

#56 Southdean Drive, Middleton-on-Sea, PO22 7TB -- Planning Reference M/59/20/HH

**The Design Parameters for the Proposed Geocellular Structure Soakaway Installation S/A#1, located in the front garden, are as follows :-**

The Soil Infiltration Rate for the Sides is 1.148E-5 metres / second and the Soil Infiltration Rate for the Base is 1.148E-5 metres / second.

The Installation consists of a GeoCellular Structure of 9.50 metres Long by 4.00 metres Wide and 0.40 metres in Depth.

With a Cover Depth of 0.55 metres.

Percentage Void Space of 95%.

Impermeable Area specified as 198 square metres.

Using a Safety Factor of 3.0 for the Volumetric Runoff Coefficient  $C_v=1.0$

The Design adopts a Factored Soil Infiltration Rate for the Sides of 3.827E-6 metres / second.

And a Factored Soil Infiltration Rate for the Base of 3.827E-6 metres / second.

Both the Side Areas and the Base Area are Included in the Calculations.

The Rainfall Ratio for the Location is  $r=0.36$

Rainfall Base Rate M5-60min the 5 Year Return Period Rainfall of 60 minutes Duration is 19.0mm.

Lowest Incoming Pipe Invert Height is 300mm above the Installation Base.

All Levels are referenced to 'Above Ordinance Datum' (AOD)

The Highest Recorded Groundwater at the Location of the Proposed Soakaway is 4.998 metres at a depth of 0.952 metres Below Ground Level (BGL)

The Ground Level at the Location of the Proposed Soakaway is 5.950 metres.

The Soffit Level of the Proposed Soakaway is 5.400 metres.

The Invert Level of the Lowest Incoming Pipe on the Proposed Soakaway is 5.300 metres

The Base Level of the Proposed Soakaway is 5.000 metres

The Base of the Soakaway Structure is 0.002 metres above the Highest Recorded Groundwater at the location of the Soakaway. This meets Building Regulations.

**The Design Summary for the Proposed Geocellular Structure Soakaway Installation S/A#1 is as follows :-**

For a 10 Year Return Storm Includes a 40% Increase for Climate Change.

The Design requires storage of 7.34 cubic metres out of 10.83 cubic metres available.

Therefore Storage is Passed with a Critical Storm occurring at 5 hours.

And the Half Drain Time is OK within the Allowable 24 hours Period at 6.54 hours.

For a 100 Year Return Storm Includes a 40% Increase for Climate Change.

The Design requires storage of 13.74 cubic metres out of 14.44 cubic metres available.

Therefore Storage is Passed with a Critical Storm occurring at 6 hours.

And the Half Drain Time is OK within the Allowable 24 hours Period at 11.56 hours.

**10 Year Return Storm Includes a 40% Increase for Climate Change.**

| Storm      | Factor | M5 Return | Factor | M10 Return | Inflow    | Outflow   | Internal    | Required | Soakaway |
|------------|--------|-----------|--------|------------|-----------|-----------|-------------|----------|----------|
| Duration   | Z1-5   | Rainfall  | Z2-10  | Rainfall   | Cu Metres | Cu Metres | Water Level | Storage  | Status   |
| 5 minutes  | 0.360  | 6.80      | 1.190  | 11.40      | 2.256     | 0.048     | 61          | 2.208    | -OK-     |
| 10 minutes | 0.510  | 9.70      | 1.220  | 16.60      | 3.277     | 0.097     | 88          | 3.180    | -OK-     |
| 15 minutes | 0.620  | 11.80     | 1.220  | 20.10      | 3.984     | 0.145     | 106         | 3.839    | -OK-     |
| 30 minutes | 0.790  | 15.00     | 1.240  | 26.10      | 5.159     | 0.290     | 135         | 4.870    | -OK-     |
| 1 hour     | 1.000  | 19.00     | 1.250  | 33.20      | 6.584     | 0.579     | 166         | 6.004    | -OK-     |
| 2 hours    | 1.216  | 23.10     | 1.240  | 40.10      | 7.941     | 1.159     | 188         | 6.783    | -OK-     |
| 3 hours    | 1.364  | 25.90     | 1.240  | 45.00      | 8.908     | 1.738     | 199         | 7.170    | -OK-     |
| 4 hours    | 1.495  | 28.40     | 1.220  | 48.50      | 9.606     | 2.317     | 202         | 7.289    | -OK-     |
| 5 hours    | 1.593  | 30.30     | 1.220  | 51.70      | 10.236    | 2.896     | 203         | 7.339    | -OK-     |
| 6 hours    | 1.670  | 31.70     | 1.220  | 54.20      | 10.731    | 3.476     | 201         | 7.255    | -OK-     |
| 7 hours    | 1.745  | 33.20     | 1.203  | 55.80      | 11.056    | 4.055     | 194         | 7.001    | -OK-     |
| 8 hours    | 1.805  | 34.30     | 1.203  | 57.80      | 11.436    | 4.634     | 188         | 6.802    | -OK-     |
| 9 hours    | 1.863  | 35.40     | 1.203  | 59.60      | 11.804    | 5.214     | 183         | 6.590    | -OK-     |
| 10 hours   | 1.915  | 36.40     | 1.203  | 61.30      | 12.133    | 5.793     | 176         | 6.341    | -OK-     |
| 11 hours   | 1.960  | 37.20     | 1.203  | 62.70      | 12.418    | 6.372     | 167         | 6.046    | -OK-     |
| 12 hours   | 2.005  | 38.10     | 1.190  | 63.50      | 12.566    | 6.951     | 156         | 5.615    | -OK-     |
| 14 hours   | 2.085  | 39.60     | 1.190  | 66.00      | 13.068    | 8.110     | 137         | 4.958    | -OK-     |
| 16 hours   | 2.155  | 40.90     | 1.190  | 68.20      | 13.506    | 9.268     | 117         | 4.238    | -OK-     |
| 18 hours   | 2.225  | 42.30     | 1.190  | 70.40      | 13.945    | 10.427    | 97          | 3.518    | -OK-     |
| 20 hours   | 2.295  | 43.60     | 1.180  | 72.00      | 14.263    | 11.586    | 74          | 2.677    | -OK-     |
| 22 hours   | 2.360  | 44.80     | 1.180  | 74.10      | 14.667    | 12.744    | 53          | 1.923    | -OK-     |
| 24 hours   | 2.430  | 46.20     | 1.180  | 76.30      | 15.102    | 13.903    | 33          | 1.199    | -OK-     |

Effective Volume of the Geocellular Structure Soakaway Installation for an M10 Return Period is 10.83 cubic metres.

Maximum Available (Effective) Outflow Surface Area at M10 Return is 42.05 square metres referenced to the Invert of the lowest incoming pipe.

Maximum Allowable Pre-Flood Water Level for 10 Year Return (Lowest Pipe Invert Level for Building Control) is 300mm.

For a 10 Year Return Period the Critical Storm occurs at 5 hours.

With a Maximum Internal Structure Critical Water Level of 203mm.

Requiring a Maximum (Critical) Storage Capacity of 7.34 cubic metres.

The Outflow Surface Area for the Critical Storm Duration for the M10 Return is 40.74 square metres referenced to the Critical Water Level.

Half Drain Time for a 10 Year Return Critical Storm is 6.54 hours.

**100 Year Return Storm Includes a 40% Increase for Climate Change.**

| Storm      | Factor | M5 Return | Factor | M100 Return | Inflow    | Outflow   | Internal    | Required | Soakaway |
|------------|--------|-----------|--------|-------------|-----------|-----------|-------------|----------|----------|
| Duration   | Z1-5   | Rainfall  | Z2-100 | Rainfall    | Cu Metres | Cu Metres | Water Level | Storage  | Status   |
| 5 minutes  | 0.360  | 6.80      | 1.790  | 17.10       | 3.394     | 0.050     | 93          | 3.344    | -OK-     |
| 10 minutes | 0.510  | 9.70      | 1.910  | 25.90       | 5.130     | 0.100     | 139         | 5.031    | -OK-     |
| 15 minutes | 0.620  | 11.80     | 1.910  | 31.50       | 6.237     | 0.149     | 169         | 6.087    | -OK-     |
| 30 minutes | 0.790  | 15.00     | 1.990  | 41.80       | 8.280     | 0.299     | 221         | 7.981    | -OK-     |
| 1 hour     | 1.000  | 19.00     | 2.030  | 54.00       | 10.692    | 0.598     | 280         | 10.094   | -OK-     |
| 2 hours    | 1.216  | 23.10     | 2.010  | 65.00       | 12.873    | 1.196     | 323         | 11.677   | -OK-     |
| 3 hours    | 1.364  | 25.90     | 2.010  | 72.90       | 14.440    | 1.794     | 350         | 12.646   | -OK-     |
| 4 hours    | 1.495  | 28.40     | 1.970  | 78.30       | 15.512    | 2.392     | 363         | 13.120   | -OK-     |
| 5 hours    | 1.593  | 30.30     | 1.970  | 83.50       | 16.528    | 2.989     | 375         | 13.539   | -OK-     |
| 6 hours    | 1.670  | 31.70     | 1.970  | 87.50       | 17.327    | 3.587     | 381         | 13.740   | -OK-     |
| 7 hours    | 1.745  | 33.20     | 1.930  | 89.60       | 17.738    | 4.185     | 375         | 13.553   | -OK-     |
| 8 hours    | 1.805  | 34.30     | 1.930  | 92.70       | 18.348    | 4.783     | 376         | 13.565   | -OK-     |
| 9 hours    | 1.863  | 35.40     | 1.930  | 95.60       | 18.937    | 5.381     | 376         | 13.556   | -OK-     |
| 10 hours   | 1.915  | 36.40     | 1.930  | 98.30       | 19.466    | 5.979     | 374         | 13.487   | -OK-     |
| 11 hours   | 1.960  | 37.20     | 1.930  | 100.60      | 19.923    | 6.577     | 370         | 13.347   | -OK-     |
| 12 hours   | 2.005  | 38.10     | 1.890  | 100.80      | 19.958    | 7.175     | 354         | 12.784   | -OK-     |
| 14 hours   | 2.085  | 39.60     | 1.890  | 104.80      | 20.755    | 8.370     | 343         | 12.384   | -OK-     |
| 16 hours   | 2.155  | 40.90     | 1.890  | 108.30      | 21.451    | 9.566     | 329         | 11.885   | -OK-     |
| 18 hours   | 2.225  | 42.30     | 1.890  | 111.90      | 22.148    | 10.762    | 315         | 11.386   | -OK-     |
| 20 hours   | 2.295  | 43.60     | 1.855  | 113.20      | 22.422    | 11.958    | 290         | 10.464   | -OK-     |
| 22 hours   | 2.360  | 44.80     | 1.855  | 116.40      | 23.057    | 13.153    | 274         | 9.904    | -OK-     |
| 24 hours   | 2.430  | 46.20     | 1.855  | 119.90      | 23.741    | 14.349    | 260         | 9.392    | -OK-     |

Effective Volume of the Geocellular Structure Soakaway Installation for an M100 Return Period is 14.44 cubic metres.

Maximum Available (Effective) Outflow Surface Area at M100 Return is 43.40 square metres referenced to the top of the GeoCell Installation.

Maximum Allowable Pre-Flood Water Level for 100 Year Return (Soakaway Height) is 400mm.

For a 100 Year Return Period the Critical Storm occurs at 6 hours.

With a Maximum Internal Structure Critical Water Level of 381mm.

Requiring a Maximum (Critical) Storage Capacity of 13.74 cubic metres.

The Outflow Surface Area for the Critical Storm Duration for the M100 Return is 43.14 square metres referenced to the Critical Water Level.

Half Drain Time for a 100 Year Return Critical Storm is 11.56 hours.

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