

Consulting Civil & Structural Engineers

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Calculation Sheet

Ref: 4097

Date: 01/10/2019

Project: Development off Stansty Road, Wrexham

Sheet No. 1

Calculations By: SJ

Checked By:

Member Ref	Calculations	Output
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Storm water drainage

In accordance with Planning policy and Building Regulations, a hierarchical approach is to be taken to determine receptor for surface water discharge in following order of preference

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;

A Ground Investigation report prepared by Groundsolve Ltd. Confirms a soil percolation is feasible and a rate of 1.0×10^{-5} m/sec can be used for the design of infiltration based systems.

On this basis other methods are not pursued further, and the infiltration designs are developed as follows.

Basic data

M5-60 = 20

Ratio R = 0.4

Design storms:

Residential areas 100 year + 40 climate change allowance

Access road 30 year + 40% climate change allowance

Catchment areas

Plots 1-2 = 100m^2 roofs (50m^2 per plot)

Plots 3-6 = 166m^2 roofs (41.5m^2 per plot)

Access road = 150m^2 (75m^2 per soakaway unit)

Porous paving calculations based on uniform rainfall area

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Plots 1-2 PC MH Soakaway Design

Basic Data:-	Catchment Area	50	m²	per unit
	Storm	100	Year	
	Ratio R=	0.4	M5-60=	20
Basic Dimensions	Diameter	1.50	m	
	Overall Depth	2.40	m	
	Incoming Pipe			
	Depth	0.50	m	
	Effective Storage			
	Depth	1.90	m	
Void Ratio	Store Vol.	3.36	m ³	
	Perc Area	5.67	m ²	
	Perc Rate	1.000E-05	m/sec	

Climate Change allowance 40 %

Duration Mins	M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage Req'd (m ³)
5	19.12	0.96	0.02	0.94
10	28.56	1.43	0.03	1.39
15	34.54	1.73	0.05	1.68
30	45.35	2.27	0.10	2.17
60	56.71	2.84	0.20	2.63
120	68.49	3.42	0.41	3.02
240	80.31	4.02	0.82	3.20
360	87.51	4.38	1.22	3.15
600	97.38	4.87	2.04	2.83
1440	116.13	5.81	4.90	0.91

Rainfall calculated using FSR
method

Use 1.5m dia x 2.4m deep PC Soakaway chambers 1 per plot

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plots 3-6 PC MH Soakaway Design

Basic Data:-	Catchment Area	41.5	m²	per unit
	Storm	100	Year	
	Ratio R=	0.4	M5-60=	20
Basic Dimensions	Diameter	1.50	m	
	Overall Depth	2.10	m	
	Incoming Pipe			
	Depth	0.50	m	
	Effective Storage			
	Depth	1.60	m	
	Store Vol.	2.83	m ³	
Void Ratio	Perc Area	4.78	m ²	
	Perc Rate	1.000E-05	m/sec	

Climate Change allowance 40 %

Duration Mins	M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage Req'd (m ³)
5	19.12	0.79	0.01	0.78
10	28.56	1.19	0.03	1.16
15	34.54	1.43	0.04	1.39
30	45.35	1.88	0.09	1.80
60	56.71	2.35	0.17	2.18
120	68.49	2.84	0.34	2.50
240	80.31	3.33	0.69	2.65
360	87.51	3.63	1.03	2.60
600	97.38	4.04	1.72	2.32
1440	116.13	4.82	4.13	0.69

Rainfall calculated using FSR
 method

Use 1.5m dia x 2.1m deep PC Soakaway chambers 1 per plot

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Access Road PC MH Soakaway Design

Basic Data:-	Catchment Area	75 m ²	per unit
	Storm	30 Year	
	Ratio R=	0.4	M5-60= 20
Basic Dimensions	Diameter	1.50 m	
	Overall Depth	2.70 m	
	Incoming Pipe		
	Depth	0.50 m	
	Effective Storage		
	Depth	2.20 m	
Void Ratio	Store Vol.	3.89 m ³	
	Perc Area	6.57 m ²	
	Perc Rate	1.000E-05 m/sec	

Climate Change allowance 40 %

Duration Mins	M30 (mm)	Inflow (m ³)	Outflow (m ³)	Storage Req'd (m ³)
5	15.09	1.13	0.02	1.11
10	22.15	1.66	0.04	1.62
15	26.61	2.00	0.06	1.94
30	34.65	2.60	0.12	2.48
60	43.14	3.24	0.24	3.00
120	52.12	3.91	0.47	3.44
240	61.57	4.62	0.95	3.67
360	67.49	5.06	1.42	3.64
600	75.65	5.67	2.36	3.31
1440	91.50	6.86	5.67	1.19

Rainfall calculated using FSR
 method

Use 1.5m dia x 2.7m deep PC Soakaway chambers – 2 required

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Blanket Soakaway Design (per 100m²)

Catchment Area		100	m ²
Storm		100	Year
Climate Change allowance		40	%
Basic Data:-		M5-60=	
Ratio R=		0.4	20
Basic Dimensions			
Length		10.00	m
Width		10.00	m
Overall Depth		1.00	m
Incoming Pipe Depth		0.50	m
Effective Storage Depth		0.50	m
Perc Rate		1.000E-05	m/sec
Base Area		100	m ²
R		1	
Design FOS		10	
Porosity		0.30	(Void ratio)
Infiltration rate		0.0360	m/hr
q		0.0036	m/hr

Duration	M100	M100	Plane
Mins	(mm)	M/hr	h (m)
5	19.12	0.229	0.063
10	28.56	0.171	0.093
15	34.54	0.138	0.112
30	45.35	0.091	0.145
60	56.71	0.057	0.177
120	68.49	0.034	0.204
240	80.31	0.020	0.220
360	87.51	0.015	0.220
600	97.38	0.010	0.205
1440	116.13	0.005	0.099

MAX
MAX

Rainfall calculated using FSR method

Use porous paving system with min 225mm thick porous sub-base