

Project Land off Acorn Way				Job no.	
Calcs for Soak Aways				Start page no./Revision 1	
Calcs by JRB	Calcs date 04/07/2022	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 Leeds
Impermeable area drained to the system $A = 100.0 \text{ m}^2$
Return period Period = **10 yr**
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.360$
5-year return period rainfall of 60 minutes duration $M5_{60\text{min}} = 19.0 \text{ mm}$
Increase of rainfall intensity due to global warming $p_{\text{climate}} = 0 \%$

Soakaway / infiltration trench details

Soakaway type Rectangular
Minimum depth of pit (below incoming invert) $d = 725 \text{ mm}$
Width of pit $w = 1000 \text{ mm}$
Length of pit $l = 1000 \text{ mm}$
Percentage free volume $V_{\text{free}} = 30 \%$

Soil infiltration rate (BRE digest 365)

Length of trial pit $l_{\text{trial}} = 1000 \text{ mm}$
Width of trial pit $b_{\text{trial}} = 1000 \text{ mm}$
Depth of trial pit (below invert) $d_{\text{trial}} = 1000 \text{ mm}$
Free volume (if fill used) $V_{\text{trial}} = 100 \%$
75% depth of pit $d_{75} = (d_{\text{trial}} \times 0.75) = 750.00 \text{ mm}$
50% depth of pit $d_{50} = (d_{\text{trial}} \times 0.50) = 500.00 \text{ mm}$
25% depth of pit $d_{25} = (d_{\text{trial}} \times 0.25) = 250.00 \text{ mm}$
Test 1 - time to fall from 75% depth to 25% depth $T1 = 2 \text{ min}$
Test 2 - time to fall from 75% depth to 25% depth $T2 = 2 \text{ min}$
Test 3 - time to fall from 75% depth to 25% depth $T3 = 2 \text{ min}$
Longest time to fall from 75% depth to 25% depth $t_g = \max(T1, T2, T3) = 2 \text{ min}$
Storage volume from 75% to 25% depth $V_{p75_{25}} = (l_{\text{trial}} \times b_{\text{trial}} \times (d_{75} - d_{25})) \times V_{\text{trial}} = 0.50 \text{ m}^3$
Internal surface area to 50% depth $a_{p50} = ((l_{\text{trial}} \times b_{\text{trial}}) + (l_{\text{trial}} + b_{\text{trial}}) \times 2 \times d_{50}) = 3.00 \text{ m}^2$
Surface area of soakaway to 50% storage depth $A_{s50} = 2 \times (l_{\text{trial}} + b_{\text{trial}}) \times d_{\text{trial}} / 2 = 2.000 \text{ m}^2$
Soil infiltration rate $f = V_{p75_{25}} / (a_{p50} \times t_g) = 1.39 \times 10^{-3} \text{ m/s}$
Wetted area of pit 50% full $a_{s50} = l \times d + w \times d = 1449726 \text{ mm}^2$

Table equations

Inflow (cl.3.3.1) $I = M10 \times A$
Outflow (cl.3.3.2) $O = a_{s50} \times f \times D$
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 (m³)	Outflow (m³)	Storage required (m³)
5	0.36;	6.8;	1.20;	8.2;	0.82;	0.60;	0.22
10	0.51;	9.7;	1.22;	11.8;	1.18;	1.21;	0.00
15	0.62;	11.8;	1.23;	14.5;	1.45;	1.81;	0.00

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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)
30	0.79;	15.0;	1.24;	18.6;	1.86;	3.62;	0.00
60	1.00;	19.0;	1.24;	23.6;	2.36;	7.25;	0.00
120	1.22;	23.2;	1.24;	28.7;	2.87;	14.50;	0.00
240	1.48;	28.1;	1.23;	34.5;	3.45;	28.99;	0.00
360	1.67;	31.7;	1.21;	38.5;	3.85;	43.49;	0.00
600	1.90;	36.1;	1.20;	43.4;	4.34;	72.49;	0.00
1440	2.42;	46.0;	1.18;	54.2;	5.42;	173.97;	0.00

Required storage volume $S_{req} = 0.22 \text{ m}^3$

Soakaway storage volume $S_{act} = l \times d \times w \times V_{free} = 0.22 \text{ m}^3$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume $t_{s50} = S_{req} \times 0.5 / (a_{s50} \times f) = 55s$

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