

Project Hevercourt- Gravesend				Job no.	
Calcs for BRE 365				Start page no./Revision 1	
Calcs by AB	Calcs date 03/07/2023	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.04

Design rainfall intensity

Location of catchment area	London
Impermeable area drained to the system	A = 100.0 m ²
Return period	Period = 10 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.440
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 9098 mm
Width of pit	w = 1000 mm
Length of pit	l = 1000 mm
Percentage free volume	V _{free} = 30 %

Soil infiltration rate (BRE digest 365)

Length of trial pit	l _{trial} = 1200 mm
Width of trial pit	b _{trial} = 400 mm
Depth of trial pit (below invert)	d _{trial} = 400 mm
Free volume (if fill used)	V _{trial} = 100 %
75% depth of pit	d ₇₅ = (d _{trial} * 0.75) = 300.00 mm
50% depth of pit	d ₅₀ = (d _{trial} * 0.50) = 200.00 mm
25% depth of pit	d ₂₅ = (d _{trial} * 0.25) = 100.00 mm
Test 1 - time to fall from 75% depth to 25% depth	T1 = 36 min
Test 2 - time to fall from 75% depth to 25% depth	T2 = 74 min
Test 3 - time to fall from 75% depth to 25% depth	T3 = 132 min
Longest time to fall from 75% depth to 25% depth	t _{lg} = max(T1, T2, T3) = 132 min
Storage volume from 75% to 25% depth	V _{p75_25} = (l _{trial} * b _{trial} * (d ₇₅ - d ₂₅)) * V _{trial} = 0.10 m ³
Internal surface area to 50% depth	a _{p50} = ((l _{trial} * b _{trial}) + (l _{trial} + b _{trial}) * 2 * d ₅₀) = 1.12 m ²
Surface area of soakaway to 50% storage depth	A _{s50} = 2 * (l _{trial} + b _{trial}) * d _{trial} / 2 = 0.640 m ²
Soil infiltration rate	f = V _{p75_25} / (a _{p50} * t _{lg}) = 10.8*10⁻⁶ m/s
Wetted area of pit 50% full	a _{s50} = l * d + w * d = 18196344 mm ²

Table equations

Inflow (cl.3.3.1)	I = M10 * A
Outflow (cl.3.3.2)	O = a _{s50} * f * D
Storage (cl.3.3.3)	S = I - O

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	10 year rainfall, M10 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.39;	10.8;	1.22;	13.2;	1.32;	0.06;	1.27
10	0.54;	15.0;	1.24;	18.6;	1.86;	0.12;	1.75
15	0.65;	18.1;	1.24;	22.5;	2.25;	0.18;	2.07
30	0.82;	22.9;	1.24;	28.4;	2.84;	0.35;	2.48

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Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	10 year rainfall, M10 (mm)	Inflow (m³)	Outflow (m³)	Storage required (m³)
60	1.00;	28.0;	1.23;	34.4;	3.44;	0.71;	2.73
120	1.19;	33.4;	1.21;	40.4;	4.04;	1.42;	2.62
240	1.39;	39.0;	1.19;	46.5;	4.65;	2.84;	1.82
360	1.53;	42.8;	1.18;	50.7;	5.07;	4.25;	0.82
600	1.70;	47.6;	1.17;	55.9;	5.59;	7.09;	0.00
1440	2.07;	58.1;	1.16;	67.4;	6.74;	17.01;	0.00

Required storage volume

$$S_{\text{req}} = 2.73 \text{ m}^3$$

Soakaway storage volume

$$S_{\text{act}} = l * d * w * V_{\text{free}} = 2.73 \text{ m}^3$$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume

$$t_{s50} = S_{\text{req}} * 0.5 / (a_{s50} * f) = 1\text{hr } 55\text{min } 32\text{s}$$

PASS - Soakaway discharge time less than or equal to 24 hours