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CALCULATIONS

RUSHBY BREWSTER

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Job Title 111 LONDON RD, WATERLOOVILLE	Job No. RBB232	Sht. No. 1
Element SOAKAWAY DESIGN	Prepared DW	Date OCT'12
	Checked	Date

SOAKAGE TEST CARRIED OUT IN 1.8M DEEP EXCAVATION, SIMILAR TO DEPTH OF SOAKAWAY.

SOAKAWAY WILL BE DESIGNED FOR 1 IN 100 YEAR STORM INTENSITY 10 HR DURATION WITH 30% ADDITIONAL ALLOWANCE FOR FUTURE CLIMATE CHANGE.

IMPERMEABLE AREA = 200 m^2

FROM SOAKAGE TEST, INFILTRATION RATE = $4.5 \times 10^{-6} \text{ m/s}$

SEE TEDDS OUTPUT ON FOLLOWING SHEETS



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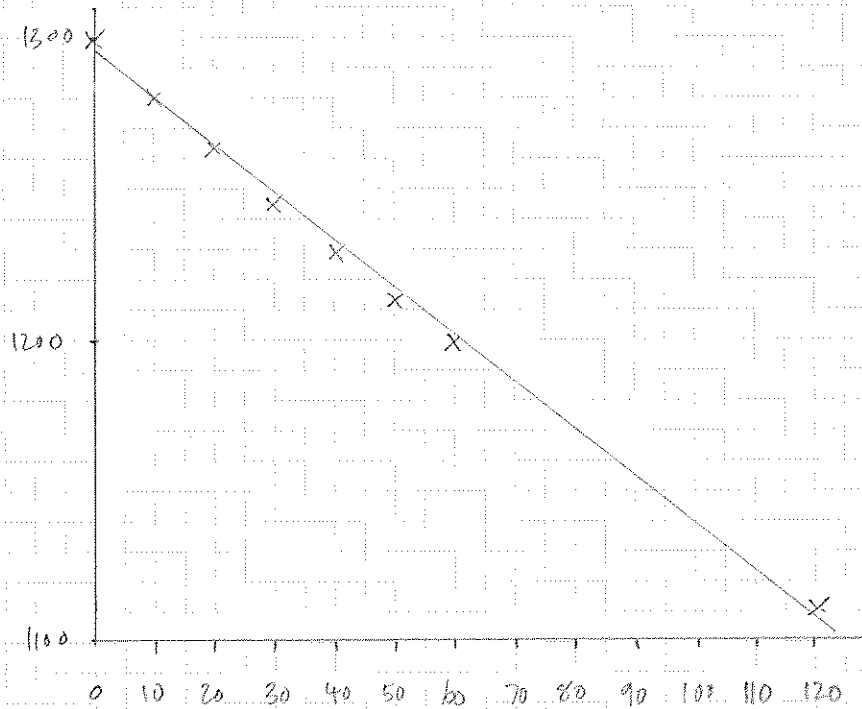
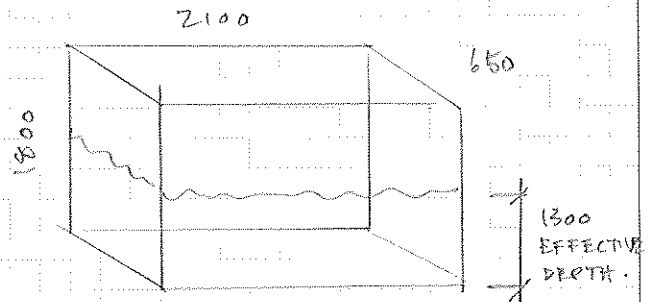
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CALCULATIONS

Job Title 111 LONDON RD, WATERLOOVILLE	Job No. RBB 232	Sht. No. 2
Element SOAKAGE TEST 2	Prepared DW	Date OCT'12
	Checked	Date

TRIAL HOLE RESULTS.

TIME	DEPTH.
0	1300
10	1281
20	1263
30	1246
40	1229
50	1213
60	1198
120	1111



$$\text{VOLUME OUTFLOWING} = 2.1 \times 0.65 \times (1.3 - 1.11) = 0.26 \text{ m}^3$$

$$\text{MEAN SURFACE AREA} = (2.1 \times 1.2 \times 2) + (0.65 \times 1.2 \times 2) + 2.1 (0.65) = 7.97 \text{ m}^2$$

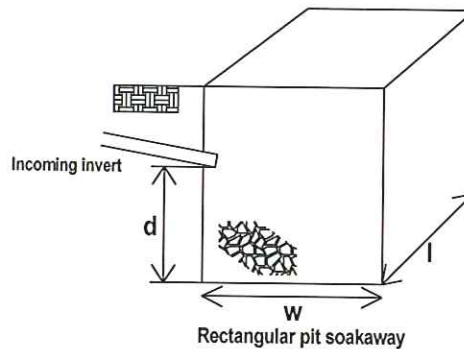
$$\text{TIME FOR OUTFLOW} = 120 \text{ MINS}$$

$$\text{SOIL INFILTRATION RATE} \left(= \frac{0.26}{7.97 \times 120 \times 60} \right) = 4.5 \times 10^{-6} \text{ m/s.}$$

Project 111 London Road				Job no. RBB232	
Calcs for Soakaway Design				Start page no./Revision 3	
Calcs by DW	Calcs date 30/10/2012	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN – BRE DIGEST 365

TEDDS calculation version 1.0.01



Rectangular Pit Design

Pit length	$l = 11000 \text{ mm}$	Pit width	$w = 2000 \text{ mm}$
Pit depth below invert	$d = 1200 \text{ mm}$	Free volume	$V_{\text{free}} = 95.0 \%$
Location of soakaway	England and Wales	Return period	100 years
Ratio of 60 minute to 2 day rainfalls of 5 year return period (BRE digest 365 - fig 1)		$r = 0.35$	
Impermeable area	$A = 200.0 \text{ m}^2$	Soil infiltration rate	$f = 0.0000045 \text{ m/s}$
Surface area of soakaway to 50% storage depth			

$$A_{s50} = 2 \times (l + w) \times d / 2 = 15.600 \text{ m}^2$$

$$\text{Outflow factor} \quad AF = A_{s50} \times f = 70.8 \times 10^{-6} \text{ m}^3/\text{s}$$

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

Duration	M5 rainfalls	Growth factor Z2	100 year rainfall	Inflow	Outflow	Storage required
5 mins	7.1 mm	1.84	13.1 mm	2.6 m ³	0.0 m ³	2.6 m ³
10 mins	10.1 mm	1.91	19.4 mm	3.9 m ³	0.0 m ³	3.8 m ³
15 mins	12.3 mm	1.95	24.0 mm	4.8 m ³	0.1 m ³	4.7 m ³
30 mins	15.7 mm	2.00	31.4 mm	6.3 m ³	0.1 m ³	6.2 m ³
1 hour	20.0 mm	2.03	40.6 mm	8.1 m ³	0.3 m ³	7.9 m ³
2 hours	24.5 mm	2.01	49.2 mm	9.8 m ³	0.5 m ³	9.3 m ³
4 hours	29.9 mm	1.97	59.0 mm	11.8 m ³	1.0 m ³	10.8 m ³
6 hours	33.8 mm	1.94	65.6 mm	13.1 m ³	1.5 m ³	11.6 m ³
10 hours	38.9 mm	1.90	73.9 mm	14.8 m ³	2.5 m ³	12.2 m ³
24 hours	49.6 mm	1.81	89.9 mm	18.0 m ³	6.1 m ³	11.9 m ³

Required storage volume $S_{\text{reqd}} = 12.2 \text{ m}^3 + 30\% = 15.86 < 25.1 \therefore \text{OK}$

Soakaway storage volume $S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 25.1 \text{ m}^3$

Soakaway storage volume - OK

Time for emptying soakaway to half volume

$$T_{s50} = S_{\text{reqd}} \times 0.5 / (A_{s50} \times f) = 23 \text{ hr } 59 \text{ min } 26 \text{ s}$$

Soakaway discharge time - OK