

Plot 1

Proposed Development at The Pines, Ellesmere Lane, Penley Soakaway Design.

Percolation Test - design based on guidance in BS 6297:2007 +A1:2008

3no. Trial holes undertaken as part of percolation test - see separate calculation sheet and layout plan.

Trial holes dimensions at a depth 1000mm below ground level - 300 x 300 filled with water to 300mm depth.

The following percolation value (Vp) has been based upon the highest value of the 3 trial holes.

$$V_p = \text{Percolation rate} \quad V_p = \boxed{4.2} \text{ s/mm}$$

Soil infiltration rate f has been derived using guidance given in Part H Building Regs 2002 (inc 2010 amendments), where

$$f = \frac{0.001}{3 \times V_p} \quad f = 7.93 \times 10^{-5} \quad \text{or} \quad \boxed{7.93\text{E-}05}$$

Design based on guidance given in BRE Digest 365

Calculating Design Rainfall

from BRE Digest 365, Figure1 $R = 0.30$ M5-60 min rainfall = 17mm (from The Wallingford Procedure Vol 4).

1 in 100 year return +30%cc

Storm duration	Z1	M5-D mins (17mm x Z1)	Growth Factor Z2	M100-D mins (M5-D min x Z2)	+30% cc
mins		mm		mm	mm
10	0.49	8	1.86	15.49	20.1
15	0.59	10	1.91	19.2	24.9
30	0.77	13	1.96	25.7	33.4
60	1.00	17	2.01	34.2	44.4
120	1.25	21	2.03	43.1	56.1
240	1.57	27	1.99	53.1	69.0
360	1.78	30	1.97	59.6	77.5
600	2.12	36	1.92	69.2	90.0
1440	2.84	48	1.85	89.3	116.1

Catchment Area

Plot1 roof and car parking area = 203.94 m²

Inflow to soakaway (I)

$$I = A \times R$$

where,

A = impermeable surface area

R = M100-D mins rainfall for various durations

Storm duration	R	A	I (RxA/1000)
mins	mm	m2	m3
10	20.1	203.94	4.108
15	24.9	203.94	5.079
30	33.4	203.94	6.802
60	44.4	203.94	9.059
120	56.1	203.94	11.437
240	69.0	203.94	14.081
360	77.5	203.94	15.805
600	90.0	203.94	18.346
1440	116.1	203.94	23.680

Plot 1

Outflow from soakaway (O)

$$O = as_{50} \times f \times D$$

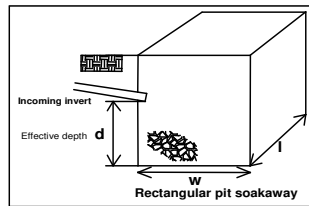
O = internal surface area of soakaway trench to 50% storage depth
(excludes base area) x soil percolation rate x storm duration

Proposed modular block soakaway dimensions are 5.6m long x 2.4m wide x 0.66m effective depth.

$$\begin{aligned} as_{50} &= (2 \times 5.6 \times 0.66 \times 0.5) + (2 \times 2.4 \times 0.66 \times 0.5) \\ &= (3.7) + (1.58) \\ &= 5.28 \end{aligned}$$

$$f = 7.93E-05$$

$$O = 5.28 \times 0.0000793 \times (D \times 60) \text{ m}^3$$



Proposed soakaway storage volume (S)

= effective volume of modular block soakaway with 95% free volume

$$S = 8.427 \quad (5.6 \times 2.4 \times 0.66 \times 95\% \text{ voids ratio})$$

Consider satisfactory storage of M100 (+30% cc) - (D x 60) run-off against constructed storage volume S.

$$I - O = S$$

$$I - [5.28 \times 0.0000793 \times (D \times 60)] = S$$

Storm duration mins	I	O	S (minimum req'd storage) m ³	
10	4.108	0.251	3.857	ok
15	5.079	0.377	4.702	ok
30	6.802	0.754	6.048	ok
60	9.059	1.507	7.552	ok
120	11.437	3.015	8.422	ok critical duration
240	14.081	6.029	8.052	ok
360	15.805	9.044	6.760	ok
600	18.346	15.073	3.272	ok
1440	23.680	36.176	-12.496	ok

Emptying time for half storage (ts50), for proposed soakaway.

$$ts_{50} = \frac{S \times 0.5}{as_{50} \times f} = \frac{8.427 \times 0.5}{5.28 \times 0.0000793}$$

$$ts_{50} = 10063 \text{ seconds}$$

$$ts_{50} = 2.79 \text{ hours}$$

This is less than 24hours & therefore acceptable.

Conclusion

The above calculation demonstrates that for Plot 1 a 5.6m long x 2.4m wide x 0.66m (effective depth) sized modular block type soakaway satisfies the requirements of Wrexham CBC drainage standards and is adequate to drain the surface water run-off from the roof and car parking areas.