

ALTERNATIVE SOAKAWAY SIZES

ALTERNATIVE SOAKAWAY SIZES			
trench soakaways			
width of trench [mm]:	450	600	900
required trench length [m]:	6.69	5.37	3.82
ring soakaways			
diameter of ring [mm]:	1050	1350	1500
required pit diameter [m]:	1.51	1.49	1.48

\* Based on effective depth and number of pits as in Soakaway Data table

SUMMARY OF CALCULATIONS

critical design rainfall duration 't <sub>crit</sub> ' =	120	min
required storage volume 'V <sub>req</sub> ' =	3.84	m <sup>3</sup>
provided storage volume 'V <sub>prov</sub> ' =	3.94	m <sup>3</sup>
utilisation factor =	0.98	.OK
required time to discharge 50% 't <sub>50</sub> ' =	2.08	hours
utilisation factor =	0.09	.OK

GENERAL DATA

site location:	England and Wales
soakaway type:	geocellular units
impermeable area drained to soakaway 'A' [m <sup>2</sup> ] =	114
60 min rainfall depth of 5 year return period 'R' [mm] =	15
M5-60 to M5-2d rainfall ratio 'r' =	0.50
allowance for climate change:	40%

SOAKAWAY DATA

soakaway width 'W' [m] =	1.95
soakaway length 'L' [m] =	1.90
total depth from ground level 'D <sub>b</sub> ' [m] =	1.75
depth to drain invert level 'D <sub>d</sub> ' [m] =	0.50
soakaway effective depth 'D <sub>eff</sub> ' [m] =	1.25
free volume in infill aggregate [%] =	85

SOIL INFILTRATION DATA

allowance for infiltration through soakaway base:	30%
available on-site infiltration test results:	
use soakage trial pit table below	
internal surface area of trial pit 'ap50' [m <sup>2</sup> ] =	7.50
storage volume between 75-25% 'V <sub>p</sub> ' [m <sup>3</sup> ] =	1.80
time for water to fall from 75-25% 't <sub>p</sub> ' [min] =	90.30
soil infiltration rate 'f' [m/s] =	4.43E-05

SOAKAGE TRIAL PIT DATA

soakage trial pit width 'W <sub>t</sub> ' [m] =	1.00
soakage trial pit length 'L <sub>t</sub> ' [m] =	2.40
total depth from ground level 'D <sub>tb</sub> ' [m] =	2.50
depth to pipe invert level 'D <sub>tp</sub> ' [m] =	1.00
soakage trial pit effective depth 'D <sub>teff</sub> ' [m] =	1.50
free volume in infill aggregate [%] =	100

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION (?)

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M50-D			M100-D			outflow from soakaway [m <sup>3</sup> ]	required storage [m <sup>3</sup> ]
			Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]		
5	0.39	5.85	1.20	9.79	1.12	1.58	12.90	1.47	1.81	14.83	1.69	0.08	1.61
10	0.54	8.10	1.21	13.71	1.56	1.62	18.32	2.09	1.86	21.14	2.41	0.16	2.25
15	0.65	9.75	1.22	16.63	1.90	1.65	22.46	2.56	1.90	25.99	2.96	0.24	2.73
30	0.82	12.30	1.23	21.17	2.41	1.67	28.81	3.28	1.95	33.52	3.82	0.47	3.35
60	1.00	15.00	1.24	26.04	2.97	1.70	35.70	4.07	1.99	41.79	4.76	0.94	3.82
120	1.19	17.85	1.24	30.99	3.53	1.72	42.91	4.89	2.01	50.30	5.73	1.89	3.84
240	1.38	20.70	1.24	35.94	4.10	1.73	50.09	5.71	2.03	58.75	6.70	3.78	2.92
360	1.51	22.65	1.24	39.32	4.48	1.72	54.69	6.23	2.02	64.04	7.30	5.67	1.63
600	1.68	25.20	1.24	43.72	4.98	1.72	60.65	6.91	2.01	70.86	8.08	9.45	0.00
1440	2.03	30.45	1.22	51.95	5.92	1.70	72.36	8.25	1.97	83.83	9.56	22.67	0.00

\* Z2 is growth factor from M5 rainfalls

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS

water level measurement No:		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Soakage Trial 1	time [min] =	0	11	25	44	80	102	150	190											
	depth to water [m] =	1.00	1.38	1.70	1.60	2.00	2.13	2.40	2.50											
Soakage Trial 2	time [min] =																			
	depth to water [m] =																			
Soakage Trial 3	time [min] =																			
	depth to water [m] =																			

calculations are based on BRE Guidelines (Digest 365)

ALTERNATIVE SOAKAWAY SIZES			
	trench soakaways		
width of trench [mm]:	450	600	900
required trench length [m]:	4.30	3.43	2.43
	ring soakaways		
diameter of ring [mm]:	1050	1350	1500
required pit diameter [m]:	1.38	1.36	1.34

SUMMARY OF CALCULATIONS		
critical design rainfall duration 'tcrit' =	60	min
required storage volume 'Vreq' =	2.39	m3
provided storage volume 'Vprov' =	2.39	m3
utilisation factor =	1.00	.OK
required time to discharge 50% 't50' =	1.69	hours
utilisation factor =	0.07	.OK

\* Based on effective depth and number of pits as in Soakaway Data table

GENERAL DATA	
site location:	England and Wales
soakaway type:	geocellular units
impermeable area drained to soakaway 'A' [m2] =	74
60 min rainfall depth of 5 year return period 'R' [mm] =	15
M5-60 to M5-2d rainfall ratio 'r' =	0.50
allowance for climate change:	40%

SOAKAWAY DATA	
soakaway width 'W' [m] =	1.50
soakaway length 'L' [m] =	1.50
total depth from ground level 'Db' [m] =	1.75
depth to drain invert level 'Dd' [m] =	0.50
soakaway effective depth 'Deff' [m] =	1.25
free volume in infill aggregate [%] =	85

SOIL INFILTRATION DATA	
allowance for infiltration through soakaway base:	30%
available on-site infiltration test results:	
use soakage trial pit table below	
internal surface area of trial pit 'ap50' [m2] =	7.50
storage volume between 75-25% 'Vp' [m3] =	1.80
time for water to fall from 75-25% 'tp' [min] =	90.30
soil infiltration rate 'I' [m/s] =	4.43E-05

SOAKAGE TRIAL PIT DATA	
soakage trial pit width 'Wt' [m] =	1.00
soakage trial pit length 'Lt' [m] =	2.40
total depth from ground level 'Dtb' [m] =	2.50
depth to pipe invert level 'Dtp' [m] =	1.00
soakage trial pit effective depth 'Dteff' [m] =	1.50
free volume in infill aggregate [%] =	100

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION (?)													
rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M50-D			M100-D			outflow from soakaway [m3]	required storage [m3]
			Z2	rainfalls [mm]	inflow [m3]	Z2	rainfalls [mm]	inflow [m3]	Z2	rainfalls [mm]	inflow [m3]		
5	0.39	5.85	1.20	9.79	0.72	1.58	12.90	0.95	1.81	14.83	1.10	0.06	1.04
10	0.54	8.10	1.21	13.71	1.01	1.62	18.32	1.36	1.86	21.14	1.56	0.12	1.45
15	0.65	9.75	1.22	16.63	1.23	1.65	22.46	1.66	1.90	25.99	1.92	0.18	1.75
30	0.82	12.30	1.23	21.17	1.57	1.67	28.81	2.13	1.95	33.52	2.48	0.35	2.13
60	1.00	15.00	1.24	26.04	1.93	1.70	35.70	2.64	1.99	41.79	3.09	0.71	2.39
120	1.19	17.85	1.24	30.99	2.29	1.72	42.91	3.18	2.01	50.30	3.72	1.41	2.31
240	1.38	20.70	1.24	35.94	2.66	1.73	50.09	3.71	2.03	58.75	4.35	2.82	1.52
360	1.51	22.65	1.24	39.32	2.91	1.72	54.69	4.05	2.02	64.04	4.74	4.23	0.50
600	1.68	25.20	1.24	43.72	3.24	1.72	60.65	4.49	2.01	70.86	5.24	7.06	0.00
1440	2.03	30.45	1.22	51.95	3.84	1.70	72.36	5.35	1.97	83.83	6.20	16.94	0.00

\* Z2 is growth factor from M5 rainfalls

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS																			
water level measurement No:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Soakage Trial 1	time [min] =	0	11	25	44	80	102	150	190										
	depth to water [m] =	1.00	1.38	1.70	1.60	2.00	2.13	2.40	2.50										
Soakage Trial 2	time [min] =																		
	depth to water [m] =																		
Soakage Trial 3	time [min] =																		
	depth to water [m] =																		

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Section: Plot 3 - Land Adjacent Corner Cottage

Prepared By:

JK

Date:

10/01/2022

ALTERNATIVE SOAKAWAY SIZES			
	trench soakaways		
width of trench [mm]:	450	600	900
required trench length [m]:	4.30	3.43	2.43
	ring soakaways		
diameter of ring [mm]:	1050	1350	1500
required pit diameter [m]:	1.38	1.36	1.34

SUMMARY OF CALCULATIONS		
critical design rainfall duration 'tcrit' =	60	min
required storage volume 'Vreq' =	2.39	m <sup>3</sup>
provided storage volume 'Vprov' =	2.39	m <sup>3</sup>
utilisation factor =	1.00	.OK
required time to discharge 50% 't50' =	1.69	hours
utilisation factor =	0.07	.OK

\* Based on effective depth and number of pits as in Soakaway Data table

GENERAL DATA	
site location:	England and Wales
soakaway type:	geocellular units
impermeable area drained to soakaway 'A' [m <sup>2</sup> ] =	74
60 min rainfall depth of 5 year return period 'R' [mm] =	15
M5-60 to M5-2d rainfall ratio 'r' =	0.50
allowance for climate change:	40%

SOAKAWAY DATA	
soakaway width 'W' [m] =	1.50
soakaway length 'L' [m] =	1.50
total depth from ground level 'Db' [m] =	1.75
depth to drain invert level 'Dd' [m] =	0.50
soakaway effective depth 'Deff' [m] =	1.25
free volume in infill aggregate [%] =	85

SOIL INFILTRATION DATA	
allowance for infiltration through soakaway base:	30%
available on-site infiltration test results:	
use soakage trial pit table below	
internal surface area of trial pit 'ap50' [m <sup>2</sup> ] =	7.50
storage volume between 75-25% 'Vp' [m <sup>3</sup> ] =	1.80
time for water to fall from 75-25% 'tp' [min] =	90.30
soil infiltration rate 'I' [m/s] =	4.43E-05

SOAKAGE TRIAL PIT DATA	
soakage trial pit width 'Wt' [m] =	1.00
soakage trial pit length 'Lt' [m] =	2.40
total depth from ground level 'Dtb' [m] =	2.50
depth to pipe invert level 'Dtp' [m] =	1.00
soakage trial pit effective depth 'Dteff' [m] =	1.50
free volume in infill aggregate [%] =	100

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION (?)													
rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M50-D			M100-D			outflow from soakaway [m <sup>3</sup> ]	required storage [m <sup>3</sup> ]
			Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]		
5	0.39	5.85	1.20	9.79	0.72	1.58	12.90	0.95	1.81	14.83	1.10	0.06	1.04
10	0.54	8.10	1.21	13.71	1.01	1.62	18.32	1.36	1.86	21.14	1.56	0.12	1.45
15	0.65	9.75	1.22	16.63	1.23	1.65	22.46	1.66	1.90	25.99	1.92	0.18	1.75
30	0.82	12.30	1.23	21.17	1.57	1.67	28.81	2.13	1.95	33.52	2.48	0.35	2.13
60	1.00	15.00	1.24	26.04	1.93	1.70	35.70	2.64	1.99	41.79	3.09	0.71	2.39
120	1.19	17.85	1.24	30.99	2.29	1.72	42.91	3.18	2.01	50.30	3.72	1.41	2.31
240	1.38	20.70	1.24	35.94	2.66	1.73	50.09	3.71	2.03	58.75	4.35	2.82	1.52
360	1.51	22.65	1.24	39.32	2.91	1.72	54.69	4.05	2.02	64.04	4.74	4.23	0.50
600	1.68	25.20	1.24	43.72	3.24	1.72	60.65	4.49	2.01	70.86	5.24	7.06	0.00
1440	2.03	30.45	1.22	51.95	3.84	1.70	72.36	5.35	1.97	83.83	6.20	16.94	0.00

\* Z2 is growth factor from M5 rainfalls

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS																				
water level measurement No:		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Soakage Trial 1	time [min] =	0	11	25	44	80	102	150	190											
	depth to water [m] =	1.00	1.38	1.70	1.60	2.00	2.13	2.40	2.50											
Soakage Trial 2	time [min] =																			
	depth to water [m] =																			
Soakage Trial 3	time [min] =																			
	depth to water [m] =																			

calculations are based on BRE Guidelines (Digest 365)

ALTERNATIVE SOAKAWAY SIZES			
	trench soakaways		
width of trench [mm]:	450	600	900
required trench length [m]:	2.29	1.82	1.26
	ring soakaways		
diameter of ring [mm]:	1050	1350	1500
required pit diameter [m]:	1.17	1.15	1.13

SUMMARY OF CALCULATIONS		
critical design rainfall duration 'tcrit' =	60	min
required storage volume 'Vreq' =	1.20	m <sup>3</sup>
provided storage volume 'Vprov' =	1.29	m <sup>3</sup>
utilisation factor =	0.93	.OK
required time to discharge 50% 't50' =	1.29	hours
utilisation factor =	0.05	.OK

\* Based on effective depth and number of pits as in Soakaway Data table

GENERAL DATA	
site location:	England and Wales
soakaway type:	geocellular units
impermeable area drained to soakaway 'A' [m <sup>2</sup> ] =	40.5
60 min rainfall depth of 5 year return period 'R' [mm] =	15
M5-60 to M5-2d rainfall ratio 'r' =	0.50
allowance for climate change:	40%

SOAKAWAY DATA	
soakaway width 'W' [m] =	1.10
soakaway length 'L' [m] =	1.10
total depth from ground level 'Db' [m] =	1.75
depth to drain invert level 'Dd' [m] =	0.50
soakaway effective depth 'Deff' [m] =	1.25
free volume in infill aggregate [%] =	85

SOIL INFILTRATION DATA	
allowance for infiltration through soakaway base:	30%
available on-site infiltration test results:	
use soakage trial pit table below	
internal surface area of trial pit 'ap50' [m <sup>2</sup> ] =	7.50
storage volume between 75-25% 'Vp' [m <sup>3</sup> ] =	1.80
time for water to fall from 75-25% 'tp' [min] =	90.30
soil infiltration rate 'I' [m/s] =	4.43E-05

SOAKAGE TRIAL PIT DATA	
soakage trial pit width 'Wt' [m] =	1.00
soakage trial pit length 'Lt' [m] =	2.40
total depth from ground level 'Dtb' [m] =	2.50
depth to pipe invert level 'Dtp' [m] =	1.00
soakage trial pit effective depth 'Dteff' [m] =	1.50
free volume in infill aggregate [%] =	100

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION (?)													
rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M50-D			M100-D			outflow from soakaway [m <sup>3</sup> ]	required storage [m <sup>3</sup> ]
			Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]		
5	0.39	5.85	1.20	9.79	0.40	1.58	12.90	0.52	1.81	14.83	0.60	0.04	0.56
10	0.54	8.10	1.21	13.71	0.56	1.62	18.32	0.74	1.86	21.14	0.86	0.08	0.77
15	0.65	9.75	1.22	16.63	0.67	1.65	22.46	0.91	1.90	25.99	1.05	0.12	0.93
30	0.82	12.30	1.23	21.17	0.86	1.67	28.81	1.17	1.95	33.52	1.36	0.25	1.11
60	1.00	15.00	1.24	26.04	1.05	1.70	35.70	1.45	1.99	41.79	1.69	0.50	1.20
120	1.19	17.85	1.24	30.99	1.25	1.72	42.91	1.74	2.01	50.30	2.04	0.99	1.04
240	1.38	20.70	1.24	35.94	1.46	1.73	50.09	2.03	2.03	58.75	2.38	1.99	0.39
360	1.51	22.65	1.24	39.32	1.59	1.72	54.69	2.21	2.02	64.04	2.59	2.98	0.00
600	1.68	25.20	1.24	43.72	1.77	1.72	60.65	2.46	2.01	70.86	2.87	4.96	0.00
1440	2.03	30.45	1.22	51.95	2.10	1.70	72.36	2.93	1.97	83.83	3.40	11.91	0.00

\* Z2 is growth factor from M5 rainfalls

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS																				
water level measurement No:		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Soakage Trial 1	time [min] =	0	11	25	44	80	102	150	190											
	depth to water [m] =	1.00	1.38	1.70	1.60	2.00	2.13	2.40	2.50											
Soakage Trial 2	time [min] =																			
	depth to water [m] =																			
Soakage Trial 3	time [min] =																			
	depth to water [m] =																			

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Prepared By:

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ALTERNATIVE SOAKAWAY SIZES			
	trench soakaways		
width of trench [mm]:	450	600	900
required trench length [m]:	23.79	19.17	13.80
	ring soakaways		
diameter of ring [mm]:	1050	1350	1500
required pit diameter [m]:	2.11	2.10	2.09

SUMMARY OF CALCULATIONS	
critical design rainfall duration 'tcrit' =	120 min
required storage volume 'Vreq' =	15.59 m <sup>3</sup>
provided storage volume 'Vprov' =	15.94 m <sup>3</sup>
utilisation factor =	0.98 .OK
required time to discharge 50% 't50' =	3.52 hours
utilisation factor =	0.15 .OK

\* Based on effective depth and number of pits as in Soakaway Data table

GENERAL DATA	
site location:	England and Wales
soakaway type:	geocellular units
impermeable area drained to soakaway 'A' [m <sup>2</sup> ] =	400
60 min rainfall depth of 5 year return period 'R' [mm] =	15
M5-60 to M5-2d rainfall ratio 'r' =	0.50
allowance for climate change:	40%

SOAKAWAY DATA	
soakaway width 'W' [m] =	3.75
soakaway length 'L' [m] =	4.00
total depth from ground level 'Db' [m] =	1.75
depth to drain invert level 'Dd' [m] =	0.50
soakaway effective depth 'Deff' [m] =	1.25
free volume in infill aggregate [%] =	85

SOIL INFILTRATION DATA	
allowance for infiltration through soakaway base:	30%
available on-site infiltration test results:	
use soakage trial pit table below	
internal surface area of trial pit 'ap50' [m <sup>2</sup> ] =	7.50
storage volume between 75-25% 'Vp' [m <sup>3</sup> ] =	1.80
time for water to fall from 75-25% 'tp' [min] =	90.30
soil infiltration rate 'I' [m/s] =	4.43E-05

SOAKAGE TRIAL PIT DATA	
soakage trial pit width 'Wt' [m] =	1.00
soakage trial pit length 'Lt' [m] =	2.40
total depth from ground level 'Dtb' [m] =	2.50
depth to pipe invert level 'Dtp' [m] =	1.00
soakage trial pit effective depth 'Dteff' [m] =	1.50
free volume in infill aggregate [%] =	100

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION (?)													
rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M50-D			M100-D			outflow from soakaway [m <sup>3</sup> ]	required storage [m <sup>3</sup> ]
			Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]	Z2	rainfalls [mm]	inflow [m <sup>3</sup> ]		
5	0.39	5.85	1.20	9.79	3.92	1.58	12.90	5.16	1.81	14.83	5.93	0.19	5.74
10	0.54	8.10	1.21	13.71	5.48	1.62	18.32	7.33	1.86	21.14	8.46	0.38	8.08
15	0.65	9.75	1.22	16.63	6.65	1.65	22.46	8.98	1.90	25.99	10.40	0.57	9.83
30	0.82	12.30	1.23	21.17	8.47	1.67	28.81	11.52	1.95	33.52	13.41	1.13	12.28
60	1.00	15.00	1.24	26.04	10.42	1.70	35.70	14.28	1.99	41.79	16.72	2.26	14.45
120	1.19	17.85	1.24	30.99	12.40	1.72	42.91	17.16	2.01	50.30	20.12	4.52	15.59
240	1.38	20.70	1.24	35.94	14.37	1.73	50.09	20.04	2.03	58.75	23.50	9.05	14.45
360	1.51	22.65	1.24	39.32	15.73	1.72	54.69	21.88	2.02	64.04	25.61	13.57	12.04
600	1.68	25.20	1.24	43.72	17.49	1.72	60.65	24.26	2.01	70.86	28.34	22.62	5.72
1440	2.03	30.45	1.22	51.95	20.78	1.70	72.36	28.94	1.97	83.83	33.53	54.30	0.00

\* Z2 is growth factor from M5 rainfalls

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS																			
water level measurement No:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Soakage Trial 1	time [min] =	0	11	25	44	80	102	150	190										
	depth to water [m] =	1.00	1.38	1.70	1.60	2.00	2.13	2.40	2.50										
Soakage Trial 2	time [min] =																		
	depth to water [m] =																		
Soakage Trial 3	time [min] =																		
	depth to water [m] =																		

calculations are based on BRE Guidelines (Digest 365)