

	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations		w948
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Section :	Soakaway Design Plots 4- 5 in accordance with CSH			SD C
Prepared By: Gemma Roberts				Date: 04/05/2011
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Approved By: Robert Evans				Date: 06/05/2011
<u>Determination of soakaway storage requirement and proposed dimensions</u> <u>Development description and estimate of Impervious areas</u> Proposed development of 5 dwellings on an existing greenfield site. Impervious areas include dwellings and access road. Individual driveways will be permeable paving. This calculation is for a soakaway serving plots 4-5 and the access road, located along the northern boundary of the site. Total impervious area 389.5m². <u>Design Procedure from BRE Digest 365 with alternative return period 100yr</u> The design method for sizing a soakaway is based upon the equation of volumes: $S = I - O$ Where: S = Required storage in the soakaway to balance inflow and outflow. I = Inflow from Impermeable Areas drained to soakaway. O = Outflow Infiltrating into the soil. <u>I = Total inflow Volume</u> I = Inflow to soakaway from on-site impervious areas = Impervious Area, A x Total Rainfall (100yr Return Period) <u>O = Outflow Volume = as50 x f x D x 60</u> as50 = Internal Surface Area of soakaway to 50% effective depth (m²) f = Soil Infiltration Rate (Taken from Infiltration Test Calc sheets) (m/s) D = Storm Duration (mins) <u>f = Soil Infiltration Rate</u> Figures determined in accordance with BRE standard Infiltration tests; See separate calculation sheet w948-t4-110426-Soakaway Infiltration Test B . Average Infiltration Rate 9.228 x 10⁻⁴ m/s				



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Rainfall Parameters

Storm return frequency - 1 in (yrs)	100.00	(Alternative to std 10yr as BRE Digest 365)
M5-60 min rainfall (mm)	26.00	(BRE 365: 20mm for all UK + 30% CC)
Ratio (M5-60 / M5-2day) - r	0.25	(From Map on Page 3)

Drainage Area

Total impervious area A (m ²)	389.50
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Soakaway Details

(Rectangular soakaway)	Length L (m) =	7.00	
	Width W (m) =	2.00	
	Effective Depth d (m) =	1.00	
	Design Area (m ²), as50 (m ²) =	9.00	Area of side to 50% depth
	Percentage Voids P (%) =	30	Typical 30% for single size stone
	Design Volume V (m ³) =	4.20	(P/100xLxWxd)

Soil Infiltration

Infiltration Rate f (m/s) =	9.23E-04	From infiltration test results
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Calculations in table below

Total rainfall **R** = M5-60 * Z1* Z2 (calculated page 3)

Inflow Volume, **I** = A x R (100% run-off)

Outflow Volume **O** = as50 * f * D * 60

Storage Volume **S** = I - O

Storm duration (D)		R (M10-D)	I	O	S	Max
(Minutes)	(Hrs)	(mm)	m ³	m ³	m ³	
Crit D	15	0.25	29.26	11.395	7.475	3.921
	30	0.50	39.70	15.462	14.949	0.512
	60	1.00	52.05	20.274	29.899	0.000
	120	2.00	65.12	25.366	59.797	0.000
	240	4.00	82.04	31.954	119.595	0.000
	360	6.00	93.38	36.370	179.392	0.000
	600	10.00	106.89	41.633	298.987	0.000
	1440	24.00	135.92	52.939	717.569	0.000
Design Storage Requirement = Maximum Volume (m ³) =					3.921	

Proposed Soakaway Dimension Check = **OK, but check Time of Emptying**

Time of Emptying of Soakaway (Taken from BRE Digest 365)

The soakaway should discharge from full to half-volume within 24 hours in readiness for subsequent storm inflow.

ts50 = Time to empty 50% of total storage volume

$$ts50 = \frac{S \times 0.5}{as50 \times f \times 3600} = 0.07 \text{ hrs} < 24 \text{ hrs, Therefore Design Acceptable}$$

Summary of acceptable dimensions:

Length =	7.00 m
Width =	2.00 m
Effective Depth =	1.00 m



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Values of Factor Z1 (From BRE 365 - Table 1)

Ratio	Rainfall Duration (mins)							
r	15	30	60	120	240	360	600	1440
0.12	0.450	0.670	1.000	1.480	2.170	2.750	3.700	6.000
0.15	0.480	0.690	1.000	1.420	2.020	2.460	3.230	4.900
0.18	0.510	0.710	1.000	1.360	1.860	2.250	2.860	4.300
0.20	0.530	0.723	1.000	1.340	1.800	2.163	2.700	3.833
0.21	0.540	0.730	1.000	1.330	1.770	2.120	2.620	3.600
0.24	0.560	0.750	1.000	1.300	1.710	2.000	2.400	3.350
0.25	0.567	0.753	1.000	1.290	1.687	1.960	2.347	3.267
0.27	0.580	0.760	1.000	1.270	1.640	1.880	2.240	3.100
0.30	0.590	0.770	1.000	1.250	1.570	1.780	2.120	2.840
0.33	0.610	0.780	1.000	1.230	1.530	1.730	2.040	2.600
0.35	0.617	0.787	1.000	1.223	1.497	1.690	1.947	2.480
0.36	0.620	0.790	1.000	1.220	1.480	1.670	1.900	2.420
0.39	0.630	0.800	1.000	1.210	1.460	1.620	1.820	2.280
0.40	0.633	0.823	1.000	1.207	1.447	1.603	1.793	2.240
0.42	0.640	0.810	1.000	1.200	1.420	1.570	1.740	2.160
0.45	0.650	0.820	1.000	1.190	1.380	1.510	1.680	2.030

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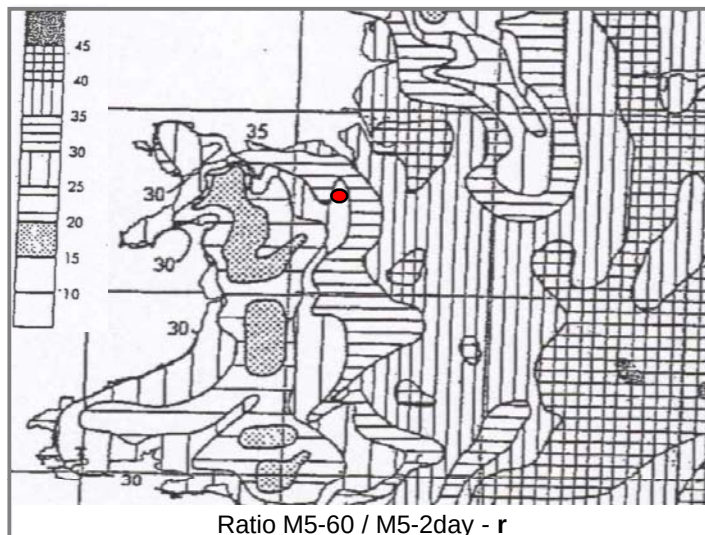
Calculating Design Rainfall, R (10yr Return Period)

Pro-rata values **

M5-60 rain (mm)		26.00	(Taken from Page 1)					
Ratio M5-60/M5-2day		0.25	(Taken from Page 1)					
Duration (mins)	Duration (hrs)	Factor Z1	R (M5-D) (mm)	Z2 Values - M100			Prorata Z2	R (M100-D) (mm)
				Z2 low	Diff (mm)	Z2 high		
15.0	0.25	0.567	14.733	1.91	5.00	1.99	1.986	29.256
30.0	0.50	0.753	19.587	1.99	5.00	2.03	2.027	39.696
60.0	1.00	1.000	26.000	2.01	5.00	1.97	2.002	52.052
120.0	2.00	1.290	33.540	1.97	10.00	1.89	1.942	65.124
240.0	4.00	1.687	43.853	1.89	10.00	1.84	1.871	82.038
360.0	6.00	1.960	50.960	1.84	25.00	1.64	1.832	93.375
600.0	10.00	2.347	61.013	1.84	25.00	1.64	1.752	106.889
1440.0	24.00	3.267	84.933	1.64	25.00	1.54	1.600	135.916

Z2 Factors - England & Wales (from Wallingford Procedure)

M5 Rain (mm)	Diff (mm)	M100
0	5	1.790
5	5	1.790
10	5	1.910
15	5	1.990
20	5	2.030
25	5	2.010
30	10	1.970
40	10	1.890
50	25	1.840
75	25	1.640
100	50	1.540
150	50	1.450
200	50	1.400



Ratio M5-60 / M5-2day - r