

## 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<br>(17mm x Z1) | Growth Factor<br>Z2 | M100-D mins<br>(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

**Plots 4 & 5** roof area and gable end car parking = 155.47 m<sup>2</sup>

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<br>(RxA/1000) |
|----------------|-------|----------------|-----------------|
| mins           | mm    | m <sup>2</sup> | m <sup>3</sup>  |
| 10             | 20.1  | 155.47         | 3.131           |
| 15             | 24.9  | 155.47         | 3.872           |
| 30             | 33.4  | 155.47         | 5.185           |
| 60             | 44.4  | 155.47         | 6.906           |
| 120            | 56.1  | 155.47         | 8.719           |
| 240            | 69.0  | 155.47         | 10.735          |
| 360            | 77.5  | 155.47         | 12.048          |
| 600            | 90.0  | 155.47         | 13.985          |
| 1440           | 116.1 | 155.47         | 18.052          |

## Plots 4 & 5

Outflow from soakaway (O)

$$O = as50 \times f \times D$$

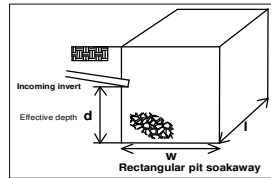
O = internal surface area of soakaway trench to 50% storage depth  
(excludes base area) x soil percolation rate x storm duration

Proposed modular block soakaway dimensions are 4.0m long x 2.4m wide x 0.66m effective depth.

$$\begin{aligned} as50 &= (2 \times 4.0 \times 0.66 \times 0.5) + (2 \times 2.4 \times 0.66 \times 0.5) \\ &= (2.64) + (1.58) \\ &= 4.22 \end{aligned}$$

$$f = 7.93E-05$$

$$O = 4.22 \times 0.0000793 \times (D \times 60) \text{ m}^3$$



Proposed soakaway storage volume (S)

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

$$S = 6.019 \quad (4.0 \times 2.4 \times 0.66 \times 95\% \text{ voids ratio})$$

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

$$I - O = S$$

$$I - [4.22 \times 0.0000793 \times (D \times 60)] = S$$

| Storm duration<br>mins | I      | O      | S<br>(minimum req'd storage)<br>m <sup>3</sup> |     |
|------------------------|--------|--------|------------------------------------------------|-----|
| 10                     | 3.131  | 0.201  | 2.931                                          | ok  |
| 15                     | 3.872  | 0.301  | 3.571                                          | ok  |
| 30                     | 5.185  | 0.602  | 4.583                                          | ok  |
| 60                     | 6.906  | 1.205  | 5.701                                          | ok  |
| 120                    | 8.719  | 2.409  | 6.309                                          | *ok |
| 240                    | 10.735 | 4.819  | 5.916                                          | ok  |
| 360                    | 12.048 | 7.228  | 4.820                                          | ok  |
| 600                    | 13.985 | 12.047 | 1.938                                          | ok  |
| 1440                   | 18.052 | 28.913 | -10.861                                        | ok  |

critical duration

\* Volume storage shortfall of 0.29m<sup>3</sup> can be safely accommodated within connecting pipework and inspection chamber arrangement for a 'critical duration' event.

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

$$ts50 = \frac{S \times 0.5}{as50 \times f} = \frac{6.019 \times 0.5}{4.22 \times 0.0000793}$$

$$ts50 = \frac{8993 \text{ seconds}}{2.49 \text{ hours}}$$

This is less than 24hours & therefore acceptable.

### Conclusion

The above calculation demonstrates that for Plots 4 & 5 a 4.0m 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 gable end car parking areas.