

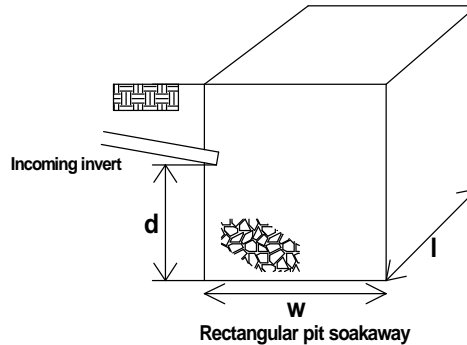


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Kevin Miller	14/05/2008	Kevin Miller			

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SOAKAWAY DESIGN – BRE DIGEST 365

TEDDS calculation version 1.0.01



Soil infiltration rate (BRE digest 365)

Length of trial pit;	$l_{\text{trial}} = 1000 \text{ mm};$	Width of trial pit;	$b_{\text{trial}} = 750 \text{ mm}$
Depth of trial pit (below invert);	$d_{\text{trial}} = 1000 \text{ mm};$	Free volume (if fill used);	$V_{\text{trial}} = 100 \text{ %};$
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;		$T1 = 56 \text{ min}$	
Test 2 - time to fall from 75% depth to 25% depth;		$T2 = 55 \text{ min}$	
Test 3 - time to fall from 75% depth to 25% depth;		$T3 = 56 \text{ min}$	
Longest time to fall from 75% depth to 25% depth;		$t_{ig} = \max(T1, T2, T3) = 56 \text{ min}$	
Storage volume from 75% to 25% depth;		$V_{p75_25} = (l_{\text{trial}} \times b_{\text{trial}} \times (d_{75} - d_{25})) \times V_{\text{trial}} = 0.38 \text{ m}^3$	
Internal surface area to 50% depth;		$a_{p50} = ((l_{\text{trial}} \times b_{\text{trial}}) + (l_{\text{trial}} + b_{\text{trial}}) \times 2 \times d_{50}) = 2.50 \text{ m}^2$	
Surface area of soakaway to 50% storage depth;		$A_{s50} = 2 \times (l_{\text{trial}} + b_{\text{trial}}) \times d_{\text{trial}} / 2 = 1.750 \text{ m}^2$	
Soil infiltration rate;		$f = V_{p75_25} / (a_{p50} \times t_{ig}) = 44.61 \times 10^{-6} \text{ m/s}$	

Rectangular Pit Design

Pit length;	$l = 2000 \text{ mm};$	Pit width;	$w = 1500 \text{ mm}$
Pit depth below invert;	$d = 1500 \text{ mm};$	Free volume;	$V_{\text{free}} = 30.0 \text{ %}$
Location of soakaway;	England and Wales;	Return period;	10 years
Ratio of 60 minute to 2 day rainfalls of 5 year return period (BRE digest 365 - fig 1);			$r = 0.35$
Impermeable area;	$A = 75.0 \text{ m}^2;$	Soil infiltration rate;	$f = 0.0000446 \text{ m/s}$
Surface area of soakaway to 50% storage depth			$A_{s50} = 2 \times (l + w) \times d / 2 = 5.250 \text{ m}^2$
Outflow factor;			$AF = A_{s50} \times f = 234.1 \times 10^{-6} \text{ m}^3/\text{s}$

M5 rainfalls are calculated from table 1 BRE digest 365 using Factor Z1

Duration	M5 rainfalls	Growth factor Z2;	10 year rainfall;	Inflow	Outflow	Storage required
5 mins	7.1 mm	1.20	8.6 mm	0.6 m ³	0.1 m ³	0.6 m ³
10 mins	10.1 mm	1.22	12.4 mm	0.9 m ³	0.1 m ³	0.8 m ³
15 mins	12.3 mm	1.23	15.2 mm	1.1 m ³	0.2 m ³	0.9 m ³
30 mins	15.7 mm	1.24	19.5 mm	1.5 m ³	0.4 m ³	1.0 m ³
1 hour	20.0 mm	1.24	24.8 mm	1.9 m ³	0.8 m ³	1.0 m ³



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2 hours	24.5 mm	1.24	30.3 mm	2.3 m ³	1.7 m ³	0.6 m ³
4 hours	29.9 mm	1.22	36.5 mm	2.7 m ³	3.4 m ³	-0.6 m ³
6 hours	33.8 mm	1.21	40.9 mm	3.1 m ³	5.1 m ³	-2.0 m ³
10 hours	38.9 mm	1.19	46.5 mm	3.5 m ³	8.4 m ³	-5.0 m ³
24 hours	49.6 mm	1.17	58.1 mm	4.4 m ³	20.2 m ³	-15.9 m ³

Required storage volume; $S_{reqd} = 1.0 \text{ m}^3$

Soakaway storage volume; $S_{act} = l \times d \times w \times V_{free} = 1.3 \text{ m}^3$

Soakaway storage volume- OK

Time for emptying soakaway to half volume;

$$T_{s50} = S_{reqd} \times 0.5 / (A_{s50} \times f) = 0 \text{ hr } 37 \text{ min } 1 \text{ s}$$

Soakaway discharge time - OK

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