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Job No. 1735

Date: July 2018

QA INFORMATION

CLIENT:	Farndell Builders Ltd
JOB ID:	172 Elmer Road
SCOPE OF WORK:	Soakaway Design
DESIGN CODES AND REFERENCES:	BRE 365
SOFTWARE:	MS EXCEL
SUB-SOIL/ FOUNDATION DATA:	N/A

MATERIAL DATA

CONCRETE:	
REINFORCEMENT:	
STEELWORK:	
TIMBER:	
OTHER:	
	Soakage test by others (data included)

OTHER INFORMATION / NOTES

Rev A	First issue
Rev B	Revised for 30% climate increase
Rev C	Revised assessment of percolation test

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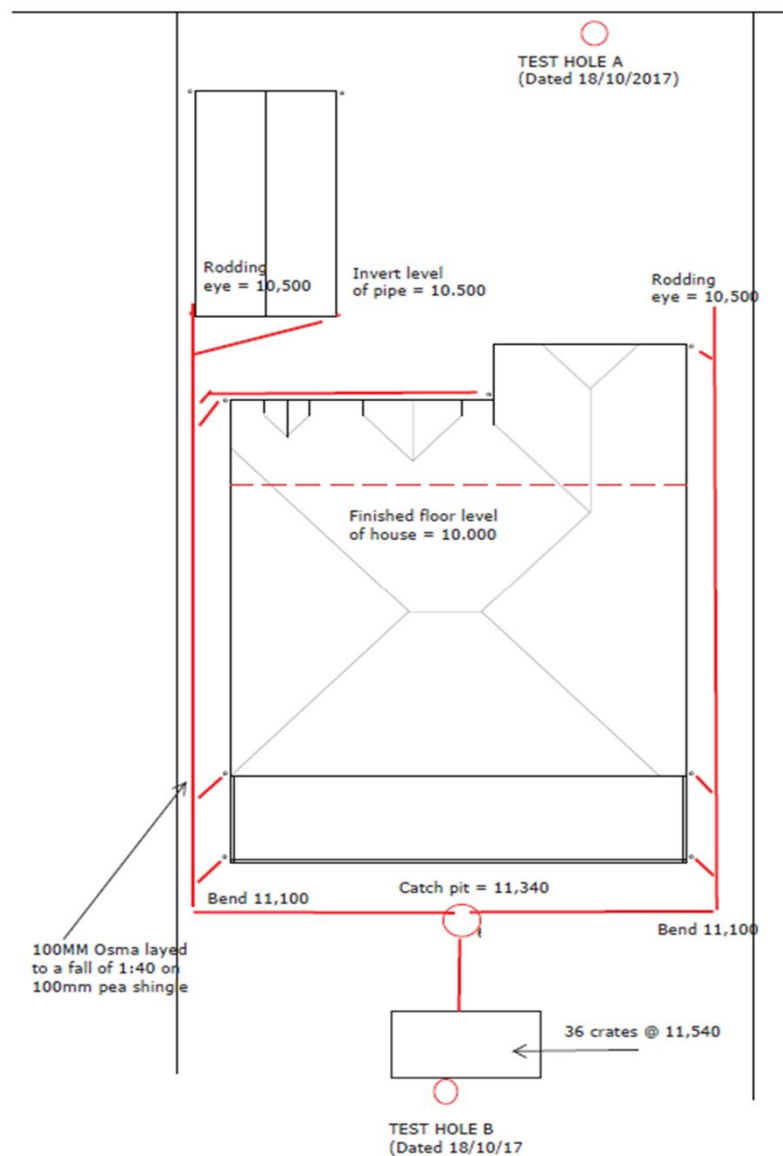
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SUMMARY:

The site is underlain by head gravel with a water table recorded at between 2 and 3m bgl (refer to attached borehole log).

Infiltration rate based on test at location of soakaway (Test B)

The calculation is based on a 100 year return period with a 30% allowance for Climate Change.



(see page 6 for larger plot)

To new soakaways	Area	
Garage	17.00	m ²
100% house	100.00	m ²
Base design on	117.00	m²

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SOAKAWAY DESIGN TO BRE(1991)

SOAKAWAY DETAILS

Ring		Pit/crates	
Soakaway size, Ds =	2.50 m	Length =	3 m
Depth of below invert, Hs =	1.00 m	Width =	2 m
		Depth below invert =	1.2 m
Free volume, S =	4.91 m ³	=	7.20 m ³
Rubble filled volume, S' =	1.47 m ³	=	2.38 m ³

INITIAL SOAKAWAY SIZING

Drained area to soakaway = **117.00** m²
 Climate change allowance = 30 %

INFLOW

Inflow, I = (run off area) x (design rainfall)
 = A x (M10-D)

DESIGN RAINFALL

Return period = 100 yrs
 Ratio of 60 min to 2-Day rainfalls of 5 year return period, r = 0.35 BRE(1991) Fig 1.

M5 rainfalls are calculated from table 1 (BRE 365) using Z1 factor

duration (mins)	Z1	M5-D (mm)	Z2 M10 (cor. Fac)	M10-D* rainfall	Z2 M100 Design	100 yr rainfall
5	0.36	7.2	1.19	11.14	1.84	17.22
10	0.51	10.2	1.22	16.18	1.91	25.33
15	0.62	12.4	1.23	19.83	1.95	31.43
30	0.79	15.8	1.22	25.06	2.00	41.08
60	1	20	1.24	32.24	2.03	52.78
120	1.23	24.6	1.24	39.66	2.01	64.28
240	1.5	30	1.22	47.58	1.97	76.83
360	1.69	33.8	1.21	53.17	1.94	85.24
600	1.94	38.8	1.2	60.53	1.90	95.84
1440	2.48	49.6	1.18	76.09	1.81	116.71

* including 30% for climate change

OUTFLOW

Soil infiltration rate*, f = 9.11E-05 m/sec
 effeptive storage depth, a(50) = H x .5 = 0.5 m (ring)
 Outflow /sec = 3.142 x Dia x a(50) = 3.58E-04 m3/sec (ring)
 effeptive storage depth, a(50) = H x .5 = 0.6 m (pit)
 Outflow /sec = 2(L + W) x a(50) x f = 5.46E-04 m3/sec (pit)

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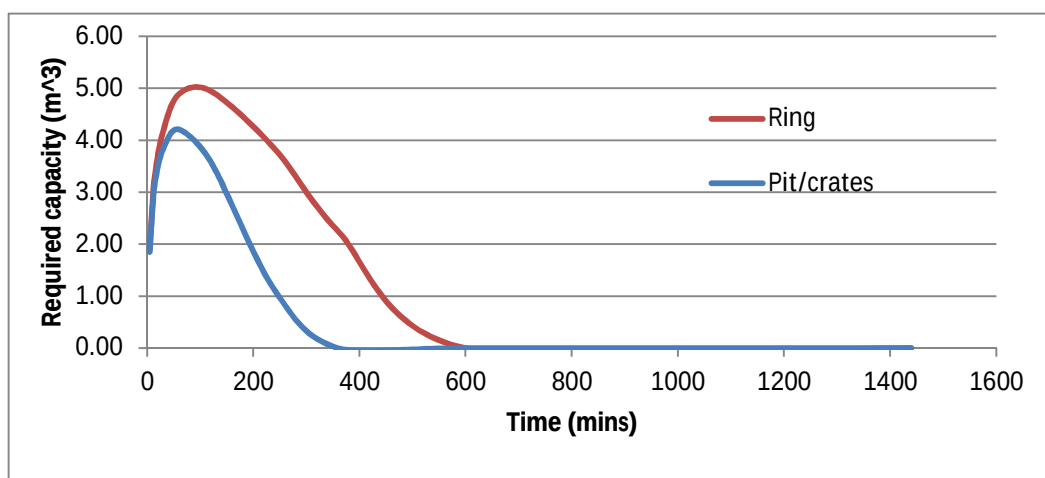
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STORAGE CAPACITY

$$\text{Storage capacity, } S = \text{Inflow} - \text{Outflow}$$

$$= I - O = [A \times (M10-D)] - O$$

Ring soakaway				Pit/crates soakaway	
Duration	Inflow	Outflow	Required	Outflow	Required
(mins)	S(1)	Max	capacity	Max	capacity
	m ³	m ³	m ³	m ³	m ³
5	2.02	0.11	1.91	0.16	1.85
10	2.96	0.21	2.75	0.33	2.64
15	3.68	0.32	3.36	0.49	3.19
30	4.81	0.64	4.16	0.98	3.82
60	6.18	1.29	4.89	1.97	4.21
120	7.52	2.57	4.95	3.93	3.59
240	8.99	5.15	3.84	7.87	1.12
360	9.97	7.72	2.25	11.80	n/a
600	11.21	12.87	n/a	19.67	n/a
1440	13.65	30.90	n/a	47.20	n/a
Max required capacity =			4.95	=	4.21
Max ring capacity =			4.91	Free volume =	7.20
Rubble filled volume =			1.47	Rubble filled volume =	2.38
			FAIL		OK
			FAIL		FAIL



Options

Ring soakaway				Status
Diameter	2.50	m	Unfilled	FAIL
Depth below invert =	1.00	m	Filled	FAIL
Pit or terno				Status
Length =	3.00	m	Unfilled	OK
Width =	2.00	m	Filled	FAIL
Depth below invert =	1.2	m		

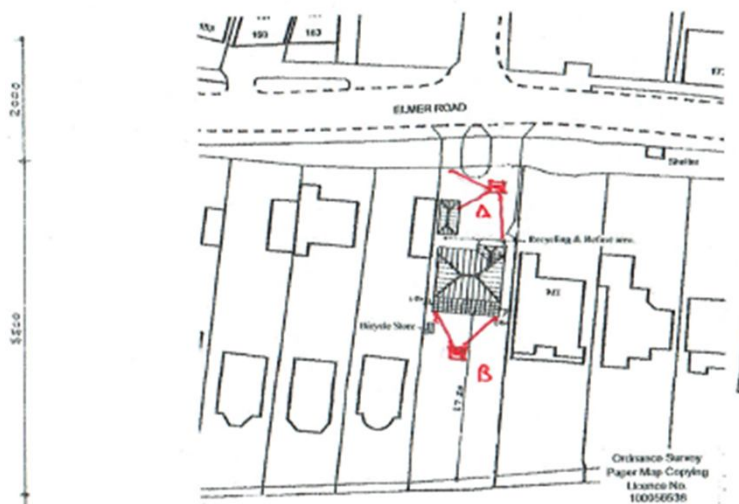
Note: for ring option calculation is conservative as ring is normally placed in square hole with rubble surround providing additional storage capacity.

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Percolation test data supplied

TEST HOLE A VP = 54.91
TEST HOLE B VP = 11.20



Percolation test method for rainwater disposal

1. A hole 300mm square should be excavated to a depth 300mm below the proposed invert level of the incoming pipe. Where deep drains are necessary, the hole should conform to this shape at the bottom, but may be enlarged above the 300mm level to enable safe excavation to be carried out. Where very deep excavations are necessary, you should seek specialist advice.
2. Fill the 300mm square section of the hole to a depth of at least 300mm with water and allow it to seep away overnight.
3. Next day, refill the 300mm square section of the hole with water to a depth of at least 300mm and observe the time, in seconds, for the water to seep away from 75% full to 25% full level (that is a depth of 150mm). Divide this time by 150mm. The answer gives the average time in seconds (Vp) required for the water to drop 1mm. For example 60mins divided by 150mm = 24 seconds (Vp = 24 seconds)
4. The test should preferably be carried out at least three times with at least two trial holes. The average figure from the tests should be taken. The test should not be carried out during abnormal weather conditions such as heavy rain, severe frost or drought.

Where the test is carried out as described above, the soil infiltration rate (f) is related to the value (Vp) derived from the test by the equation:

Formula to calculate the soil infiltration rate

$$f = \frac{10^{-3}}{2V_p}$$

Infiltration rates

Test hole A

Vp = 54.91 sec
Infiltration rate, f = 9.11E-05 mm/sec

Test hole B

Vp = 11.20 sec
Infiltration rate, f = 0.000446 m/sec

Use lowest value in calculation from Test hole A

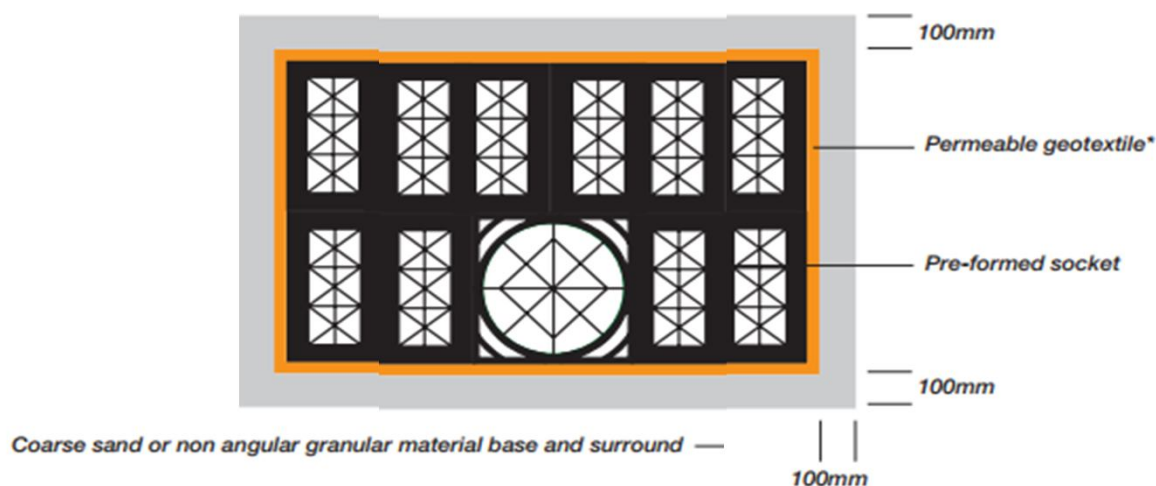
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Typical installation procedure for AquaCell Eco (or similar) crated

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile* over the base and up the sides of the trench.
4. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below). For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
5. Fix the Adaptors to the AquaCell units as required and connect pipework.
6. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework.
7. Wrap and overlap the geotextile covering the entire AquaCell structure.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
10. Backfill with suitable material.
11. Rainwater from roof areas may discharge directly into the soakaway but rainwater from carpark must discharge through a catchpit manhole and/or a petrol interceptor.

Crates installed in three layers



SUMMARY:

The design indicates a single soakaway located in the rear garden would be sufficient to cater for run-off from the house and garage.

A typical arrangement using 30 AquaCell or similar crates of 1 x 0.5 x 0.4 (high) installed in the rear garden in accordance with manufacturers recommendations.

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