



Blue Roof Calculation Summary

Project Name: Echo Street
Location: Manchester

Client:
Completed By: N.Todd

Reference: BR-5111-06
Date: 14/03/2024

Roof ID:	Catchment Area (m ²)	Area of Blue Roof Storage (m ²)	Area of other roofs draining onto Blue Roof (m ²)	Max allowable depth of water (mm)	Hmax (mm)	Allowable discharge (l/s)	Achievable discharge (l/s)	Minimum number of outlets	Exceedance Overflow Discharge (l/s)	Minimum Weir Sizing (length, mm)
Block A	533	385	148	100	99		1.49	3	9.59	140
Link A-B (level 11)	67	60	7	100	96		0.10	1	1.85	27
Link A-B (level 12)	110	98	12	100	98		0.15	1	1.98	29
Block B	558	398	160	100	100		1.60	3	10.04	147
Link B-C (Level 15)	67	60	7	100	96		0.10	1	1.85	27
Link B-C (Level 16)	110	98	12	100	98		0.15	1	1.98	29
Block C	548	377	171	100	99		1.83	3	9.86	144
Over Level 0	90	84	6	100	99		0.10	1	3.17	46
Over Level -01	151	93	58		146		0.19	1	3.84	56
TOTAL discharge						0.00	5.71			

Notes:

Areas of Blue Roof Storage taken from Data Capture Form completed by A.Rubinstein & D.Burrows.

Blue Roof Calculations based on FEH data with a 45% percentage increase for Climate Change.

Radmat Blue Roof outlet restrictors incorporate an integral overflow unless otherwise specified. Radmat recommend that at least one additional 'tell-tale' overflow is installed to alert building users of maintenance issues.

Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Block A

Roof Details:

BlueRoof	385 m ²	x 100 %
Additional Area	148 m ²	x 100 %
Effective Area	533 m ²	

Storage Details:

Length	385 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity mm	Intensity mm/h	Required storage(m ³)
5 min	20.9	250.6	11.0
10 min	30.6	183.7	16.0
15 min	38.3	153.2	19.8
30 min	51.1	102.3	25.9
45 min	59.2	78.9	29.4
60 min	65.2	65.2	31.7
2 hours	78.2	39.1	35.2
6 hours	101.8	17.0	36.2
24 hours	134.9	5.6	27.7

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	27 mm
Sump Depth	None
Discharge rate	1.49 l/s
Outlet	3 No
Flow Per Outlet	0.5 l/s

Result:

Outcome	Pass
Critical Storm Duration	4.47 hrs
Hmax	99 mm
Required Volume	36.4 m ³
Time to half empty	3.4 hrs
Roof Loading	94.55 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Link A-B (Level 11)

Roof Details:

BlueRoof	60 m ²	x 100 %
Additional Area	7 m ²	x 100 %
Effective Area	67 m ²	

Storage Details:

Length	60 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity		Required storage(m ³)
	mm	mm/h	
5 min	20.9	250.6	1.4
10 min	30.6	183.7	2.0
15 min	38.3	153.2	2.5
30 min	51.1	102.3	3.3
45 min	59.2	78.9	3.8
60 min	65.2	65.2	4.2
2 hours	78.2	39.1	4.8
6 hours	101.8	17.0	5.5
24 hours	134.9	5.6	5.0

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Sump Depth	None
Discharge rate	0.1 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	6.22 hrs
Hmax	96 mm
Required Volume	5.5 m ³
Time to half empty	7.9 hrs
Roof Loading	91.67 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Link A-B (Level 12)

Roof Details:

BlueRoof	98 m ²	x 100 %
Additional Area	12 m ²	x 100 %
Effective Area	110 m ²	

Storage Details:

Length	98 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity		Required storage(m ³)
	mm	mm/h	
5 min	20.9	250.6	2.3
10 min	30.6	183.7	3.3
15 min	38.3	153.2	4.2
30 min	51.1	102.3	5.5
45 min	59.2	78.9	6.3
60 min	65.2	65.2	6.9
2 hours	78.2	39.1	8.0
6 hours	101.8	17.0	9.1
24 hours	134.9	5.6	8.5

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	15 mm
Sump Depth	None
Discharge rate	0.15 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	6.58 hrs
Hmax	98 mm
Required Volume	9.1 m ³
Time to half empty	8.3 hrs
Roof Loading	92.86 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Block B

Roof Details:

BlueRoof	398 m ²	x 100 %
Additional Area	160 m ²	x 100 %
Effective Area	558 m ²	

Storage Details:

Length	398 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity mm	Intensity mm/h	Required storage(m ³)
5 min	20.9	250.6	11.5
10 min	30.6	183.7	16.7
15 min	38.3	153.2	20.8
30 min	51.1	102.3	27.1
45 min	59.2	78.9	30.7
60 min	65.2	65.2	33.1
2 hours	78.2	39.1	36.6
6 hours	101.8	17.0	37.6
24 hours	134.9	5.6	28.5

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	28 mm
Sump Depth	None
Discharge rate	1.6 l/s
Outlet	3 No
Flow Per Outlet	0.53 l/s

Result:

Outcome	Pass
Critical Storm Duration	4.3 hrs
Hmax	100 mm
Required Volume	37.8 m ³
Time to half empty	3.3 hrs
Roof Loading	94.97 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Link B-C (Level 15)

Roof Details:

BlueRoof	60 m ²	x 100 %
Additional Area	7 m ²	x 100 %
Effective Area	67 m ²	

Storage Details:

Length	60 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity		Required storage(m ³)
	mm	mm/h	
5 min	20.9	250.6	1.4
10 min	30.6	183.7	2.0
15 min	38.3	153.2	2.5
30 min	51.1	102.3	3.3
45 min	59.2	78.9	3.8
60 min	65.2	65.2	4.2
2 hours	78.2	39.1	4.8
6 hours	101.8	17.0	5.5
24 hours	134.9	5.6	5.0

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Sump Depth	None
Discharge rate	0.1 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	6.22 hrs
Hmax	96 mm
Required Volume	5.5 m ³
Time to half empty	7.9 hrs
Roof Loading	91.67 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Link B-C (Level 16)

Roof Details:

BlueRoof	98 m ²	x 100 %
Additional Area	12 m ²	x 100 %
Effective Area	110 m ²	

Storage Details:

Length	98 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity		Required storage(m ³)
	mm	mm/h	
5 min	20.9	250.6	2.3
10 min	30.6	183.7	3.3
15 min	38.3	153.2	4.2
30 min	51.1	102.3	5.5
45 min	59.2	78.9	6.3
60 min	65.2	65.2	6.9
2 hours	78.2	39.1	8.0
6 hours	101.8	17.0	9.1
24 hours	134.9	5.6	8.5

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	15 mm
Sump Depth	None
Discharge rate	0.15 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	6.58 hrs
Hmax	98 mm
Required Volume	9.1 m ³
Time to half empty	8.3 hrs
Roof Loading	92.86 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Block C

Roof Details:

BlueRoof	377 m ²	x 100 %
Additional Area	171 m ²	x 100 %
Effective Area	548 m ²	

Storage Details:

Length	377 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity mm	Intensity mm/h	Required storage(m ³)
5 min	20.9	250.6	11.3
10 min	30.6	183.7	16.4
15 min	38.3	153.2	20.3
30 min	51.1	102.3	26.3
45 min	59.2	78.9	29.7
60 min	65.2	65.2	31.9
2 hours	78.2	39.1	34.7
6 hours	101.8	17.0	35.1
24 hours	134.9	5.6	24.9

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	30 mm
Sump Depth	None
Discharge rate	1.83 l/s
Outlet	3 No
Flow Per Outlet	0.61 l/s

Result:

Outcome	Pass
Critical Storm Duration	4 hrs
Hmax	99 mm
Required Volume	35.5 m ³
Time to half empty	2.7 hrs
Roof Loading	94.16 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06 Designer: N.Todd Date: 14/03/2024

Location: Manchester

Roof Location: Over Level 0

Roof Details:

BlueRoof	84 m ²	x 100 %
Additional Area	6 m ²	x 100 %
Effective Area	90 m ²	

Storage Details:

Length	84 m
Width	1 m
Depth	100 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity		Required storage(m ³)
	mm	mm/h	
5 min	20.9	250.6	1.9
10 min	30.6	183.7	2.7
15 min	38.3	153.2	3.4
30 min	51.1	102.3	4.5
45 min	59.2	78.9	5.2
60 min	65.2	65.2	5.7
2 hours	78.2	39.1	6.6
6 hours	101.8	17.0	7.8
24 hours	134.9	5.6	7.6

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Sump Depth	None
Discharge rate	0.1 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	8.87 hrs
Hmax	99 mm
Required Volume	7.9 m ³
Time to half empty	11.3 hrs
Roof Loading	94.05 Kg/m ²

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Client:

Project: Echo Street

Reference: BR-5111-06

Designer: N.Todd

Date: 14/03/2024

Location: Manchester

Roof Location: Over Level -01

Roof Details:

BlueRoof	93 m ²	x 100 %
Additional Area	58 m ²	x 100 %
Effective Area	151 m ²	

Storage Details:

Length	93 m
Width	1 m
Depth	150 mm
Porosity	95 %
Slope	none

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	45 %

Summer Storm Profile

Duration	Intensity		Required storage(m ³)
	mm	mm/h	
5 min	20.9	250.6	3.1
10 min	30.6	183.7	4.6
15 min	38.3	153.2	5.7
30 min	51.1	102.3	7.6
45 min	59.2	78.9	8.7
60 min	65.2	65.2	9.5
2 hours	78.2	39.1	11.0
6 hours	101.8	17.0	12.8
24 hours	134.9	5.6	12.2

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	15 mm
Sump Depth	None
Discharge rate	0.19 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	7.55 hrs
Hmax	146 mm
Required Volume	12.9 m ³
Time to half empty	9.7 hrs
Roof Loading	138.71 Kg/m ²

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