



JNM Engineering Ltd
14-16 High Street
Ironbridge
TF8 7AD

Project Bronington				Job no. J01718	
Calcs for Infiltration basin volume				Start page no./Revision 1	
Calcs by JJM	Calcs date 17/08/2017	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area Other
Impermeable area drained to the system $A = 9330.0 \text{ m}^2$
Return period Period = **100 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) $d = 750 \text{ mm}$
Width of pit $w = 2500 \text{ mm}$
Length of pit $l = 282853 \text{ mm}$
Percentage free volume $V_{\text{free}} = 100 \%$

Soil infiltration rate (BRE digest 365)

Length of trial pit $l_{\text{trial}} = 300 \text{ mm}$
Width of trial pit $b_{\text{trial}} = 300 \text{ mm}$
Depth of trial pit (below invert) $d_{\text{trial}} = 300 \text{ mm}$
Free volume (if fill used) $V_{\text{trial}} = 100 \%$
75% depth of pit $d_{75} = (d_{\text{trial}} \times 0.75) = 225.00 \text{ mm}$
50% depth of pit $d_{50} = (d_{\text{trial}} \times 0.50) = 150.00 \text{ mm}$
25% depth of pit $d_{25} = (d_{\text{trial}} \times 0.25) = 75.00 \text{ mm}$
Test 1 - time to fall from 75% depth to 25% depth $T1 = 45 \text{ min}$
Test 2 - time to fall from 75% depth to 25% depth $T2 = 47 \text{ min}$
Test 3 - time to fall from 75% depth to 25% depth $T3 = 55 \text{ min}$
Longest time to fall from 75% depth to 25% depth $t_{\text{lg}} = \max(T1, T2, T3) = 55 \text{ min}$
Storage volume from 75% to 25% depth $V_{p75_25} = (l_{\text{trial}} \times b_{\text{trial}} \times (d_{75} - d_{25})) \times V_{\text{trial}} = 0.01 \text{ m}^3$
Internal surface area to 50% depth $a_{p50} = ((l_{\text{trial}} \times b_{\text{trial}}) + (l_{\text{trial}} + b_{\text{trial}}) \times 2 \times d_{50}) = 0.27 \text{ m}^2$
Surface area of soakaway to 50% storage depth $A_{s50} = 2 \times (l_{\text{trial}} + b_{\text{trial}}) \times d_{\text{trial}} / 2 = 0.180 \text{ m}^2$
Soil infiltration rate $f = V_{p75_25} / (a_{p50} \times t_{\text{lg}}) = 15.2 \times 10^{-6} \text{ m/s}$
Wetted area of pit 50% full $a_{s50} = l \times d + w \times d = 214014895 \text{ mm}^2$

Table equations

Inflow $I = M100 \times A$
Outflow $O = a_{s50} \times f \times D$
Storage $S = I - O$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.36;	6.8;	1.83;	12.5;	117.05;	0.97;	116.08
10	0.51;	9.7;	1.90;	18.4;	172.01;	1.95;	170.06
15	0.62;	11.8;	1.94;	22.8;	213.05;	2.92;	210.13



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Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
30	0.79;	15.0;	1.99;	29.9;	278.70;	5.84;	272.86
60	1.00;	19.0;	2.02;	38.4;	358.44;	11.67;	346.77
120	1.22;	23.2;	2.02;	46.8;	436.28;	23.35;	412.93
240	1.48;	28.1;	1.99;	55.8;	520.79;	46.69;	474.10
360	1.67;	31.7;	1.96;	62.1;	579.10;	70.04;	509.06
600	1.90;	36.1;	1.92;	69.4;	647.09;	116.74;	530.35
1440	2.42;	46.0;	1.84;	84.7;	790.27;	280.16;	510.11

Required storage volume $S_{req} = 530.35 \text{ m}^3$

Soakaway storage volume $S_{act} = l \times d \times w \times V_{free} = 530.35 \text{ m}^3$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume $t_{s50} = S_{req} \times 0.5 / (a_{s50} \times f) = 22\text{hr } 42\text{min } 58\text{s}$

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