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RPS-MCOS Ltd., Carnegie House, Library Road, Dun Laoghaire, County Dublin, Ireland
T +353 1 202 0870 F +353 1 202 0707 E rpsmcos@rpsgroup.ie W www.rpsmcos.ie

Ms Emer Cooney
Inspector
Waste Management Licensing
Environmental Protection Agency
Headquarters,
P.O. Box 3000
Johnstown Castle Estate
Co. Wexford

14th June 2004

Our Ref.: MDE0163LT0056DUN
File Ref.: 350

Re: Waste Licence Application Reg. Number 205-1
Clarification of the proposed Drainage Design

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Dear Ms. Cooney,

Following on from our phone conversation on Monday 31st June 2004 I have the enclosed a copy of the latest drainage design option sent to South Dublin County Council (SDCC) in response to a 'Clarification Information Request'.

The clarification request in relation to the drainage design was issued by SDCC on the 5th March 2004 and followed an 'Additional Information Request' issued to the client on the 12th January. This revised drainage design option features the Stormtech attenuation system and meets the limiting discharge requirement of 6l/s/ha set by SDCC for the site. This design supersedes the original drainage options, which were included in the Waste Licence Application submitted to the Agency on the 7th April 2004.

The information enclosed includes:

- A technical description of the proposed system
- Technical Appendices with design calculations and product specification
- Revised drawings showing the layout of the system

An original and five copies of the information is enclosed as requested.

Yours Faithfully,

Warren Phelan

Warren Phelan
For & On behalf of RPS-MCOS Ltd.

WP/wp.

Encl. 6 * Report, Appendices and Drawings
cc. Mr. Brian Buckley, Director, Greyhound Recycling & Recovery

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CLARIFICATION OF ADDITIONAL INFORMATION

1. DRAINAGE DESIGN CLARIFICATION

1. The applicant has failed to respond to Item 6 to the satisfaction of the Council. The proposed attenuation facility is insufficiently sized. The applicant is requested to submit revised attenuation details upsizing the tank to 1084m^3. This is to satisfy the following: The surface water run-off from the new development shall be limited to 6l/s/ha for the area of the site. The attenuation facilities and flow control mechanism should limit surface water discharges based on rainfall intensity for a 20-year return period of 2-hour duration. Details to include discharge calculations, pipe sizes, invert levels and gradient, manhole locations, required storm water storage volume, location of storm water storage area together with a cross-section of the storm water storage area showing details of both inlets and outlets. Details of proposed flow control mechanisms to limit surface water discharges shall also be limited. Full details of how the attenuation facility shall be kept free from siltation and cleaned shall also be included.

Introduction

Upon receipt of the Clarification Request, RPS-MCOS made contact with SDCC Drainage Dept and a meeting was held on the 15th April 2004. Follow-up contact to clarify outstanding issues was made with the Senior Engineer and other environmental staff.

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The total area of the site is approximately 4.5ha. Reduce Reuse & Recycle Ltd. proposes to develop 3.1ha in the current application. The balance of the site is to be left undeveloped at present. The boundary of the proposed development area is illustrated in **Appendix A**, Figure 1, with shading illustrating the proposed surfaces for the development.

Two calculations have been carried out:

- one on the surface water network using InfoWorks CS to determine required surface water drainage pipework using the M20-120 storm
- one to determine the required storage volume to store the M20-120 storm with an allowable discharge of 6l/s/ha (19l/s for this site). This calculation was based on the rational method. The volume was determined by calculating the volume of runoff from the different surfaces on the site.

The calculations only consider the 3.1ha of the site where the proposed development will occur. The remainder of the site, should the Client wish to develop, will be subject to future planning applications.

Parameters

Following a meeting with SDCC drainage personnel on 15th April 2004, the following impermeability coefficients were agreed for the site:

- Concrete, C = 0.8 (80% impermeable due to the condition of the concrete surface)
- Tarmacadam/Asphalt, C = 0.9
- Roof Surface, C = 1.0

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Surface Water Networks

Appendix A illustrates surface water network calculations with the detailed layout of the surface water system presented in **Appendix D, DG008A04**. InfoWorks CS was used to size the pipework using the Wallingford Procedure. It is proposed to retain some of the existing pipework in addition to some new lines being laid.

Storage Requirements

The required storage volume is calculated as follows:

M20-120 Rainfall depth = 31mm

	Area, A (ha)	Impermeability Coefficient, C	Impermeable Area (ha)
Tarmac Surface	0.83	0.9	0.747
Concrete Surface	1.65	0.8	1.32
Roof Surface	0.63	1	0.63
Total (ha)	3.11		2.697

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The volume of runoff is determined by multiplying the area by the coefficient and the total rainfall depth. This gives a volume of runoff of 835m³.

The allowable discharge of 18.6l/s is applied over the 2 hour period to get a volume of 134m³. Therefore the volume of storage required is 701m³.

It is proposed to provide this storage using Stormtech chambers, with outflows limited by Hydroslide provided by Copa.

Stormtech Stormwater Management System

Stormtech is a widely used storm water attenuation system in the USA and recently in Ireland. The system comprises rows of porous arch chambers surrounded by stone with 40% voids ratio thus providing a large storage volume within a confined space. A cross-section of the Stormtech system is provided in **Appendix D DG0019A01**. It is proposed to use the SC-740 chambers as shown.

Flows pass into a manhole where first flush is diverted to the isolator row (ref below). When the weir is overtopped flows pass to the header pipe which feeds additional rows of Stormtech chambers. Since the chambers are porous flow is transferred to the stone backfill from the chambers. The purpose of the isolator row is outlined below.

Subsequent chambers are fed through the isolator and also the header pipe. The Stormtech chambers and stone back fill are laid on a bentofix liner which prevents infiltration of surface water runoff to groundwater.

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Foul Sewer Calculations

These have been included for clarity as it has been necessary to propose a diversion of the existing foul sewer to enable ease of installation of stormtech.

The drawing provided with the Planning Application – DG008 A04 – outlines the relevant foul sewer locations, diameters and invert levels. This drawing has been updated as previously requested and is included in this report. It is intended to retain the existing foul sewer network insofar as is possible. A new 150mm line is proposed to drain the main recovery building. The effluent from this facility will consist primarily of domestic, foul etc. The existing sewer draining the workshop/proposed truck wash is to be retained with a diversion around the proposed storm water attenuation tank and discharging into an existing manhole on the 225mm foul sewer on Crag Avenue.

The associated design calculations for the foul water system are attached in **Appendix C.**

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It is proposed to lay the SC740 chambers on a base of 300mm 5cm to 2cm washed angular stone, with 150mm of this stone on top of the chambers. The proposed stone has 40% porosity, which when taken into account gives a chamber volume of 2.31m³, refer to **Appendix B** for details. Therefore the number of chambers proposed is 315 giving a total volume of 725m³. It is proposed to have 15 chambers per row with 21 rows.

The advantage of this system over other similar systems is the ease of maintenance, total suspended solids removal and it's structural strength, which allows heavy traffic loading with minimum cover on the chambers.

It is proposed that flow will be collected in a 250mm perforated pipe adjacent to the last row of stormtech chambers which will transfer flow to the outlet manhole.

Figure 1 illustrates the proposed layout of the Stormtech system for this site.

Selection of Outlet Control

The allowable discharge for the site is 6l/s/ha, which is equal to 18.6l/s for the site. It is proposed to limit discharges to the surface water system by a DR 200/150 VS Hydroslide supplied by Copa Ltd. Head discharge curves are supplied for this product in **Appendix B**.

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Maintenance of Stormtech Attenuation Facility

It is proposed to install a SW10808 Surf Sep provided by Copa to screen inlet flows. This will be located upstream of the PIB4 Class 1 Bypass Interceptor. It will ensure that solids are captured within the Surf Sep thus reducing cleaning requirements of the oil and grit interceptor.

SurfSep units utilise continuous deflective screening (CDS) a revolutionary non blinding method of screening solids from liquids. US EPA studies have confirmed the non blinding nature of the screens and confirmed the ability to continue screening and prevent scouring out of contaminants for high flow events and very low flow events alike. SurfSeps are proven to remove 50-70% of TSS, 5-20% of Biological Oxygen Demand and 30-70% of Phosphorous. Greater than 98% of all particles >3mm are captured by the screen, even if buoyant or neutrally buoyant. This additional screen has the effect of reducing suspended solids passing into the Stormtech chambers where blocking of the hydroslide by larger gross solids (litter) can prove to be troublesome. A design specification for the SurfSep System is included in **Appendix B** of this report.

After passing through the interceptor and SurfSep screen flows pass into the inlet manhole. It is proposed to have a catchbasin in the inlet manhole that will enable additional solids to be retained. First flush flows will pass into the isolator row. The isolator row is a row of standard stormtech chambers wrapped in a non-woven textile. The non-woven textile allows for removal of TSS, while allowing water to egress through the filter fabric while sediment is trapped within. The base of the isolator row is separated from the stone backfill by a woven geotextile which prevents sediment passing through to the stone base. It should be inspected at a minimum of every 4 months. The isolator row can be cleaned as required using a standard jetter.

Possible Future Extension at the site

Should the additional 1.4 ha of the site be developed in the future, the stormtech system can be extended as presented in **Appendix D DG0008**. Surface water pipes have been sized to cater for possible new flows in that portion of the site. The outlet control would have to be adjusted to allow higher runoff from the site (based on the same restrictions on outflow as are currently specified by SDCC).

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APPENDIX A

SURFACE WATER NETWORK AND

STORAGE CALCULATIONS

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Legend

- Roof Areas (C = 1)
- Tarmac Areas (C = 0.9)
- *Concrete Areas* (C = 0.8)

Reduce Reuse 3R's Recycle

Project: *Sustainable Resource Recovery Facility*

Title: **Catchment Surfaces**

Figure 1

RPS mcos
Carnegie House
Dun Laoghaire
Co Dublin
Phone. 01 - 2020670
Fax No. 01 - 2027937
rpsmcos@rpsgroup.ie

Issue Details

Drawn:	SK	Project No.	MDE0163
Checked:	WP	File Ref.	MDE0163MI0018D01
Approved:	CB		
Scale:	NTS	Drawing No.	MI0018
Date:	15/04/2004	Rev.	D01

Notes
1 *This drawing is the property of RPS-MCOS Ltd. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.*
2 All levels are referred to Ordnance Datum, Malin Head
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Surface Water Network Calculations

The Table below provides details of the surface water pipes, invert levels, manhole cover levels and deisgn pipe flows for the proposed network.

The surface water calculations were determined by the HR Wallingford modelling packagage InfoWorks v4.5, using the Wallingford Procedure. Simulations were run for the M20-120 storm with discharges limited to 6L/s/ha

Table 1 Details Calculations of the proposed Surface Water Network

US Node ID	DS Node ID	US Cover Level	DS Cover Level	US Invert Level (m AD)	DS Invert Level (m AD)	Length (m)	Diameter (mm)	Gradient (m/m)	Capacity (m3/s)	M20-120 Peak Flow (m3/s)	M20-120 Velocity (m/s)	Max DS Depth (m)	M20-120 Cumulative Flow (m3)
SP 1	SP 2	54.21	54.16	52.91	52.68	71.9	375	0.0032	0.113	0.07941	0.648	1.598	208.61
SP 2	SP3	54.16	54.29	52.68	52.562	35.3	375	0.00334	0.115	0.10132	0.823	1.628	265.18
SP3	SP 4	54.29	54.13	52.562	52.421	42.1	450	0.00334	0.186	0.21648	1.241	1.56	514.7
SP 4	SP 5	54.13	54.1	52.421	52.306	34.7	450	0.00332	0.185	0.28876	1.67	1.371	657.59
SP 5	STORAGE	54.1	54.1	52.156	52.118	9.6	600	0.004	0.434	0.41006	1.762	1.351	914.44
STORAGE	New SW MH	54.1	54.3	51.7	51.676	6	300	0.004	0.07	0.019	0.747	0.092	134
SP 10	SP 9	55.08	55.1	54.62	54.334	28.6	300	0.01	0.111	0.04229	0.919	0.27	91.16
SP 9	SP 8	55.1	55.18	54.334	54.224	11	300	0.01003	0.111	0.07083	1.425	0.327	152.62
SP 8	SP 7	55.18	54.5	54.224	54.025	19.9	300	0.01001	0.111	0.0773	1.563	0.415	166.57
SP 7	SP3	54.5	54.29	54.025	52.562	24.7	300	0.05931	0.272	0.10045	1.238	1.629	216.89
SE 12	Sp 12	55.18	55.25	54.522	54.345	26.5	150	0.00668	0.014	0.0265	1.429	0.265	52.88
SE 2	Sp 12	55.4	55.25	54.589	54.345	36.7	150	0.00665	0.014	0.03112	1.689	0.266	78.4
Sp 12	SP 11	55.25	55.13	54.345	54.03	47.2	300	0.00667	0.091	0.0746	1.209	0.352	168.68
SP 11	SP 6	55.13	54.37	54.03	53.419	71.5	300	0.00852	0.102	0.10008	1.362	0.355	222.36
SP 6	SP 5	54.37	54.1	52.5	52.395	26.2	450	0.00436	0.213	0.10007	0.579	1.37	216.76
SE 6	SP 9	55.12	55.1	54.451	54.334	17.6	150	0.00666	0.014	0.00541	0.292	0.27	11.42
SE 11	SE 10	55.02	55.02	54.494	54.367	18.6	150	0.00683	0.015	0.00505	0.374	0.24	9.37
SE 10	SE 9	55.02	55.03	54.367	54.271	14.4	150	0.00669	0.014	0.00971	0.724	0.291	19.9
SE 9	SP 7	55.03	54.5	54.271	54.025	24.6	150	0.00999	0.018	0.01303	0.704	0.414	26.55

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NOTE:
SE DENOTES EXISTING SW NETWORK
SP DENOTES PROPOSED SW NETWORK

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Planning Application Bdy (3.1ha)

M20-120 Rainfall Depth = 0.031 m

Area of tarmac (m²)=	8,283.0
Impermeability Coeff. =	0.9
Volume of runoff (m³) =	***231.1***
Area of concrete(m²) =	16,510.0
Impermeability Coeff.	0.8
Volume of runoff (m³)	***409.4***
Area of Roof (m²) =	6,283.0
Impermeability Coeff.	1.0
Volume of runoff (m³)	***194.8***

Total Volume of Runoff (m³) = 835

Allowable Runoff -6l/s/ha for 2hr (m³) 134

Volume of Storage Required (m³)= 701

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Storage Summary

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Area Breakdown

	Area (ha)	Impermeability Coefficient
Tarmac Surface	0.83	0.9
Concrete Surface	1.65	0.8
Roof Surface	0.63	1

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Rainfall Data

r = 0.3

2 Day M5 = 60mm

M5 as % of 2 Day M5 = 38

Growth Factor MT/M5 (Eng/Wales) = 1.38

Depth of rainfall for M20-120 = 31mm

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APPENDIX B

SURFACE WATER SYSTEMS DESIGN SPECIFICATIONS

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- **Stormtech Details**
- **COPA Details**
- **SurfSep Details**

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Number of Chamber in Bed - 1

Volume of voids in the stone - 0.40

StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management℠

StormTech SC 740 Incremental Storage Volumes

Height of System (in)	Chamber (ft^3)	Storage (ft^3)	Cumulative Storage (ft^3)	Total System Volume (ft^3)	Conversion to metric	**Cumulative Volume (m^3)**
48	0	1.13	81.66	82	0.02832	**2.31**
47	0	1.13	80.53	81	0.02832	**2.28**
46	0	1.13	79.41	79	0.02832	**2.25**
45	0	1.13	78.28	78	0.02832	**2.22**
44	0	1.13	77.15	77	0.02832	**2.18**
43	0	1.13	76.03	76	0.02832	**2.15**
42	0.05	1.16	74.90	75	0.02832	**2.12**
41	0.16	1.22	73.74	74	0.02832	**2.09**
40	0.28	1.30	72.52	73	0.02832	**2.05**
39	0.60	1.49	71.22	71	0.02832	**2.02**
38	0.80	1.61	69.73	70	0.02832	**1.97**
37	0.95	1.70	68.12	68	0.02832	**1.93**
36	1.07	1.77	66.42	66	0.02832	**1.88**
35	1.18	1.84	64.65	65	0.02832	**1.83**
34	1.27	1.89	62.82	63	0.02832	**1.78**
33	1.36	1.94	60.93	61	0.02832	**1.73**
32	1.45	2.00	58.99	59	0.02832	**1.67**
31	1.52	2.04	56.99	57	0.02832	**1.61**
30	1.58	2.08	54.95	55	0.02832	**1.56**
29	1.64	2.11	52.88	53	0.02832	**1.50**
28	1.70	2.15	50.76	51	0.02832	**1.44**
27	1.75	2.18	48.62	49	0.02832	**1.38**
26	1.80	2.21	46.44	46	0.02832	**1.31**
25	1.85	2.24	44.23	44	0.02832	**1.25**
24	1.89	2.26	41.99	42	0.02832	**1.19**
23	1.93	2.29	39.73	40	0.02832	**1.12**
22	1.97	2.31	37.44	37	0.02832	**1.06**
21	2.01	2.33	35.13	35	0.02832	**0.99**
20	2.04	2.35	32.80	33	0.02832	**0.93**
19	2.07	2.37	30.44	30	0.02832	**0.86**
18	2.10	2.39	28.07	28	0.02832	**0.79**
17	2.13	2.41	25.68	26	0.02832	**0.73**
16	2.15	2.42	23.27	23	0.02832	**0.66**
15	2.18	2.43	20.85	21	0.02832	**0.59**
14	2.20	2.45	18.42	18	0.02832	**0.52**
13	2.21	2.45	15.98	16	0.02832	**0.45**
12	0	1.13	13.52	14	0.02832	**0.38**
11	0	1.13	12.40	12	0.02832	**0.35**
10	0	1.13	11.27	11	0.02832	**0.32**
9	0	1.13	10.14	10	0.02832	**0.29**
8	0	1.13	9.02	9	0.02832	**0.26**
7	0	1.13	7.89	8	0.02832	**0.22**
6	0	1.13	6.76	7	0.02832	**0.19**
5	0	1.13	5.64	6	0.02832	**0.16**
4	0	1.13	4.51	5	0.02832	**0.13**
3	0	1.13	3.38	3	0.02832	**0.10**
2	0	1.13	2.26	2	0.02832	**0.06**
1	0	1.13	1.13	1	0.02832	**0.03**
		81.66				

Total Chamber Storage = 45.9 ft^3

Calculations are based upon a 12 inch stone base under the chambers

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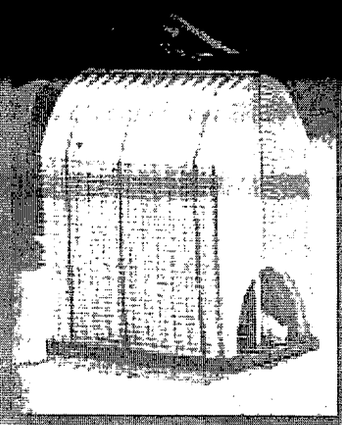
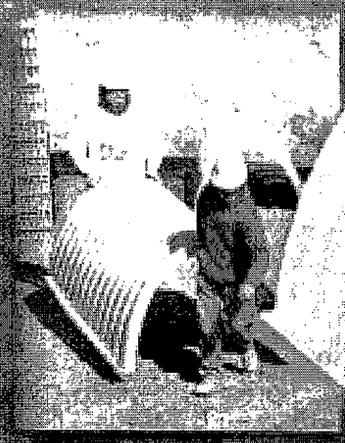
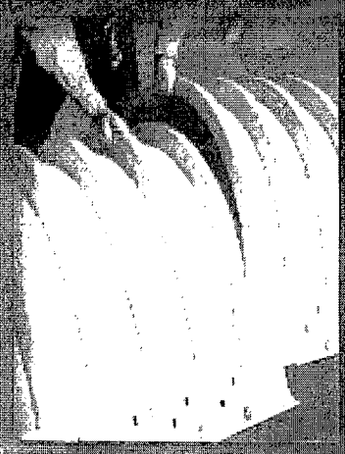
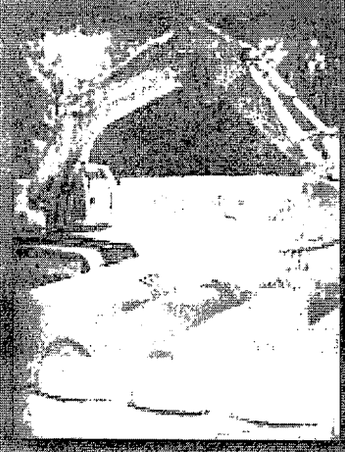
Product Catalog

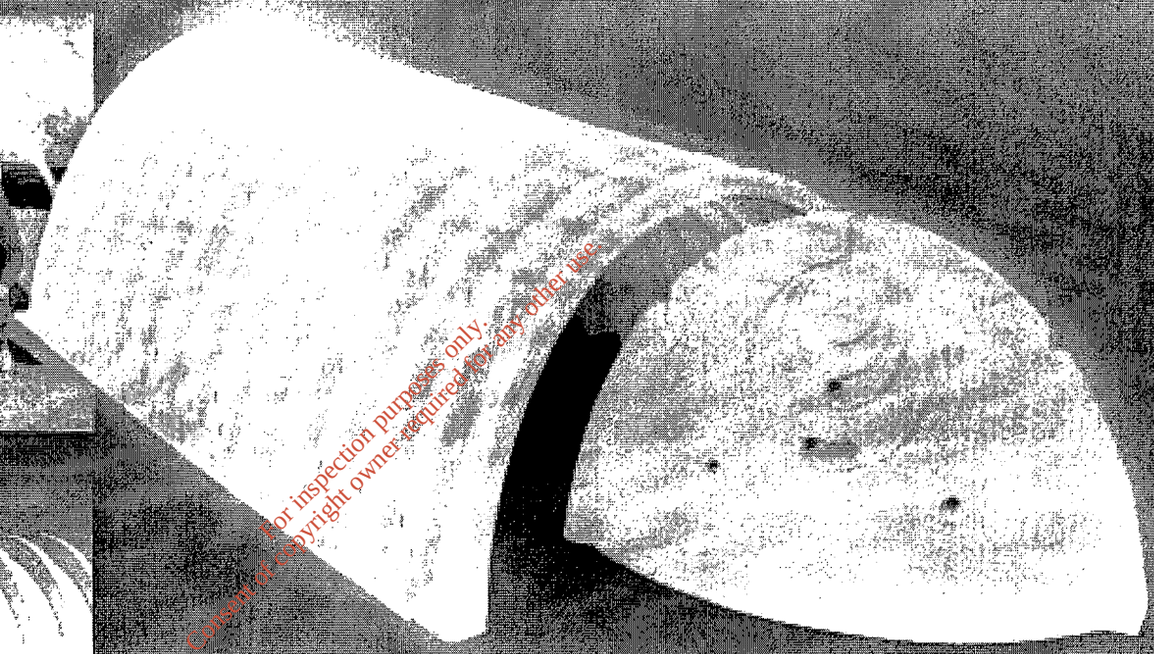
Underground Stormwater Chambers











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Save Valuable Land and Protect Water Resources℠

StormTech®

Detention • Retention • Recharge

Subsurface Stormwater Management™

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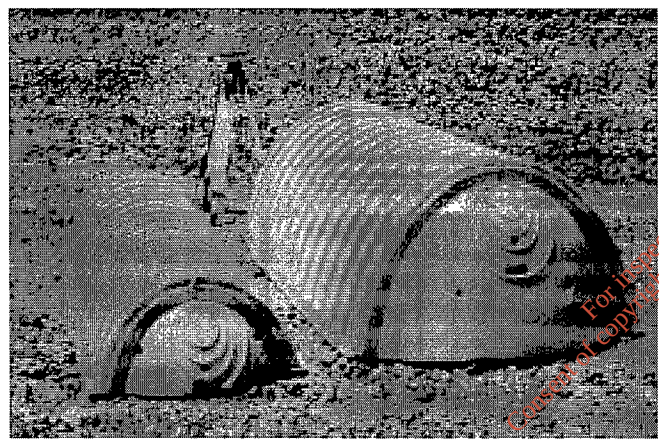
StormTech® Subsurface Chambers –

The advanced design of StormTech's Gold™ chambers allows stormwater professionals to create more profitable, environmentally sound developments. Compared with other subsurface systems, StormTech's innovative chambers offer lower overall installed costs, superior design flexibility and enhanced long-term performance.

Superior Design Flexibility for Optimal Land Use

StormTech chambers are ideal for commercial, municipal, industrial and residential applications. Our chamber systems can function as stormwater detention, retention, "first-flush" storage systems or a combination of these. They can also be designed into beds or trenches of various configurations. Unlike the costly fittings and bulk heads of pipe systems, our end caps allow fast and cost-effective row termination. Trimmable chamber lengths allow our systems to be designed around all types of limiting boundaries.



L to R: SC-310 chamber and SC-740 chamber

Product Features and Benefits

The advanced features and innovative technology of StormTech chambers streamline installations while lowering overall installed costs. StormTech chambers offer these unique benefits:

- Isolation Chamber System™ dramatically reduces costs associated with piping manifolds, while isolating sediment to manageable areas for ease of maintenance.
- Compliance with local regulations and NPDES Phase I and II requirements.
- Two people can install chambers quickly and easily, saving time and money.
- Extensive product research & development and rigorous testing ensure reliability and performance.
- Versatile product design accommodates a variety of cost-effective system configurations.
- The chambers' length can be cut in 16.5 cm increments end caps can be easily secured for flexibility in design and installation.
- The subsurface chamber system facilitates various design requirements for detention, retention and recharge of stormwater.
- Products are produced in our ISO 9001:2000 certified manufacturing facility.
- Injection molded of polypropylene ensures precise control of wall thickness and resistance to environmental stress cracking.
- Distinctive gold chambers reflect the sun's energy to retain their integrity at the most crucial point of installation.

For more information on StormTech's Isolation Chamber System, contact your local StormTech representative.

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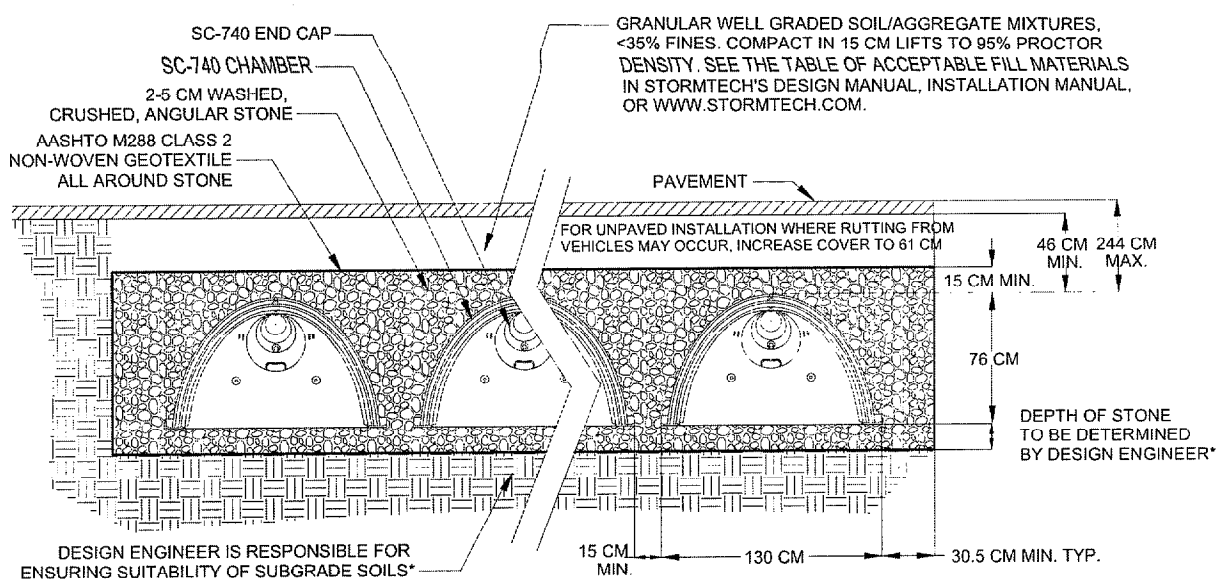
Typical Cross Section Detail (not to scale)



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The Gold Standard in Stormwater Management™

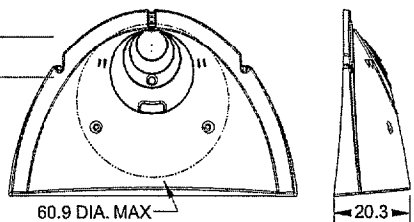
SC-740 and SC-310 Chamber Specifications

The StormTech SC-740 chamber optimizes storage volumes in relatively small footprints by providing 0.67 m³/m² (minimum) of storage. This can decrease excavation, backfill and associated costs. The StormTech SC-310 chamber is ideal for systems requiring low-rise and wide-span solutions. The chamber allows the storage of large volumes, 0.4 m³/m² (minimum), at minimum depths.

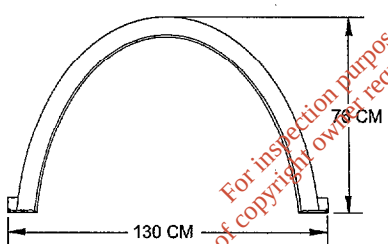
StormTech SC-740 Chamber (not to scale)

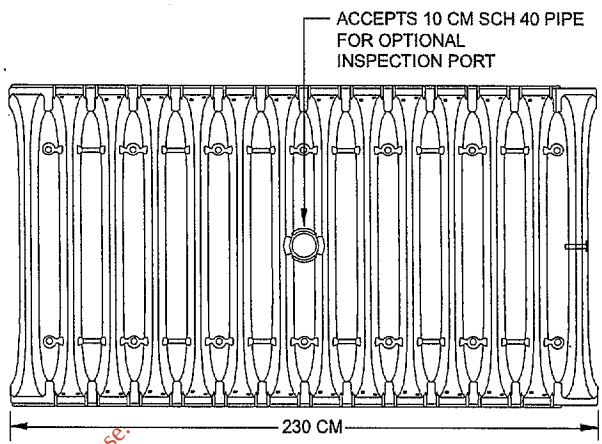
Nominal Chamber Specifications

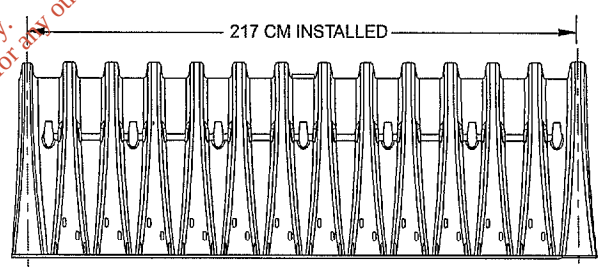
Size (W x H x Installed L)	130cm x 76cm x 217cm
Chamber Storage	1.30 m³
Minimum Installed Storage*	2.12 m³
Weight	33.6 kg



SC-740 end cap







SC-740 chamber

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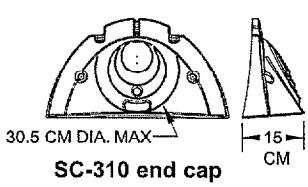
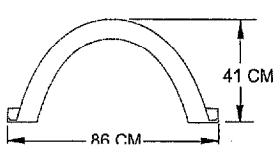
StormTech SC-310 Chamber (not to scale)

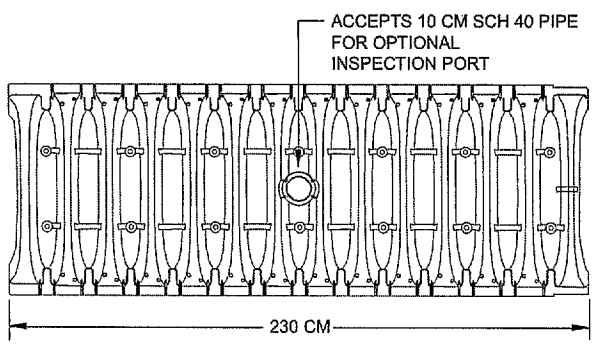
Nominal Chamber Specifications

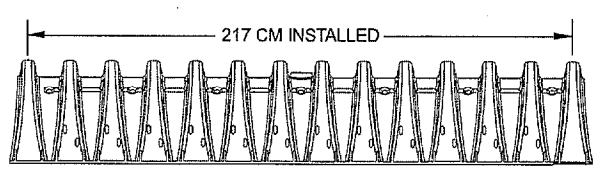
Size (W x H x Installed L)	86cm x 41cm x 217cm
Chamber Storage	0.42 m³
Minimum Installed Storage*	0.88 m³
Weight	16.8 kg



SC-310 end cap







SC-310 chamber

*This assumes a minimum of 15.2 cm of stone below, above and between chamber rows.

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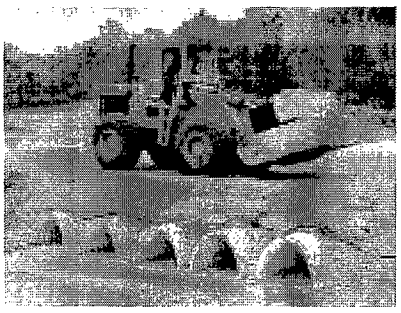
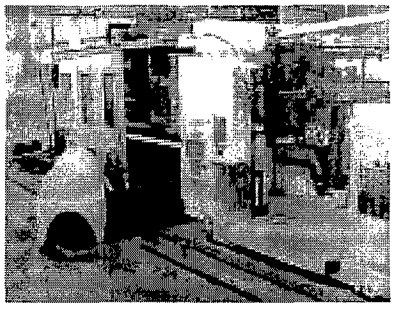
Advanced Structural Performance for Greater Long-Term Reliability



StormTech implemented rigorous research, development, design, and manufacturing protocol establishing a gold standard in stormwater management through:

- Collaboration with world-renowned experts of buried drainage structures to develop and evaluate the structural testing program and product design.
- Designing StormTech chambers to exceed AASHTO's LRFD recommended design factors for Earth Loads and HS-20 live loads.
- Molding the product using polypropylene, which is inherently resistant to environmental stress cracking and chemicals found in stormwater runoff.
- Manufacturing StormTech chambers with gold polypropylene, which allows them to reflect the sun's energy and retain their integrity during installation, unlike black products which absorb heat and can lose a significant portion of their strength.
- Injection molding the product, which ensures precise control of wall thickness, fit-up of joints and end caps, and allows for molded-in features that simplify design and installation.

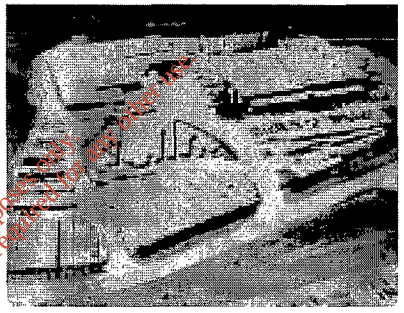


Injection molding machine

About StormTech

StormTech is a subsidiary of Infiltrator Systems Inc., the world leader in subsurface chamber technology. StormTech was founded in 1998 to provide environmental solutions for stormwater management. StormTech utilized Infiltrator Systems' sixteen years of experience in the design and manufacture of subsurface chambers, and invested over $7.5 million and four years to develop StormTech chambers. These innovative products exceed the rigorous requirements of the stormwater industry.

StormTech's in-house technical support staff is available to provide assistance and plan reviews to contractors, engineers and developers. Easy-to-use design resources help you design and calculate system configurations.



ISO 9001:2000-certified. Manufacturing facilities in Kentucky and Utah

Contact StormTech at 888.892.2694 or visit our website at www.stormtech.com for installation, product and technical information.

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StormTech®

Detention • Retention • Recharge

Subsurface Stormwater Management℠

20 Beaver Road, Suite 104 | Wethersfield | Connecticut | 06109
860.529.8188 | 888.892.2694 | fax 866.328.8401 | www.stormtech.com

Warranty:
StormTech offers a standard Limited Warranty on its chambers and end caps. The Limited Warranty is for ten years and provides for the supply of replacements for any such products that are determined to be defective. The Limited Warranty applies only to chambers and end caps that have been designed and installed in accordance with StormTech's design and installation instructions. Certain conditions and exclusions apply.

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Revision: 3

Copa LIMITED Hydroslide Selection

Project Id: **Greyhound Waste, Crag Avenue**

Flow restriction required			**Variation at top**
Flow:	18.6	L/s	5% ☑
Smallest pipe size:	150	mm dia.	20% ☐
Maximum head:	2	m	
Approach slope:	0.5	% - typically 0.5% [1 in 200]	
Application:	Surface Water		

Type	Model	Head	
M	Not this type	0.62 m	☐
VN	Not this type	1.35 m	☐
VS	DR 200/150 VS	2.7 m	☑
G	DR 150 G	2 m	☐
C	DR 150 C	2.4 m	☐

Approximate back plate dimensions

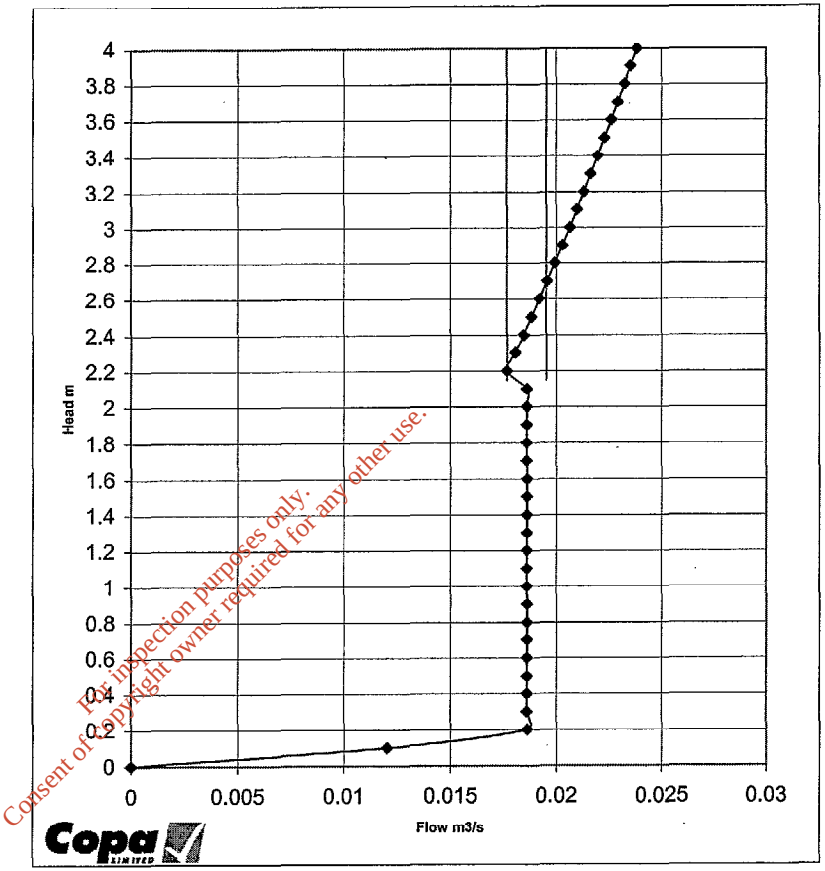
Right/Left float Height 1585 mm; Width 510 mm; Arc 0 mm

Front float: Height 1585 mm; Width 400 mm; Arc 0 mm

9-Jun-04

Flow Discharge Curve for Hydroslide DR 200/150 VS

Note: Axis should change automatically, if not please contact Copa Ltd.



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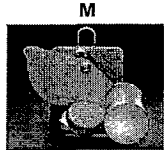
Flow m3/s	Head m
0	0
0.012	0.1
0.0186	0.2
0.0186	0.3
0.0186	0.4
0.0186	0.5
0.0186	0.6
0.0186	0.7
0.0186	0.8
0.0186	0.9
0.0186	1
0.0186	1.1
0.0186	1.2
0.0186	1.3
0.0186	1.4
0.0186	1.5
0.0186	1.6
0.0186	1.7
0.0186	1.8
0.0186	1.9
0.0186	2
0.0186	2.1
0.0177	2.2
0.0181	2.3
0.0185	2.4
0.0188	2.5
0.0192	2.6
0.0196	2.7
0.0199	2.8
0.0203	2.9
0.0206	3
0.021	3.1
0.0213	3.2
0.0216	3.3
0.022	3.4
0.0223	3.5
0.0226	3.6
0.0229	3.7
0.0232	3.8
0.0235	3.9
0.0238	4

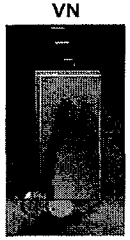
Disclaimer:
This spreadsheet has been created to assist the engineer or consultant in determining the appropriate Hydroslide flow regulator for the conditions entered above. The selection process has been simplified to suit this spreadsheet, hence there may be rare cases where other models are better suited. The head/flow curve has been generalised such that small variations can occur at each end of the vertical part of the discharge curve. Should your project be critical at these points please consult Copa Ltd for a more accurate head/discharge curve. Ph: 01622 833 900
Read below to learn more about all the available model types.

How to use this curve and data:
The data table on the right can be directly entered into many modelling packages by selecting other flow restriction device and manually entering the table >>>>

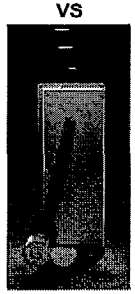
M



VN



VS

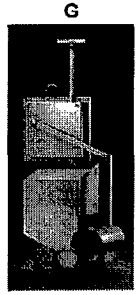


Standard design flow regulators
Three different types.
Selection based on the required or desired upstream head level.
Flow 1 to 5,200 l/s

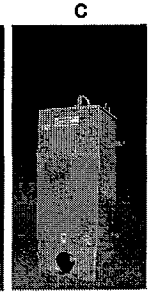
M - option of right or left float.
VN,VS - left, right or front float.

M - typically 3 to 5 x pipe dia.
VN - typically 6 to 12 x pipe dia.
VS - typically 11 to 21 x pipe dia.

G



C



Self unblocking regulators
Two different types.
External pivot float control (G) and internal vertical float control (C).
Both types can determine that the front orifice is blocked or partly blocked and can raise the orifice to full open in an attempt to pass this blockage, and then return to regulating the flow.

G - typically 11 to 21 x pipe dia
C - 4, 8, or 12 m maximum head (dry or wet)

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SURFSEP

The perfect solution to surface water treatment

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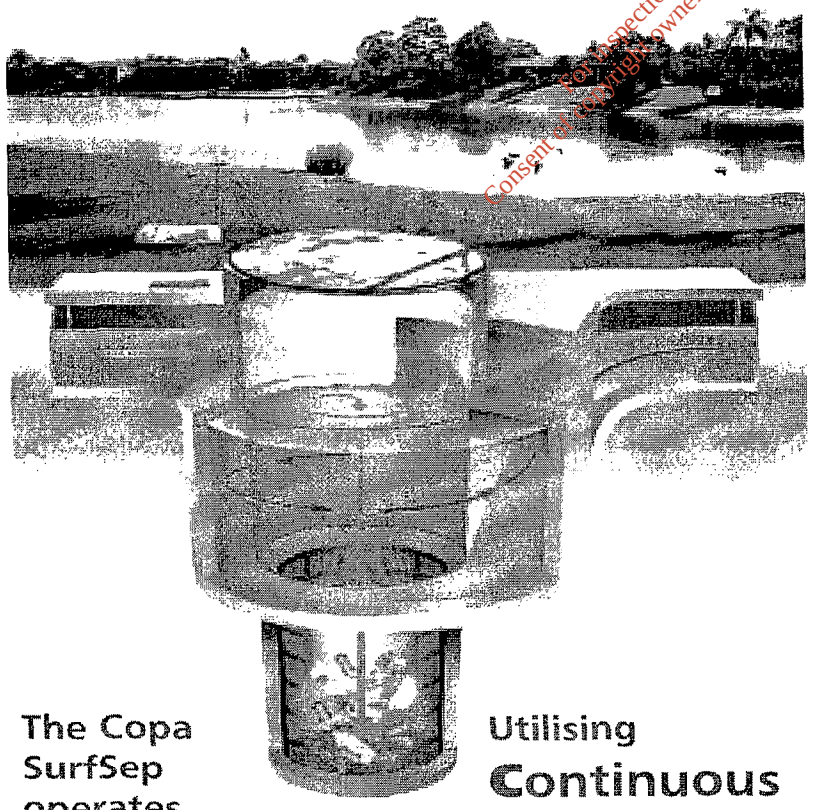

The Copa SurfSep operates continuously at any flow providing non blinding screening to 3mm in two dimensions.

Utilising **Continuous Deflective Separation (CDS)** Technology

- ☑ Fully designed and packaged for easy installation
- ☑ New/retrofit installations
- ☑ Ideal for the protection of wetlands and other SUDS
- ☑ Suited to -
  - Highways run off
  - New developments
  - Industrial areas
  - Car Parks
  - Shopping Centres
- ☑ Pre-treatment of oil/water Separation
- ☑ Catchments from 0.5 to 500 ha

Copa LIMITED

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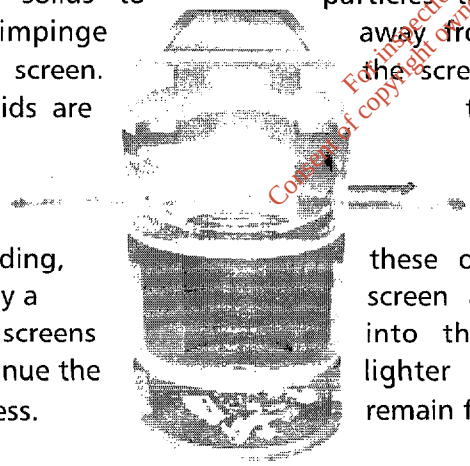
SurfSep

The removal of litter and debris from surface waters is an important step in achieving a clean and environmentally appropriate discharge quality. With ever increasing pressure to reduce the impact of urbanisation on our waterways it is important to apply proven technologies and products. SurfSep has a worldwide reputation in achieving the highest quality standards.

The CDS Technology

The principle that underpins the patented CDS technology is **indirect screening.** This is an improvement, over conventional or direct screening, because of the way that the fluid is presented to the screen.

In most conventional screening operations, the solids to be separated impinge directly on the screen. Whilst these solids are separated out from the flow, this soon causes blinding, and consequently a reduction in the screens capacity to continue the separation process.



The patented CDS technology is **not** a direct separation system - fluids are not introduced directly onto the screen face.

Rather, the fluid flow is introduced tangentially to the screen and coupled with the screen design, means that the incoming solids cannot see the screen apertures.

The raised lips of the mesh apertures cause the solid particles to be deflected away from the face of the screen. Once inside the separator, the solid particles are carried past these openings in the screen and are settled into the sump or, if lighter than water, remain floating.

The accumulated debris can then be periodically removed by standard methods.

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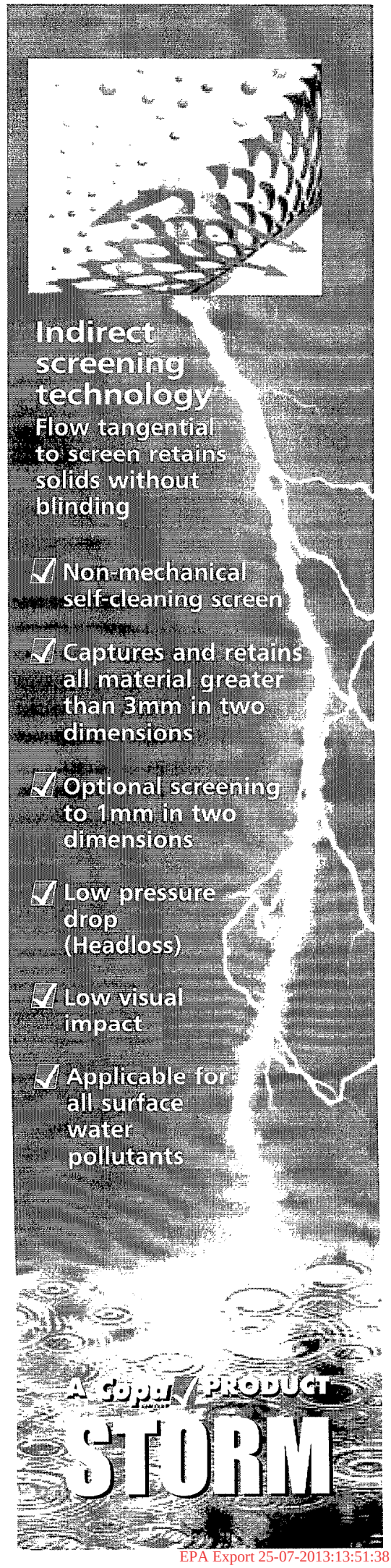

Tel: +44 (0)1622 833 900
Fax: +44 (0)1622 831 466
Email: enquiries@copa.co.uk

Copa Limited.
Crest Industrial Estate,
Marden, Tonbridge,
Kent. TN12 9QJ
United Kingdom

www.copa.co.uk

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APPENDIX C

FOUL WATER NETWORK CALCULATIONS

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1 Foul Drainage Calculations for Waste Recovery Building and Office Building

1.1 It is proposed to lay a 150mm Concrete pipe @1:125 (Ref FP4 - FP1 on services drawing) from proposed Waste Recovery Building to an existing manhole on Crag Avenue. Levels as shown on drawing

1.2

U/S Ref	D/S Ref	U/S CL	D/S CL	Cum Flow (L/s)	U/S IL	D/S IL	L (m)	Diameter	Grad	Capacity (l/s)	Velocity (m/s)
FP4	FP3	54.9	54.29	0.5	53.6	53.024	72	225	125	13.8	0.78
FP3	FP2	54.29	54.13	0.5	53.02	52.552	59	225	125	13.8	0.78
FP2	FP1	54.13	54.05	0.78	52.55	52.408	18	225	125	13.8	0.78
FE1	Ex. F MH	54.05	54.42	0.78	52.41	52.304	13	225	125	13.8	0.78

ks = 1.5mm

1.3 Calculation of assumed flows from Waste Recovery Facility

15 No. Staff
Assume 20m³/hd/yr.....CIRIA Report - Dry Weather Flows in Sewers
Q_{staff} = 300m³/yr
Assume 365 days @ 12 hrs/day, $DWF_{domestic}$ = 0.02 L/s

Allow 5m³/day for washing down spills etc
DWF_{spills} = 0.06 L/s

DWF_{total} = 0.08 L/s

Allow 6 DWF, Q = 0.5 L/s

Therefore 150mm pipe at 1 in 125 is satisfactory for Waste Recovery Facility

1.4 Calculation of assumed flows from Office Building

40 No. Staff, Total of 55 (including Waste Recovery Facility Staff)
Assume 20m³/hd/yr.....CIRIA Report - Dry Weather Flows in Sewers
Q_{staff} = 1,100m³/yr
Assume 365 days @ 12 hrs/day, $DWF_{domestic}$ = 0.07 L/s

Allow 5m³/day for washing down spills etc
DWF_{spills} = 0.06

DWF_{total} = 0.13

Allow 6 DWF, Q = 0.78L/s

Therefore 150mm pipe at 1 in 125 is satisfactory for Waste Recovery Facility and Office Building

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2 Foul Drainage Calculations for Truck Wash/Workshop Facility

2.1 It is proposed to retain existing pipework draining the workshop/future truck wash.
Consists of as follows

U/S Ref	D/S Ref	U/S CL	D/S CL	U/S IL	D/S IL	L (m)	Diameter	Grad	Capacity (l/s)	Velocity (m/s)	Prop Vel (m/s)
FE4	FE3	54.97	55.13	54.68	54.03	24	100	37	8	0.96	
FE3	FP7	55.13	54.42	54.03	53.58	78	150	175	10	0.6	
FP7	FP6	54.42	54.4	53.58	53.56	2	225	100	46	1.15	
FP6	FP5	54.4	54.3	53.56	51.56	200	225	100	46	1.15	
FP 5	Ex. MH	54.3	54.51	51.56	51.26	30	225	100	46	1.15	

2.2 Hydraulic Check on FE4 - FE3

This pipe will drain the toilets for the workshop.

15 No. Staff
Assume 20m³/hd/yr.....CIRIA Report - Dry Weather Flows in Sewers
Q_{staff} = 300m³/yr
Assume 365 days @ 12 hrs/day, $DWF_{domestic}$ = 0.02 L/s

Allow 6 DWF, Q = 0.12 L/s
Capacity = 8l/s

Therefore FE4 - FE3 is satisfactory

2.3 Hydraulic Check on FE3 - FP7

This link will drain the toilets and truck wash.

Water usage for truck wash = 15m³/d
Water usage for truck wash = 0.2L/s

DWF = 0.2 + 0.02 = 0.22L/s

Design Flow, 6DWF = 1.32 L/s
Capacity = 10l/s

Therefore FE3 - FP7 is satisfactory

2.4 Hydraulic Check on FP7-FP6

As above,
Design Flow, 6DWF = 1.32 L/s
Capacity = 46l/s

Therefore FP7 - FP6 is satisfactory

2.4 Hydraulic Check on FP6-FP5

As above,
Design Flow, 6DWF = 1.32 L/s
Capacity = 46l/s

Therefore FP6 - FP5 is satisfactory

2.5 Hydraulic Check on FP5 - Ex MH

As above,
Design Flow, 6DWF = 1.32 L/s
Capacity = 46l/s

Therefore FP5 - Ex MH is satisfactory

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APPENDIX D

DRAWINGS

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