MOLONY MILLAR
Consulting Civil and Structural Engineers

ENGINEERING REPORT

FOR

DEVELOPMENT OF AN APARTMENT BUILDING

AT

BALL ALLEY HOUSE, LEIXLIP ROAD,

LUCAN, CO. DUBLIN

PROJECT NUMBER: 930-344				Document Ref: Engineering Report		
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Architect: CDP Architecture
Client: Gerry Teague

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1 INTRODUCTION

1.1 General Description

The subject site is known as Ball Alley House, a protected structure with an extended car parking area to the rear. The site is bounded by Leixlip Road (R835) to the north, No. 1 & 2 Leixlip Road, Semi-detached housing and No. 19 & 21 Ardeevin Drive, Semi-detached housing, to the west, Ardfield House and terraced housing to the east and Ardeevin Drive with 20/22 Ardeevin Drive, Semi-detached housing to the south.

It is proposed to develop the car parking area and existing access drive to provide a 14 no. apartment building new parking (while retaining a total of 15 for the public house), access road and associated facilities.

1.2 Scope of this Report

This report describes the proposed civil engineering infrastructure for the development and how it connects to the existing infrastructure serving the area. In particular, Foul and Surface Water Drainage and Water supply aspects are considered. This report should be read in conjunction with the following drawings submitted with the Planning Application:

930-344-C01 Access & Parking Layout Plan;

930-344-C02 Surface Water & Foul Drainage Layout Plan;

930-344-C03 Watermain Layout Plan;

930-344-C04 Road Longitudinal Section, Typical Sections & Details;

930-344-C05 Surface Water Tree Pits, Petrol Interceptor, Green Roof & Hydrobrake Details; &

930-344-C06 Foul & SW Drain and Sewer Longitudinal Sections.

2 ACCESS AND ROADS

2.1 General

It is proposed to retain the existing access point to the site from the Leixlip Road. Adequate kerb radii, entry treatment and pedestrian facilities are to be provided at the junction. The access road is to serve as a shared pedestrian / vehicular access.

Road junction visibility requirements have been demonstrated on drawing no. 930-344-C01 as per the agreed relaxation distances provided in the Additional Information requirement, the sightline shown are at a setback of 2.0m is 45m.

It should be noted that this is an existing entrance and that there is no intention to detrimentally modify it. It can also be also noted that the reduction in existing Public House parking spaces should provide reduced traffic for this entrance. The adjacent property (to the left) is a protected structure and as such can unfortunately not be modified to achieve improved visibility. To further support this it should be noted that the building protrudes a mere 234mm into the clear sight triangle.

Drawing no. 930-344 C01, Access & Parking Layout Plan, shows the layout of the access road/ parking serving the development.

2.2 Design of Roads / Access

The existing access junction and access road, adjacent to Ball Alley House, is to be retained as a shared surface comprising existing macadam surfacing. New road markings cycling/pedestrian markings are to be provided to indicate the shared surface designation of this road.

New parking to the north of the proposed apartment building comprises a parking aisle of varying width, exceeding 6m with parallel parking bays either side. 6 No. existing parking bays adjoining Ball Alley House are to be retained with 8 No. new permeable paving parking bays constructed on the southern side of the aisle and two new permeable paving parking bays at the end of the access road..

A further 3 parking bays and 1 disable parking bay to be constructed as permeable parking bays on Ardeevin Drive to the south of the proposed apartment building.

All has been designed taking cognisance of DMURS and the local authority requirements. Refer to drawing no. 930-344 C01 for the Proposed Road Layout and drawing no. 930-344 C04 for sections and details indicating proposed construction. The proposed pavement design is based on 5% CBR, which would need to be confirmed by a geotechnical investigation prior to detailed design stage.

3 SURFACE WATER DRAINAGE SYSTEM

3.1 Existing Surface Water Infrastructure

The site is served by a network of existing surface water (SW) sewers – see layout of existing drainage infrastructure in Appendix I for clarity. An existing 225mm diameter SW sewer flows eastwards on Leixlip Road., while an existing 225mm diameter SW sewer, at higher level, flows westwards on Ardeevin Drive.

3.2 Proposed Site Surface Water Drainage System

It is proposed to discharge surface water (SW) run-off from the site (after interception and attenuation – see Section 3.3 below) to the existing stormwater sewer to the north of the site.

Run-off from the 442 m^2 roofs, incorporating 224 m^2 sedum green roof will drain into the 225mm diameter surface water drain system, along with 461 m^2 area of access road aisle and 180 m^2 of permeable parking bays and 797 m^2 area of paved and landscaped area.

The Sustainable Urban Drainage Systems (SUDS) provide in the form of sedum green roof, permeable paving car parking and local footpaths and unlined tree pits provide stormwater management functions in the form of storage, treatment,, while also providing for biodiversity and amenity functions. All discharge to the proposed 225mm diameter SW drain system. The gravity outfall from the drainage pipework will be controlled by a Hydrobrake (max. flow of 3 l/s (see attenuation calculations for further information with respect to this) and will flow to the existing SW sewer, on Leixlip Road.

It is proposed to construct all new car parking bays as permeable paving parking bays (with macadam aisle).

Refer to Molony and Millar Drawings 930-344-C02, 930-344-C05 & 930-344-C06 and Appendix III IV and V for SW pipe design calculations. SW attenuation and Sedum green roof data.

3.3 Compliance with the Principles of Sustainable Urban Drainage Systems

Currently, the surface water run-off from this site, which is practically entirely covered in impermeable areas, discharges un-attenuated flow to the SW sewer system serving the area. In order to both reduce and attenuate the flow; the proposed development will be designed in accordance with the principles of Sustainable Urban Drainage Systems (SUDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off

characteristics of a greenfield site. The criteria provide a consistent approach to addressing both rate and volume of run-off as well as ensuring the environment is protected from pollution that is washed off roads and buildings.

The requirements of SUDS are typically addressed by provision of the following:

- Interception storage;
- Treatment storage (not required if interception storage is provided);
- Attenuation storage;
- Long term storage (not required if growth factors are not applied to Q_{bar} when designing attenuation storage).

In the case of the subject site, interception storage will be provided, and a 20% climate change factor will be applied to the allowable discharge for the 100-year event. This means that both treatment storage and long-term storage are not required.

3.3.1 Interception Storage

Interception storage is catered for as follows:

- Sedum Green Roof;
- Unlined Tree Pits; and
- Permeable Paving – All surface car parking is to comprise a partial infiltration system with permeable paving car parking spaces and macadam aisles. Permeable paving has been designed to provide attenuation for the 100-year event (+20% climate change).

  In addition, as described in section 2.2, it is proposed to provide a conventional gulley and piped system to cater for excess run-off from the permeable paving system, which may not infiltrate timeously. A Klargester petrol by-pass interceptor is proposed to deal with any fuel related pollutants emanating from these parking bays.

3.3.2 Attenuation Storage

Attenuation storage will be provided by a a series of SUDS devices as outlined above and provision capacities included in Addendum IV. Attenuation calculations.

Equivalent Greenfield runoff for the site (Q_{bar}) has been calculated as 1.43 l/s. However, reference to GDSDS 6.8.2.3 recommends a minimum throttle size of 75mm for private

developments, based on this and a maximum head achievable in manhole S8 of 1.6m, the maximum permissible outflow = 3.00 l/s (Hydro Int.) Refer to appendix IV, HR Wallingford Greenfield runoff estimation for sites and Hydro International Hydrobrake Optimum Design Tool.

Because long term storage is not provided, the limiting value is used for the 100-year storm without growth factors being applied. The Calculations in Appendix III shows that for a 100-year return storm (+ 20% for climate change), a minimum volume of 32.9 m^3 is required when applying a constant maximum discharge of 3 l/s.

A effective storage volume of 33.3 m^3 has been proposed at a maximum head of 33mOD, while the total storage provided within all the SUDS devices equates to 65.4 m^3

4 FOUL DRAINAGE SYSTEM

4.1 Existing Foul Sewer Infrastructure

The existing site is served by a 225mm diameter foul sewer flowing eastwards, on Leixlip Road and a 150/225mm diameter foul sewer flowing westwards on Ardeevin Drive.

The proposed point of discharge is to the proposed foul manhole F1 on Leixlip Road.

See layout of existing drainage infrastructure in Appendix I for further clarity.

4.2 Proposed Foul Sewer System

Foul stacks in internal service shafts serving the units will feed into the foul drain system shown on drawing 930-344-C02.

The fully occupied proposed foul effluent estimate is calculated as follows:

Apartments:

No. of individual living units = 14

Say 14 x 405 l/unit/day = 5,250 l/day (assuming 2.7 PE/unit @ 150 l/p/d)

Total: WW Flow = **5,670 l/day**

Peak Flow = $\frac{6 \times 5,670}{24 \times 60 \times 60}$ = 0.4 l/s

Foul Sewer Network Pipe Sizes

Refer to attached Foul Sewer calculations in Appendix II.

5. WATER SUPPLY

5.1 Existing Watermain Infrastructure

An existing 6-inch Cast Iron watermain is located along the site frontage on Leixlip Road, with a 100mm diameter uPVC located on Ardeevin Drive to the rear of the site – see Irish Water Records contained in Appendix I of this report.

5.2 Proposed Watermain Connection

The existing service connection on Leixlip Road, serving the existing Ball Alley House, is to be retained. A 100mm diameter MDPE looped Watermain is proposed to tee off of the existing watermain on Leixlip Road (with associated sluice valves). This will serve the existing retained structures and the new nursing home building. It is proposed to provide a new 100mm diameter MDPE watermain, in order to provide a new fire hydrant on site and service connection for the apartment block.

The apartment block is to be provided with a manifold system feeding each individual unit.

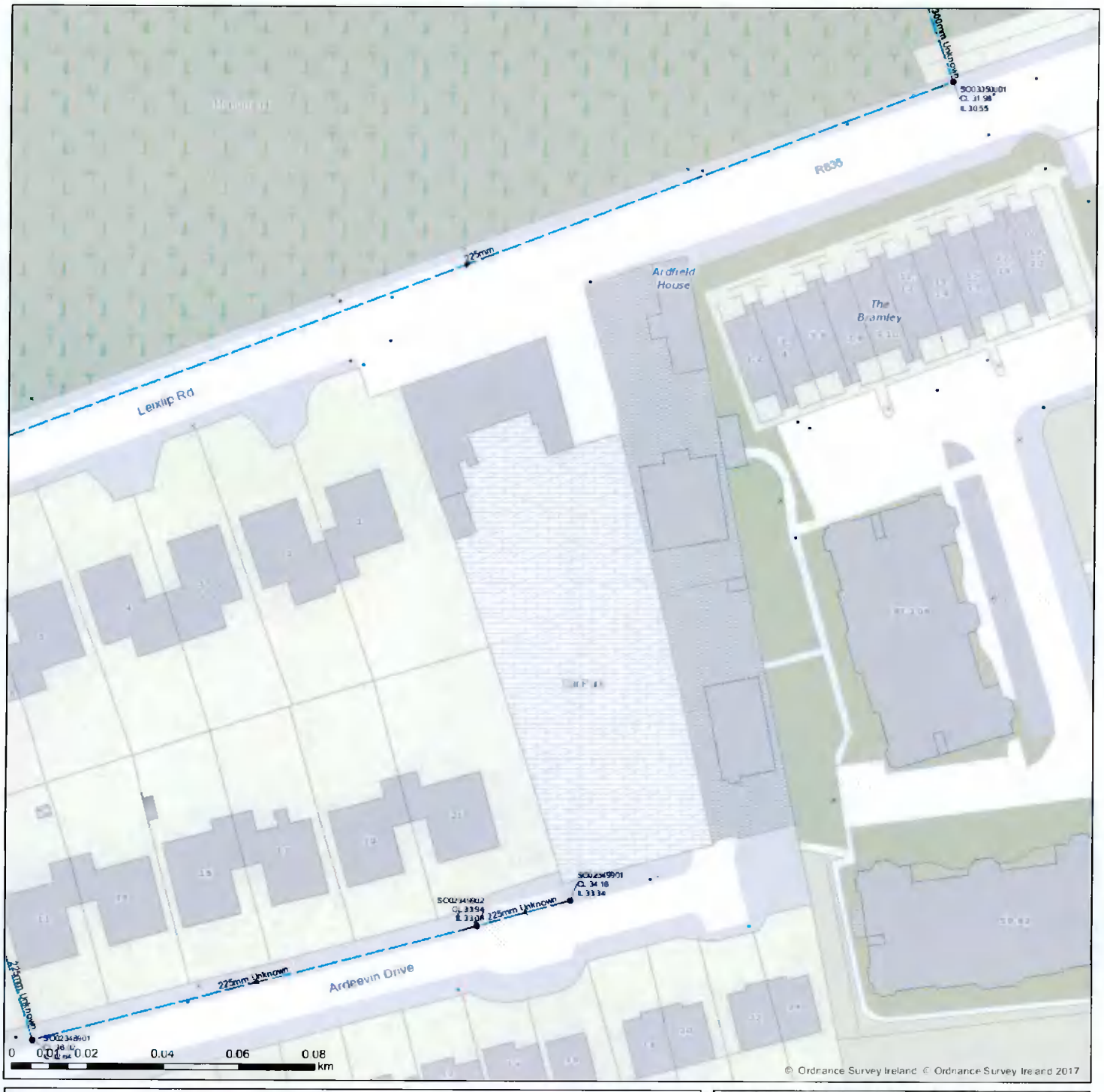
The hydrant has been located on the new looped main, ensuring that no part of any building is further than 46m from the hydrant.

The water demand for the entire development is 5.67 m^3 (5,670 l/day) equivalent to the calculated total foul effluent discharge in Section 4.2 above.

APPENDIX I

RECORDS OF EXISTING SERVICES

Irish Water Web Map

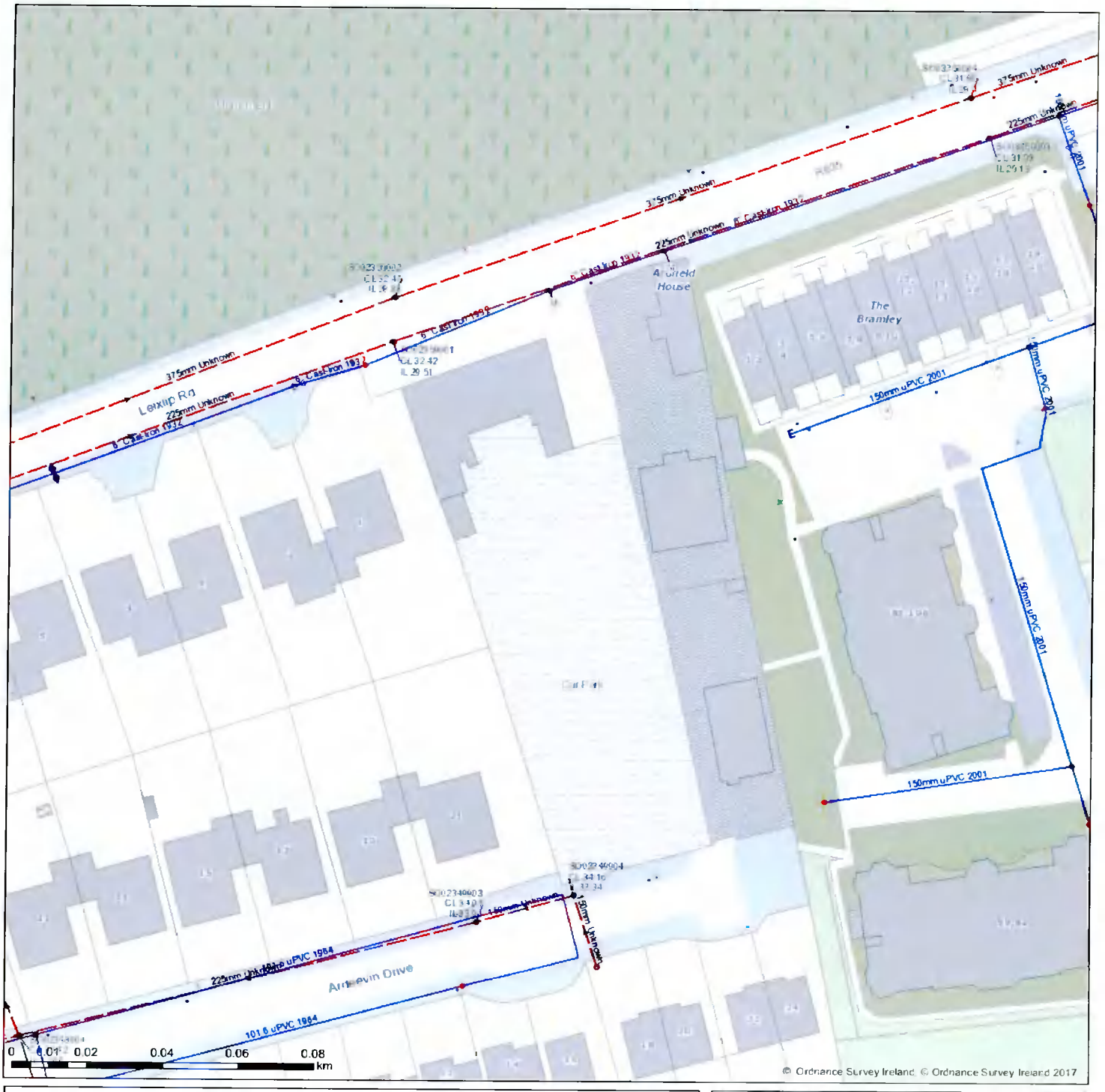


UISCE EIREANN : IRISH WATER

Print Date: 18/05/2021

Printed by:Irish Water

Irish Water Web Map



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APPENDIX II

FOUL DRAIN AND SEWER DESIGN CALCULATIONS

0.75 to 3 m/s
0.6 for <420 Discharge Units (Intermittent Flow)
1.5 for >420 Discharge Units (Constant Flow)

Self cleansing velocity when flowing half full
Pipe Roughness Co-efficient (K_s):

References:
Code of Practice for Wastewater Infrastructure, Irish Water, 2017
Recommendations for Site Development Works, D.O.E. Nov. 1998
BS8301:1985, Table 4, 7.4.4.1
BS8301:1985, Table 4, 7.4.4.1

Pipe Run	Pipe Gradient	Pipe Diameter	Discharge Units for segment	Accumulative Discharge units	Actual Peak		Full Bore		Proportional flow	Discharge Velocity	Proportional Depth
					Flow Q	Velocity v	Flow Q_f	Velocity v_f	Q/Q_f		
	1 in	mm	units	units	l/s	m/s	l/s	m/s	OK?	OK?	OK?
Faj1-Faj2	75	150	196	196	4.596	0.940	20.495	1.160	YES	YES	YES
Faj2-F1	30	150	0	196	4.596	1.311	32.553	1.842	YES	YES	YES
F1-F2	30	150	0	196	4.596	1.311	32.553	1.842	YES	YES	YES
F2-F3	100	225	0	196	4.596	0.812	51.886	1.305	YES	YES	YES
F3-F4	30	225	0	196	4.596	1.246	95.205	2.394	YES	YES	YES

14 Units allowed per apartment

Prepared by: A. Manthe

APPENDIX III

SURFACE WATER DRAIN AND SEWER DESIGN CALCULATIONS

Rainfall Intensity (i) roof =	**75**	**mm/hr**	***RSDW, DOE, 1998, 3.4***
Rainfall Intensity (i) paved =	**50**	**mm/hr**	***RSDW, DOE, 1998, 3.4***
Storm Return Period =	**5**	**years**	***RSDW, DOE, 1998, Table 3.1***
Self cleansing Velocity =	**0.8-3**	**m/s**	***RSDW, DOE, 1998, 3.4***
Roof Vol. run-off coefficient (Cv) =	**0.9**		
Paved Vol. run-off coefficient (Cv) =	**0.8**		
Pipe Roughness K_s =	**0.6**	**mm**	***BS8301:1985, 7.4.4.1 Hydraulic Roughness***

Design calculations: **Q =** **A_p x i x Cr x Cv x 2.78**

Routing coefficient (Cr) = **1.0**

Qmax = **17.2 l/s**

Total Roof Area = **422.0** **m^2**
Total Paved Area = **831.0** **m^2**

Pipe No.	Impermeable Area (A_p)		Gradient	Diameter	Actual Rate of Flow	Accumulative Rate of Flow	Discharge Velocity	Capacity Full bore flow	Full Bore Velocity	Proportional flow	Discharge Velocity	Proportional Depth
	Roof (A_{p1})	Paved (A_{p2})			Q	Q_t	v	Q_p	v_p	Q/Q_p		
P	m^2	m^2	1 in	mm	l/s	l/s	m/s	l/s	m/s	OK?	OK?	OK?
S1-S2	105.5	156	80	225	3.7	3.7	0.83	58.077	1.461	YES	YES	YES
S2-S3	105.5	48	100	225	2.5	6.2	0.89	51.886	1.305	YES	YES	YES
S3-S4	105.5	0	100	225	2.0	10.7	1.03	51.886	1.305	YES	YES	YES
S4-S8	0	79	100	225	0.9	15.0	1.13	51.886	1.305	YES	YES	YES
S8-S9	0	190	200	225	4.1	4.1	0.61	36.526	0.919	YES	*	YES
S9-S10	0	0	200	225	0.0	4.1	0.61	36.526	0.919	YES	*	YES
S5-S5	0	48	80	225	0.5	0.5	0.46	58.077	1.461	YES	*	YES
S6-S3	105.5	0	80	225	2.0	2.5	0.74	58.077	1.461	YES	*	YES
S7-S4	0	310	80	225	3.4	3.4	0.81	58.077	1.461	YES	YES	YES

* Reduced Velocity after SUDS device Hydrobrake

APPENDIX IV

SURFACE WATER ATTENUATION CALCULATIONS

SYSTEM A - TOTAL INFILTRATION

Area / linear m:
Permeable Paved Footpath Area = **2.0 m^2**

SUB-BASE THICKNESS REQUIRED FOR VEHICLE LOADINGS

Subgrade - CBR assumed min. 5%
Sub-base - Coarse graded aggregate Type 20/40 (20mm min. and 40mm max. particle size)

Loading category (Table 7):		**(1)-'DOMESTIC'; Footway with zero vehicle overrun**
Required thickness of Subbase (Table 7) =		**250 mm**

SUB-BASE THICKNESS REQUIRED FOR WATER STORAGE

r =	**Ratio of 60min to 2-day rainfalls of 5-years return period for Blessington**	**0.28**
M_5-60 =	**1 in 5 years . 60 min duration rainfall**	**16.7 mm**
CT (A) =	**1 in 100 year event (+20%)**	**380 mm**
	Table 6: Permeable sub-base thickness for infiltration system	
CT (2) =	**CT (A) * (Roof Area+Paved Area / Paved Area)**	**380 mm**

SUB-BASE THICKNESS REQUIRED = MAX CT (1) AND CT (2) **380 mm**
Therefore Sub-base thickness = **380 mm**

The design section is:

80 mm BLOCK PAVIOR, ON
50 mm AGGREGATE TYPE 20/40 LAYING COURSE, ON
380 mm PERMEABLE COARSE GRADED AGGREGATE TYPE 20/40 ACCORDING TO BS EN 13242:2002, ON
SUBGRADE - CBR MIN. 5%

*Permeability of subgrade (k m/s) assumed to be 10^{-6} to 10^{-3} On-site infiltration tests to be undertaken to confirm actual k value prior to construction.
*CBR to be confirmed on site prior to construction

REFERENCES: PERMEABLE PAVEMENTS. GUIDE TO THE DESIGN, CONSTRUCTION AND MAINTENANCE OF CONCRETE BLOCK PERMEABLE PAVEMENTS EDITION 6.

BS 7533 13:2009

Storm Water Attenuation Calculations

Total Site Area = 1680 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof	concrete/sedam	422	90	379.8
Access Road & Footpaths	macadam/paving	461	80	368.8
Parking bays	permeable paviors	180	60	108.0
Landscaped Areas	landscaping	617	10	61.7
Equivalent impermeable area:				**918.3**

Greenfield runoff rate (Qbar) = 1.43 l/s (HR Wallingford)
However, reference to GDSDS 6.8.2.3 recommends a minimum throttle size of 75mm for private developments, based on this and a maximum head achievable in manhole S8 of 1.6m, the maximum
Permissible outflow = **3.00 l/s** (Hydro Int.)

100 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	27.2	2700.00	24977.76	22277.76
30	33.6	5400.00	30854.88	25454.88
60	41.6	10800.00	38201.28	27401.28
120	51.4	21600.00	47200.62	25600.62
240	63.6	43200.00	58403.88	15203.88
360	72	64800.00	66117.60	1317.60
720	82.8	129600.00	76035.24	-53564.76
1440	110	259200.00	101013.00	-158187.00
2880	120.7	518400.00	110838.81	-407561.19

Site specific. Met Eireann

From table above, required storage volume is 27.40 m^3
Allow 20% for climate change, volume required = 32.88 m^3

Hydrobrake discharge = 3.00 l/s

Total Attenuation is provided in a series of SUDS devices as follows:

Green Roof:		
Sedum area =	244	m^2
Attenuation =	44	l/m^2
Attenuated Volume =	**10.736**	m^3
Permeable Paving:		
PP Area =	180	m^2
Depth of Aggregate =	380	mm
Assumed void ratio =	40	%
Attenuated Volume =	**27.360**	m^3
Tree Pits:		
Total Tree Pit Area =	60	m^2
Depth of Tree Pit =	1500	mm
Assumed void ratio =	25	%
Attenuated Volume =	**22.500**	m^3
Drainage Pipework:		
Total Length =	122	m
Pipe diameter =	225	mm
Attenuated Volume =	**4.853**	m^3
Total Attenuation provided =	**65.449**	m^3

Assuming a worst case scenario, that all SUDS Attenuation can only store up to the maximum site level of 33mOD (being the lowest inlet level), the effective attenuation volume is as follows:

Effective Attenuation is provided in a series of SUDS devices as follows:

Green Roof:		
Sedum area =	0	m^2 (All above 33mOD)
Attenuation =	44	l/m^2
Total Attenuated Volume =	**0**	m^3
Permeable Paving:		
PP Area =	115	m^2 ($65m^2$ above 33mOD)
Depth of Aggregate =	380	mm
Assumed void ratio =	40	%
Attenuated Volume =	**17.480**	m^3
Tree Pits:		
Total Tree Pit Area =	60	m^2
Depth of Tree Pit =	730	mm (assumed invert level of 32.77mOD)
Assumed void ratio =	25	%
Attenuated Volume =	**10.950**	m^3
Drainage Pipework:		
Total Length =	122	m
Pipe diameter =	225	mm
Effective Attenuated Volume =	**4.853**	m^3
Total Attenuation provided =	**33.283**	m^3

Therefore the effective Attenuation Volume provided is in excess of the theoretical Voume required to store the 100-year storm, inclusive of a 20% increase for potential future climate change.

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 302945, Northing: 234971,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.3,	3.5,	4.1,	5.0,	5.7,	6.2,	8.0,	10.0,	11.4,	13.4,	15.2,	16.6,	18.8,	20.5,	22.0,	N/A ,
10 mins	3.2,	4.8,	5.7,	7.0,	7.9,	8.7,	11.1,	14.0,	15.9,	18.7,	21.2,	23.1,	26.2,	28.6,	30.6,	N/A ,
15 mins	3.8,	5.7,	6.7,	8.3,	9.4,	10.2,	13.1,	16.4,	18.7,	21.9,	24.9,	27.2,	30.8,	33.7,	36.1,	N/A ,
30 mins	5.0,	7.4,	8.7,	10.6,	12.0,	13.1,	16.6,	20.7,	23.4,	27.3,	30.9,	33.6,	37.9,	41.3,	44.1,	N/A ,
1 hours	6.7,	9.6,	11.2,	13.7,	15.4,	16.7,	21.0,	26.0,	29.3,	34.0,	38.3,	41.6,	46.7,	50.7,	54.1,	N/A ,
2 hours	8.8,	12.6,	14.6,	17.6,	19.7,	21.3,	26.6,	32.7,	36.7,	42.4,	47.5,	51.4,	57.5,	62.3,	66.2,	N/A ,
3 hours	10.4,	14.7,	17.0,	20.4,	22.8,	24.6,	30.6,	37.4,	41.9,	48.2,	53.8,	58.2,	64.9,	70.2,	74.5,	N/A ,
4 hours	11.7,	16.4,	18.9,	22.7,	25.3,	27.3,	33.8,	41.1,	46.0,	52.8,	58.9,	63.6,	70.8,	76.4,	81.1,	N/A ,
6 hours	13.7,	19.1,	22.0,	26.3,	29.2,	31.5,	38.8,	47.0,	52.4,	60.0,	66.8,	72.0,	80.0,	86.1,	91.3,	N/A ,
9 hours	16.2,	22.3,	25.6,	30.5,	33.8,	36.3,	44.6,	53.8,	59.8,	68.2,	75.7,	81.5,	90.3,	97.1,	102.7,	N/A ,
12 hours	18.1,	25.0,	28.5,	33.9,	37.5,	40.2,	49.2,	59.1,	65.7,	74.8,	82.8,	89.0,	98.4,	105.7,	111.8,	N/A ,
18 hours	21.4,	29.1,	33.2,	39.3,	43.3,	46.4,	56.5,	67.6,	74.9,	85.0,	93.9,	100.7,	111.2,	119.2,	125.8,	N/A ,
24 hours	24.0,	32.5,	37.0,	43.6,	48.0,	51.4,	62.3,	74.4,	82.2,	93.1,	102.7,	110.0,	121.2,	129.8,	136.9,	161.4,
2 days	30.1,	39.7,	44.7,	51.9,	56.7,	60.3,	71.9,	84.5,	92.6,	103.7,	113.4,	120.7,	131.9,	140.4,	147.4,	171.3,
3 days	35.0,	45.5,	50.9,	58.6,	63.7,	67.5,	79.7,	92.8,	101.2,	112.6,	122.5,	130.0,	141.3,	149.9,	157.0,	180.9,
4 days	39.3,	50.6,	56.3,	64.4,	69.8,	73.8,	86.5,	100.1,	108.7,	120.5,	130.6,	138.3,	149.8,	158.5,	165.6,	189.7,
6 days	46.9,	59.4,	65.7,	74.6,	80.3,	84.7,	98.3,	112.7,	121.8,	134.1,	144.7,	152.6,	164.5,	173.5,	180.8,	205.4,
8 days	53.6,	67.2,	73.9,	83.5,	89.6,	94.2,	108.6,	123.7,	133.2,	146.0,	157.0,	165.2,	177.4,	186.6,	194.1,	219.2,
10 days	59.8,	74.3,	81.4,	91.5,	98.0,	102.8,	117.9,	133.7,	143.5,	156.8,	168.0,	176.5,	189.0,	198.5,	206.1,	231.7,
12 days	65.6,	80.9,	88.4,	99.0,	105.7,	110.8,	126.5,	142.8,	153.0,	166.7,	178.2,	186.9,	199.8,	209.4,	217.2,	243.2,
16 days	76.3,	93.1,	101.3,	112.7,	120.0,	125.4,	142.2,	159.5,	170.3,	184.7,	196.8,	205.8,	219.2,	229.2,	237.3,	264.2,
20 days	86.3,	104.4,	113.1,	125.3,	133.0,	138.8,	156.5,	174.7,	186.0,	200.9,	213.5,	222.9,	236.8,	247.1,	255.4,	283.0,
25 days	98.0,	117.5,	126.9,	139.9,	148.1,	154.3,	172.9,	192.2,	204.0,	219.6,	232.8,	242.5,	256.9,	267.6,	276.2,	304.6,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Tecnnical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Alan Manthe
Site name:	Ball Alley House
Site location:	Leixlip Road, Lucan

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance 'Rainfall runoff management for developments', SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.35514° N
Longitude:	6.45445° W
Reference:	1265572688
Date:	Jun 22 2021 16:29

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.16

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.53

Hydrological characteristics

	Default	Edited
SAAR (mm):	951	951
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.42	1.43
1 in 1 year (l/s):	0.35	1.22
1 in 30 years (l/s):	0.89	3.06
1 in 100 year (l/s):	1.09	3.74
1 in 200 years (l/s):	1.19	4.1

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

HYDRO-BRAKE® OPTIMUM

A UK 3D BIM Model is available for Hydro Brake® Optimum

DESIGN INPUTS

UNIT OF MEASUREMENT

METRIC • setting

PROJECT INFORMATION

Reference No

930-344

Site Name

BALL ALLEY

PRIMARY DESIGN POINT

Design Head (m) *

1.6

Design Flow (l/s) *

3

CUSTOMISED HYDRAULIC RESPONSE

Objective *

(HE) Minimise upstre

Flush-Flo™ (l/s)

SITE OPTIONS

Water Type *

Surface Water Only

Sump Available *

Yes (Default)

MECHANICAL BUILD OPTIONS

Mounting Style *

Lugs (Default)

Adjustable Inlet *

No (Default)

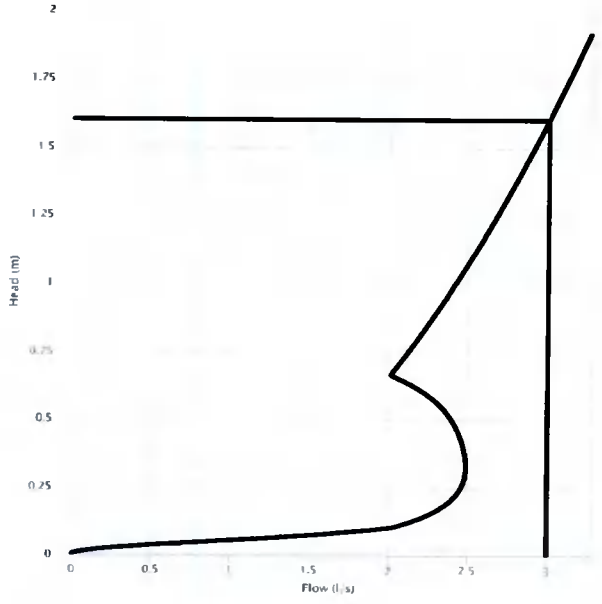
Design

DESIGN OUTPUT

PRODUCT DETAILS

Product	Hydro-Brake® Optimum
	Visit Product Page
Unit Reference	SHE-0074-3000-1600-3000

HYDRAULIC CHARACTERISTICS



CONTROL POINTS

	Head (m)	Flow (l/s)
Primary Design Point	1.600	3.000
Flush-Flo™	0.323	2.487
Kick-Flo®	0.661	2.004

PERFORMANCE FLOW

Mean Flow Over Head Range (l/s)	2.378

KEY DIMENSIONS

UNIT DIMENSIONS

(B) Unit Outlet Diameter (mm)	74
Internal Clearance (m)	0.0044
(C) Unit Depth (mm)	80
(A) Unit Width (mm)	450
Unit Span (mm)	445
Material Thickness (mm)	3

INSTALLATION DIMENSIONS

Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1,200
Minimum Sump Depth (mm)	325
Minimum Sump Width (mm)	160
Minimum Mounting Block Width (mm)	655
Minimum Mounting Block Height (mm)	800

Bypass NSB RANGE

APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Oil storage volume.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

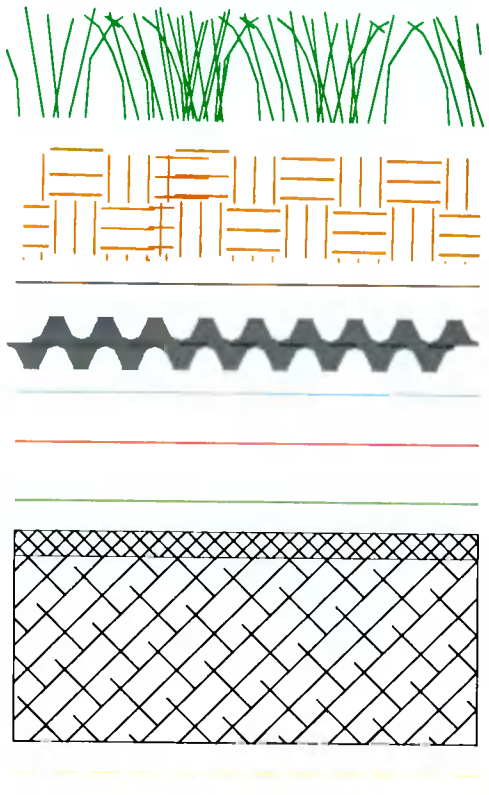
UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction GRP chamber construction * Some units have more than one access shaft – diameter of largest shown.

APPENDIX V

SEDUM GREEN ROOF DATA

Legend – Green Roof Build Up.



Precultivated Sedum Blanket.

Extensive Roof Garden Soil Mix 50mm.

VLF150 Filtration Fleece 1.5mm thick.

DE25 Drainage & Reservoir Layer 25mm.

VLU300 Protective / Reservoir Fleece 2.5mm.

4mm Unosint Root Resistant Cap Sheet.

4MM TOP/S Base Sheet.

100mm Paratorch Insulation Board.

2mm Vapobar Vapour Control Layer.

IMPORTANT NOTE.
The combined thickness of all the elements used in the green roof build up, from top of decking to top of soil layer is 215mm.

Sedum plants will typically reach heigths of 100 – 150mm.

MOYMATERIALS

Waterproofing & Insulation Specialists

Rainwater Attenuation with Moy Materials Ltd. Diadem 150 Extensive Green Roof System.

The ability of the Diadem Extensive Green Roof to absorb rainfall is a function of many dynamic factors, the most important of which are the elements used in the green roof build up and their specific ability to absorb rainfall.

The standard Diadem 150 Extensive Green Roof constructed utilising the Moy Materials Ltd. pre-cultivated Sedum Blanket, has a maximum rainwater retention capacity of 44 litres per M2. Each 1mm of rainfall recorded is the equivalent of 1 litre per M2.

Rainfall Attenuation Capacity of Moy Diadem 150 Extensive Green Roof.

Rainfall Intensity (mm / hour).	Attenuation Time (Minutes).
25	105
75	35

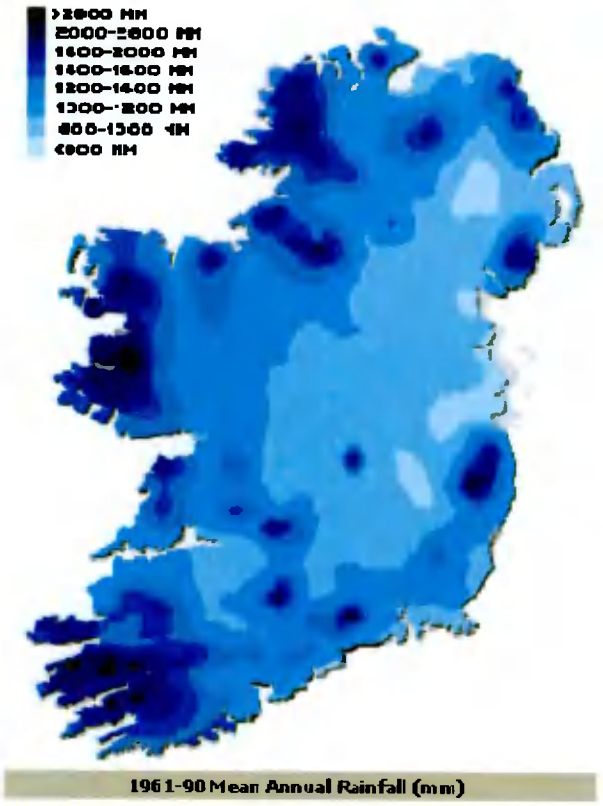
These figures may be augmented by utilising larger capacity reservoir boards, heavier protection and filtration fleeces and deeper zones of growing media.

Maximum Water Storage Capacity Moy Materials Diadem Extensive Green Roof Elements:

- Sedum Blanket 20mm 9 Lt / M2.
- Growing Media 50mm 22.5 Lt / M2.
- VLF200 Filtration Fleece 1.2 Lt / M2.
- DE25 Reservoir & Drainage Board 10 Lt / M2.
- VLU300 Protection Fleece 1.8 Lt / M2.

Unit K, South City Business Park, Whitestown Way, Tallaght, Dublin 24.
Ph. 01 451 9077 Fax. 01 450 0033
E Mail : info@moymaterials.com Website: www.moymaterials.com

Data on Rainfall



1961-90 Mean Annual Rainfall (mm)

How Often Does it Rain?

The general impression is that it rains quite a lot of the time in Ireland but in fact two out of three hourly observations will not report any measurable rainfall. The average number of wet days (days with more than 1mm of rain) ranges from about 150 days a year along the east and south-east coasts, to about 225 days a year in parts of the west.

How Heavy is the Rain? Unlike the rain in many other countries, especially in the tropics, average hourly rainfall amounts in Ireland are quite low, ranging from 1 to 2mm. Short-term rates can of course be much higher: for example, an hourly total of 10mm is not uncommon and totals of 15 to 20mm in an hour may be expected to occur once in 5 years. *Hourly totals exceeding 25mm are rare in this country and when they do occur they are usually associated with heavy thunderstorms.*

Rainfall in Ireland - Download '2008 Summer Rainfall in Ireland' [PDF] Report
Most of the eastern half of the country has between 750 and 1000 millimetres (mm) of rainfall in the year. Rainfall in the west generally averages between 1000 and 1250 mm. In many mountainous districts rainfall exceeds 2000mm per year. The wettest months, in almost all areas are December and January. April is the driest month generally across the country. However, in many southern parts, June is the driest. Hail and snow contribute relatively little to the precipitation measured.

MOYMATERIALS

Waterproofing & Insulation Specialists

PARALON WARM ROOF AND DIADEM EXTENSIVE GREEN ROOF MODEL SPECIFICATION.

Paralon Warm Roof Elements.

Decking
Concrete deck to Engineers specification laid to minimum finished falls of 1 in 80

Surface Preparation
Primer - Apply Impertene bitumen primer at ratio 4m. Sq. per litre.

Vapour Control Layer
Plasfal 3Kg glass fibre reinforced modified bitumen vapour barrier membrane fully torch bonded with 100mm side and end laps, sealed and detailed to envelope insulation board.

Thermal Insulation
Paratorch PIR foam composite bitumen impregnated Hunton fibreboard faced insulation 120mm thick bonded with Instastick adhesive. Install butt jointed and staggered, incorporating 75mm insulated angle fillets at upstands and kerbs.

Base Layer
Top S 3mm polyester reinforced A.P.P. modified bitumen base sheet membrane fully bonded with 100mm side and end laps.

Cap Sheet
Paralon NT4 4mm (anti-root) IAB & BBA certified, polyester reinforced A.P.P. modified bitumen Plasto Elastomeric membrane, fully torch bonded with 100mm side and 150mm end laps. Carry out visual inspection and electronic waterproofing integrity test prior to installation of green roof system.

General Detailing.
Parapets – Form Paralon upstand detail at parapet upstands extending membranes to form continuous D.P.C. under cappings. Paralon ARD/HS plus to be used on all upstands. Form upstands to terminate a minimum of 150mm above the finished surface levels with Paralon membrane termination under approved metal cover flashing or clamping bar detail.

Kerbs - Form all upstands to terminate a minimum of 150mm above the finished vegetation level.

Moy Materials to conduct pre warranty inspection of roof prior to installation of green roofing elements.

Warranty / Guarantee
Provide on completion 15-year roof warranty by Imper Italia covering materials and workmanship by authorised Contractor.

Drainage
Roof Outlets - Install Ital Profili Surefix Dutral vertical spigot roof outlet complete with metal clamping ring and leaf grate 100mm diam. X 300mm (Flange must be recessed in membrane or insulation).

Inspection & Irrigation Box.
Install APP KSE15 Inspection Box with lockable cover and drainage openings. Surround inspection box with 300mm wide band of washed round gravel nominal size 30mm.

Diadem Extensive Green Roof Elements.

Protective Fleece.
Install VLU 300 Protective Fleece with 100mm end and side laps.

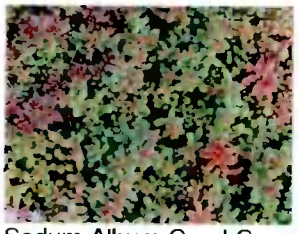
Drainage & Reservoir Board.
Install Diadem DE-25 Drainage and Reservoir Board, overlap at sides and ends by one row.

Filtration Fleece.
Install polypropylene VLF-150 filtration fleece. Overlap by 100mm at side and end laps. At edges and terminations dress filtration fleece up to beneath the surface of the vegetation support course.

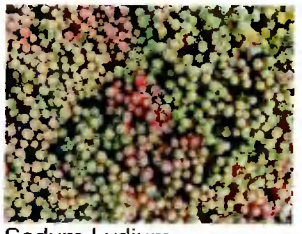
Separation / Demarcation.
Install Diadem KLS-10 recycled PE gravel board 100mm high.
Or
Install Diadem KLS-12 stainless steel / Galv. Steel / Aluminum 120mm high separation device.

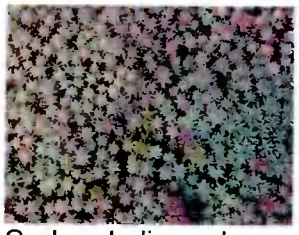
Root Zone Growth Medium.
Install minimum 50mm deep layer of extensive roof garden growth substrate by Moy Materials Ltd.

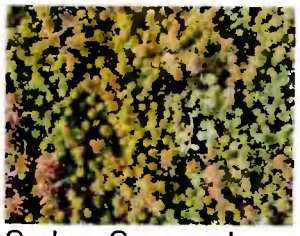
Vegetation Layer.
Install pre cultivated Standard Grade Sedum blanket layer by Moy Materials Ltd. Standard Blanket species may include Sedum album coral carpet, Sedum album minor, Sedum lydium, Sedum lydium glaucum, Sedum Sexangulare, Sedum Acre. Install rolls butt joined and loose laid. Install all sedum blanket upon day of delivery to site. Water well with a sprinkler head hose or watering can.


Sedum Album Coral Carpet.


Sedum Album Minor.


Sedum Lydium.


Sedum lydium glaucum.


Sedum Sexangulare.


Sedum Acre.

(Alternate varieties include Grass / Herb / Sedum mixes and reinforced mixes for high pitch roof applications).

Safety System.
Install non penetrating FLG "Single Point" combined lightning protection and fall arrest system. System conforms to EN795:1996 and EN795:2000 Class E.
Or
Install non penetrating FLG "Multi Point" combined lightning protection and fall arrest system. System conforms to EN795:1996 and EN795:2000 A1 Class E.

Solar Panel Mounts.
Install non penetrating Diadem DE60 Solar panel mounting frames as required to support solar panel array.
Or
Install non penetrating Roof Pro Solar Panel mounting frames as required to support solar panel array.

Detailing.
A wide range of proprietary components are available for separation and demarcation of pedestrian and green areas. There are numerous options for the treatment of roof edges and for drainage at terminations and thresholds. Please consult with the Technical Dept. at Moy Materials Ltd. for advice on available options.

Maintenance Contract.
A maintenance contract may be established, between Moy Materials Ltd. and the building owner. This contract will be subject to the payment of an annual maintenance fee.

Note on Maintenance.
Extensive green roof systems are inherently low maintenance, but shall require a minimum of two maintenance visits annually. Where a maintenance contract is not taken out with Moy Materials Ltd. maintenance of the roof, from the date of installation, is the responsibility of the building owner.

Where maintenance is not carried out in accordance with our green roof maintenance guide, no responsibility for the performance of the green roof shall be accepted by Moy Materials Ltd.

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