

 JNM Engineering Ltd 14-16 High Street Ironbridge TF8 7AD	Project Knolton Farm				Job no.	
	Calcs for Soakaway Design 1 in 100 year + 40% for CC				Start page no./Revision 1 A	
	Calcs by JM	Calcs date 08/02/2021	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.03

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = 145.0 m ²
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.400
5-year return period rainfall of 60 minutes duration	M5_60min = 19.0 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 = 1000 mm
Width of pit	w = 1000 mm
Length of pit	l = 6868 mm
Percentage free volume	V _{free} = 95 %

Soil infiltration rate (BRE digest 365)

Length of trial pit	l _{trial} = 300 mm
Width of trial pit	b _{trial} = 300 mm
Depth of trial pit (below invert)	d _{trial} = 300 mm
Free volume (if fill used)	V _{trial} = 100 %
75% depth of pit	d ₇₅ = (d _{trial} × 0.75) = 225.00 mm
50% depth of pit	d ₅₀ = (d _{trial} × 0.50) = 150.00 mm
25% depth of pit	d ₂₅ = (d _{trial} × 0.25) = 75.00 mm
Test 1 - time to fall from 75% depth to 25% depth	T1 = 15 min
Test 2 - time to fall from 75% depth to 25% depth	T2 = 17 min
Test 3 - time to fall from 75% depth to 25% depth	T3 = 18 min
Longest time to fall from 75% depth to 25% depth	t _{lg} = max(T1, T2, T3) = 18 min
Storage volume from 75% to 25% depth	V _{p75_25} = (l _{trial} × b _{trial} × (d ₇₅ - d ₂₅)) × V _{trial} = 0.01 m ³
Internal surface area to 50% depth	a _{p50} = ((l _{trial} × b _{trial}) + (l _{trial} + b _{trial}) × 2 × d ₅₀) = 0.27 m ²
Surface area of soakaway to 50% storage depth	A _{s50} = 2 × (l _{trial} + b _{trial}) × d _{trial} / 2 = 0.180 m ²
Soil infiltration rate	f = V _{p75_25} / (a _{p50} × t _{lg}) = 45.3×10⁻⁶ m/s
Wetted area of pit 50% full	a _{s50} = l × d + w × d = 7868205 mm ²

Table equations

Inflow (cl.3.3.1)	I = M100 × 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	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.37;	9.9;	1.91;	19.0;	2.75;	0.11;	2.64
10	0.52;	13.9;	1.97;	27.5;	3.98;	0.21;	3.77
15	0.63;	16.8;	2.00;	33.8;	4.90;	0.32;	4.58

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Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m³)	Outflow (m³)	Storage required (m³)
30	0.80;	21.4;	2.02;	43.3;	6.27;	0.64;	5.63
60	1.00;	26.6;	2.00;	53.1;	7.70;	1.28;	6.42
120	1.21;	32.1;	1.95;	62.7;	9.09;	2.57;	6.52
240	1.45;	38.5;	1.90;	73.2;	10.61;	5.13;	5.48
360	1.60;	42.6;	1.87;	79.7;	11.56;	7.70;	3.86
600	1.79;	47.7;	1.83;	87.2;	12.65;	12.83;	0.00
1440	2.24;	59.6;	1.74;	104.0;	15.07;	30.79;	0.00

Required storage volume

$$S_{\text{req}} = 6.52 \text{ m}^3$$

Soakaway storage volume

$$S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 6.52 \text{ m}^3$$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume

$$t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = 2\text{hr } 32\text{min } 29\text{s}$$

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