


Ironside Farrar Ltd		Page 1
3 Worsley Court Walkden Manchester M28 3NJ	Berry Hill Road Adderbury SW Network 2	
Date 09/10/2019 File Berry Hill Network 2 191...	Designed by srg Checked by	
Micro Drainage	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	10
Ratio R	0.413	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits



Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.340	4-8	0.059

Total Area Contributing (ha) = 0.399


Total Pipe Volume (m³) = 75.379

Network Design Table for Storm






PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section	Type	Auto Design
1.000	37.385	0.900	41.5	0.142	4.00	0.0	0.600		o	225	Pipe/Conduit		
2.000	21.340	0.350	61.0	0.064	4.00	0.0	0.600		o	225	Pipe/Conduit		

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.31	106.050	0.142	0.0	0.0	1.9	2.04	80.9	21.2
2.000	50.00	4.21	105.500	0.064	0.0	0.0	0.9	1.68	66.7	9.5

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.001	21.473	0.650	33.0	0.044	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.002	30.650	0.700	43.8	0.055	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.003	13.850	0.529	26.2	0.068	0.00	0.0	0.600		o	300	Pipe/Conduit	
3.000	46.970	0.750	62.6	0.026	4.00	0.0		0.025	\/	-1	Pipe/Conduit	
3.001	4.350	0.129	33.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.004	8.070	0.054	149.4	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.001	50.00	4.44	105.075	0.250	0.0	0.0	3.4	2.74	194.0	37.2
1.002	50.00	4.65	104.425	0.305	0.0	0.0	4.1	2.38	168.4	45.4
1.003	50.00	4.73	103.725	0.373	0.0	0.0	5.1	3.09	218.1	55.6
3.000	50.00	4.33	104.150	0.026	0.0	0.0	0.4	2.40	3459.2	3.9
3.001	50.00	4.36	103.400	0.026	0.0	0.0	0.4	2.26	89.9	3.9
1.004	50.00	4.83	103.196	0.399	0.0	0.0	5.4	1.28	90.8	59.4

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	107.500	1.450	Junction		1.000	106.050	225				
4	106.900	1.400	Open Manhole	1200	2.000	105.500	225				
6	106.600	1.525	Open Manhole	1200	1.001	105.075	300	1.000	105.150	225	
								2.000	105.150	225	
7	105.900	1.475	Open Manhole	1200	1.002	104.425	300	1.001	104.425	300	
5	105.000	1.275	Open Manhole	1200	1.003	103.725	300	1.002	103.725	300	
8	104.750	0.600	Junction		3.000	104.150	-1				
9	104.000	0.600	Junction		3.001	103.400	225	3.000	103.400	-1	
12	104.000	0.804	Open Manhole	1200	1.004	103.196	300	1.003	103.196	300	
								3.001	103.271	225	
Basin	104.000	0.858	Open Manhole	0		OUTFALL		1.004	103.142	300	

No coordinates have been specified, layout information cannot be produced.


Simulation Criteria for Storm

Volumetric Runoff Coeff 0.750 Additional Flow - % of Total Flow 10.000
Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Inlet Coefficient 0.800
Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000
Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60
Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Profile Type Summer
Return Period (years) 2 Cv (Summer) 0.750
Region England and Wales Cv (Winter) 0.840
M5-60 (mm) 20.000 Storm Duration (mins) 30
Ratio R 0.413

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		


Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 446944 234772 SP 46944 34772
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840
Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON


Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1 15	Winter	2	+0%					106.141
2.000	4 15	Winter	2	+0%	100/15	Summer			105.569
1.001	6 15	Winter	2	+0%	100/15	Summer			105.183
1.002	7 15	Winter	2	+0%	100/15	Summer			104.551
1.003	5 15	Winter	2	+0%	30/15	Summer			103.852
3.000	8 15	Winter	2	+0%					104.160
3.001	9 15	Winter	2	+0%	30/15	Summer			103.513
1.004	12 15	Winter	2	+0%	2/15	Summer			103.510

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded			Pipe Flow (l/s)	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Overflow Cap. (l/s)		
1.000	1	-0.134	0.000	0.35	28.1	OK*
2.000	4	-0.156	0.000	0.21	12.7	OK
1.001	6	-0.192	0.000	0.28	47.7	OK
1.002	7	-0.174	0.000	0.37	56.2	OK
1.003	5	-0.173	0.000	0.37	66.3	OK
3.000	8	-0.590	0.000	0.00	5.1	OK
3.001	9	-0.112	0.000	0.12	6.1	OK*
1.004	12	0.014	0.000	1.16	71.1	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 446944 234772 SP 46944 34772
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON


Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%					106.197
2.000	4	15 Winter	30	+0%	100/15 Summer				105.606
1.001	6	15 Summer	30	+0%	100/15 Summer				105.249
1.002	7	15 Winter	30	+0%	100/15 Summer				104.646
1.003	5	15 Winter	30	+0%	30/15 Summer				104.150
3.000	8	15 Winter	30	+0%					104.172
3.001	9	15 Winter	30	+0%	30/15 Summer				103.761
1.004	12	15 Winter	30	+0%	2/15 Summer				103.761

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
1.000	1	-0.078	0.000	0.76		61.3	OK*	
2.000	4	-0.119	0.000	0.46		27.6	OK	
1.001	6	-0.126	0.000	0.63		107.8	OK	
1.002	7	-0.079	0.000	0.86		131.3	OK	
1.003	5	0.125	0.000	0.86		154.7	SURCHARGED	
3.000	8	-0.578	0.000	0.00		11.2	OK	
3.001	9	0.136	0.000	0.67		34.0	FLOOD RISK*	
1.004	12	0.265	0.000	2.34		143.6	FLOOD RISK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 446944 234772 SP 46944 34772
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1 30	Winter	100	+40%					106.275
2.000	4 15	Winter	100	+40%	100/15	Summer			106.428
1.001	6 15	Winter	100	+40%	100/15	Summer			106.288
1.002	7 15	Winter	100	+40%	100/15	Summer			105.788
1.003	5 15	Winter	100	+40%	30/15	Summer			104.793
3.000	8 15	Winter	100	+40%					104.189
3.001	9 15	Winter	100	+40%	30/15	Summer			103.983
1.004	12 15	Winter	100	+40%	2/15	Summer			103.991

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
1.000	1	0.000	0.000	0.96		78.1	SURCHARGED*	
2.000	4	0.703	0.000	0.68		41.5	SURCHARGED	
1.001	6	0.913	0.000	0.88		150.2	SURCHARGED	
1.002	7	1.063	0.000	1.18		181.4	FLOOD RISK	
1.003	5	0.768	0.000	1.22		219.7	FLOOD RISK	
3.000	8	-0.561	0.000	0.01		20.2	OK	
3.001	9	0.358	0.000	1.14		57.6	FLOOD RISK*	
1.004	12	0.495	0.000	3.06		187.5	FLOOD RISK	