to the plant's ongoing operation and should be carried out in accordance with the guidelines in the maintenance section of this manual.

Maintenance contracts are available. Please contact Klargester for your local service provider.

SECTION 5**MAINTENANCE****1. Introduction**

Klargester BioDisc units are designed and engineered for the minimum possible maintenance requirements, consistent with proper performance. Nevertheless, it is important that routine preventive electro/mechanical maintenance and de-sludging are carried out at the appropriate intervals by suitably qualified persons.

Please contact Klargester for your local service provider.

2. Customer Checks

As a back-up to routine servicing and to assist trouble-free operation, we recommend that you familiarise yourself with the operation of your BioDisc and make the following checks from time to time: (Refer to Fig. 6 for positions of parts mentioned.)

Your attention is specifically drawn to the Health and Safety section of this manual.

- Review the appearance of the Biomass. It may be light grey to grey at the first bank, gradually changing to brown in the second stage and dark brown at the drive end of the rotor. If the growth is excessively thick and the colour predominantly grey throughout, an overload condition is indicated.
- Visually check the general condition of the BioDisc.
- Check that the inlet and outlet pipes (C) are clear. Remove any debris if necessary.
- Check that the dosing bucket(s) (D) are transferring liquid consistently from the first to second biozone section.
- Units with an Integral Discharge Pump: Check that the pump float can move freely and switches the pump on and off as the level in the pump chamber rises and falls. If a high level alarm is fitted check that the alarm float can move freely.
- Units with Loss of Rotation Warning Device: Check for correct operation (see Initial Start Up Section).
- Familiarise yourself with the normal operating sound of your BioDisc. Report any unusual noises to your maintenance engineer.

If any malfunction is discovered, contact your maintenance engineer.

3. Failure of Power Supply or of Discharge Pump

BioDiscs with gravity discharge: In the event of a power failure, flow through the BioDisc will continue by gravity, although the quality of the discharge will gradually deteriorate. When power is re-established, check that the rotor has re-started and is turning correctly (see Section 3.0 paragraphs (5) and (6)). If the BioDisc has not been working for some time, the rotor may become unbalanced. This can cause the rotor to turn unevenly or prevent the unit restarting. In the event of any difficulties, contact your local service provider.

4 Low Voltage Power Supply

Motors may burn out if this condition is experienced. Consult electrician.

IMPORTANT - READ THIS. TAKE IMMEDIATE ACTION IF A PROBLEM ARISES

BioDiscs with pumped discharge (Integral or external pumps): During power cuts, or in the event of pump failure, the level of sewage in the BioDisc will rise and if unchecked will lead to overflowing and/or possible damage to the motor/gearbox. At normal flow rates, sewage will reach the level of the motor in about 40 hours (6 people) or 20 hours (12 people). If pump operation cannot be re-established within this time the sewage level in the BioDisc must be carefully monitored and incoming flow restricted. If necessary the BioDisc should be emptied by a licensed waste contractor to avoid sewage overflowing the internal baffles or damaging the motor. **Do not allow the motor/gearbox to come into contact with sewage.**

When normal operation is resumed, check for solids in the Biozone and FST and de-sludge if necessary. Check rotor rotation as above.

4. Sludge Removal from BioDiscs BA, BB, NB, BC AND NC.

Refer to the illustration below for recommended desludge positions.
(Note: Illustration is typical; individual units may vary).

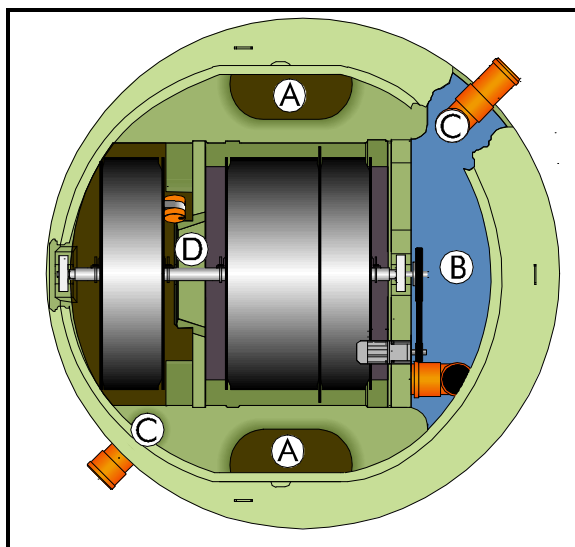


Fig. 6 - Desludge Positions

- a) Isolate power to the BioDisc.
- b) Undo the BioDisc cover latches and remove the cover. Hinged covers should be folded before removal.
- c) Remove surface scum and about half the contents of the Primary Settlement Tank through the desludge ports [A] on either side of the rotor. Use the ports alternately. If port covers are fitted, keep the port not in use covered.
- d) Empty the Final Settlement Tank [B]. **DO NOT** attempt to remove liquid from the discharge pump chamber (if fitted).
- e) Remove remaining matter from the Primary Settlement tank.
- f) **DO NOT** attempt to remove any liquid from the rotor section.
- g) **DO NOT** attempt to clean off the gelatinous biomass growth on the rotor.
- h) Ensure that the BioDisc inlet and outlet pipes [C] and the forward feed buckets [D] are free of debris. Ensure that the desludge port covers, if fitted, are replaced, then close and lock the BioDisc covers.
- i) Re-connect the power supply. Ensure that the control panel door is locked shut.
- j) Units with Loss of Rotation Alarms only: Wait for two minutes. If the alarm on the control panel does not activate, this indicates that the rotor has successfully re-started. If the alarm activates, switch off the power at the control panel and immediately switch on again. If the alarm continues to activate, isolate the power supply and notify the plant owner so that the problem can be investigated.

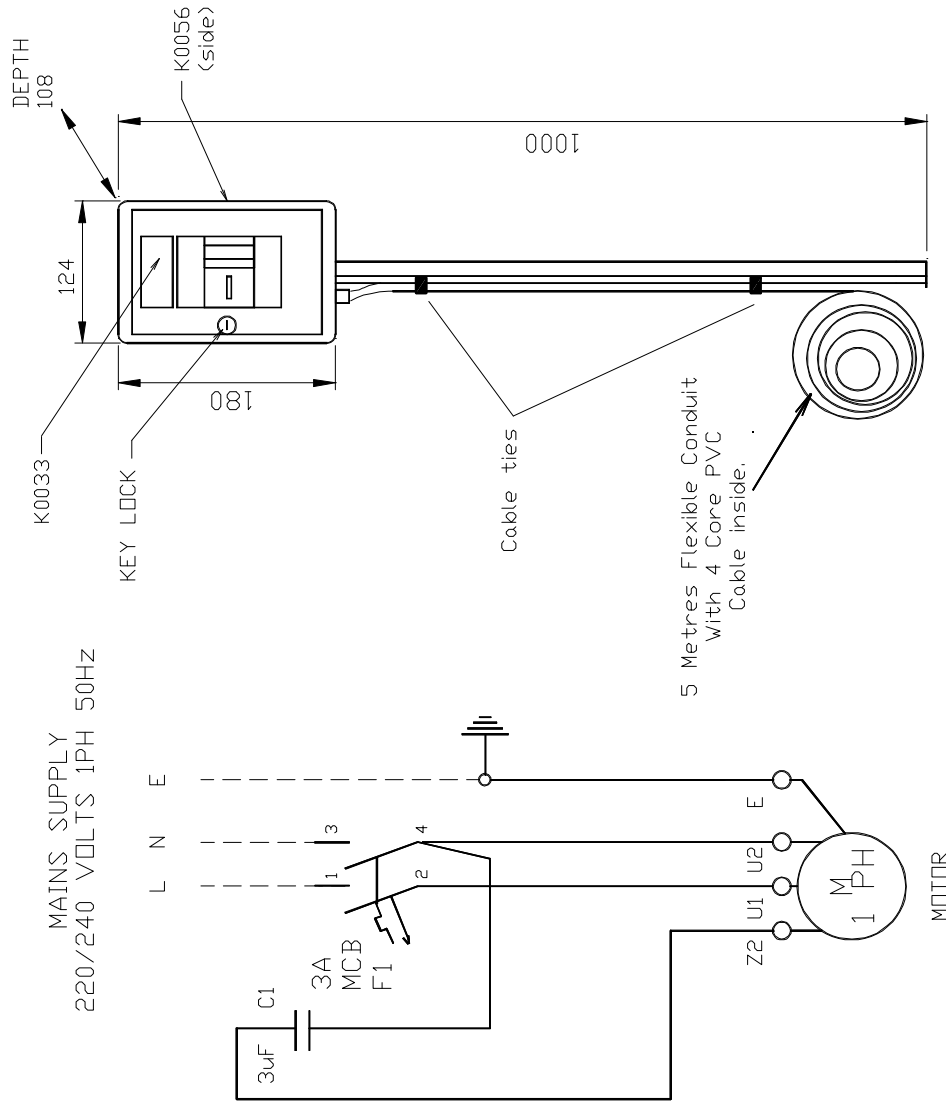
5. Desludge Volumes

Model	BA	BB/NB	BC/NC
Primary Settlement Tank	2200 litres (485 galls)	2200 litres (485 galls)	4580 litres (1009 galls)
Final Settlement Tank	400 litres (88 galls)	400 litres (88 galls)	850 litres (187 galls)
Desludge Period	12 months Maximum	6 months Maximum	7 months Maximum
You should not exceed the maximum desludge periods given above.			

TROUBLE SHOOTING GUIDE FOR BIODISC UNITS BA/BB/NB/BC/NC

SYMPTOM	CAUSE	ACTION
Strong odour	Excessive build up of sludge and scum	Desludge the unit.
	Grease (white/cream crust in primary tank and/or thick, smooth biomass ¹)	De-sludge unit. If necessary hose off discs. Avoid excessive use of fats and oils. Please note removal of Biomass will reduce treatment until new Biomass establishes.
	Chemicals in the system (very sparse or no biomass ¹)	In most instances, units will recover naturally from toxic inhibition events. Refer to section 4 of the Owners Handbook for general guidance on use of domestic chemicals.
	Excessive laundry use (thick, stringy whitish biomass ¹ on first section)	Spread out laundry operations. Avoid biological powders where possible and use the minimum possible amounts of detergent. Refer to section 4.
	Unit overloaded (thick/grey biomass ¹) over most of rotor	Check section 1 of the Owners Handbook for the process capability of the unit. If in doubt, contact Klargester.
	Rotor stopped	See rotor stopped section below.
	Drains inadequately ventilated	Check that there is an open high level vent at the head of the drains (not "Durgo" valve or tile vent).
Rotor stopped	Switched off	Check that the motor switch on the panel is in the "on" position. Re-set if necessary.
	Power failure	Check the fuse/trip at the supply board. Replace/re-set as necessary. If the problem persists, contact Klargester.
	Wiring fault	Have the wiring to control panel checked by a competent electrician. If the supply wiring is OK contact Klargester.
	Drive belt broken	Contact Klargester.
	Drive motor faulty	Contact Klargester.
	Loose pulleys on rotor or gearbox output shaft	Contact Klargester.
Rotor fails to re-start after a stoppage	Rotor unbalanced	Hose off excess Biomass on the heavy side of the rotor. Note removal reduces treatment.
Rotor turns intermittently	Drive motor overheating	Contact Klargester.
Effluent discharge not to required standard	See strong odour and rotor stopped sections.	
	Managed flow system in-operative.	Check that bucket(s) are in place and discharging correctly into the biozone second stage.
	Sludge return pump inoperative (NB/NC only)	Contact Klargester.
Unit flooded (units with integral discharge pump)	Discharge pump not working.	Check that the pump switch on the panel is in the "on" position. Re-set if necessary. Check that pump control float is clear of obstructions and set at the correct length. If the problem persists consider emptying unit to protect motor and gearbox and contact Klargester or service provider. (See Section 5).

1. Refer to Section 5 of this manual for guidance on the appearance of a healthy Biomass.



SPECIFICATION	PART No.	REF
* ENCLOSURE	80200001	
* KEY LOCK	802000041	
* MCB 3A 2 POLE	32100121	F1
* 5 MTRS 20mm FLEXIBLE CONDUIT	70300001	
* 2 - GLANDS FOR FLEXIBLE CONDUIT	70300011	
* 2 - 20mm LOCKNUTS	70300021	
* 2 - 20mm WASHER	70300031	
* 1 METRE GALVANIZED ANGLE IRON	92200001	
* 5.25 MTRS 4 CORE 1mm FLEX CABLE	72300001	
* CAPACITOR 3 uF	02400001	C1
* VINYL LABEL 'KLARGESTER'	K0033	
* VINYL LABEL 'DO NOT WALK ON COVER'	K0056	
* VINYL LABEL '230 VOLTS WARNING LABEL'	K0043	
* 2 - CABLE TIES	70500001	

PART No. E0180

— DO NOT SCALE

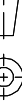
TITLE

BA/BB BIDDISC
1 PHASE
CONTROL PANEL

SCALE
DRAWING No.

510100



3	02.06.03	A.L.	BORDER UPDATE
2	01.10.01	A.L.	COMPONENT MODIFICATION
1	01.07.01	M.P.C.	INITIAL ISSUE
ISSUE	DATE	DRAWN	MODIFICATION
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