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	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.400	Maximum Backdrop Height (m)	3.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	1000
PIMP (%)	100		

Designed with Level Soffits

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)	HYD SECT	DIA (mm)
1.000	36.041	1.638	22.0	0.186	5.00	0.0	0.600	o	225
2.000	27.395	1.096	25.0	0.116	5.00	0.0	0.600	o	225
1.001	32.624	1.483	22.0	0.022	0.00	0.0	0.600	o	225
1.002	28.388	2.581	11.0	0.000	0.00	0.0	0.600	o	225
1.003	54.558	1.364	40.0	0.215	0.00	0.0	0.600	o	300
3.000	54.667	0.683	80.0	0.200	5.00	0.0	0.600	o	225
4.000	31.986	0.800	40.0	0.152	5.00	0.0	0.600	o	225

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	5.21	121.795	0.186	0.0	0.0	0.0	2.80	111.4	33.6
2.000	50.00	5.17	121.595	0.116	0.0	0.0	0.0	2.63	104.5	20.9
1.001	50.00	5.41	120.157	0.324	0.0	0.0	0.0	2.80	111.4	58.5
1.002	50.00	5.53	118.674	0.324	0.0	0.0	0.0	3.97	157.8	58.5
1.003	50.00	5.89	116.018	0.539	0.0	0.0	0.0	2.49	176.2	97.3
3.000	50.00	5.62	121.935	0.200	0.0	0.0	0.0	1.46	58.2	36.1
4.000	50.00	5.26	121.595	0.152	0.0	0.0	0.0	2.07	82.5	27.4

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)	HYD SECT	DIA (mm)
3.001	65.839	4.252	15.5	0.000	0.00	0.0	0.600	o	225
5.000	25.341	0.317	80.0	0.112	5.00	0.0	0.600	o	225
3.002	25.135	0.084	300.0	0.141	0.00	0.0	0.600	o	375
3.003	21.190	1.060	20.0	0.091	0.00	0.0	0.600	o	375
1.004	41.175	0.137	300.0	0.000	0.00	0.0	0.600	o	525

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)
3.001	50.00	5.95	120.795	0.352	0.0	0.0	0.0	3.34	132.9	63.6
5.000	50.00	5.29	116.785	0.112	0.0	0.0	0.0	1.46	58.2	20.2
3.002	50.00	6.35	116.318	0.605	0.0	0.0	0.0	1.04	115.0	109.2
3.003	50.00	6.44	116.234	0.696	0.0	0.0	0.0	4.07	449.2	125.7
1.004	50.00	6.97	114.429	1.235	0.0	0.0	0.0	1.29	278.8	223.0

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	123.220	1.425	Open Manhole	1050	1.000	121.795	225				
2	123.020	1.425	Open Manhole	1050	2.000	121.595	225				
3	121.720	1.563	Open Manhole	1050	1.001	120.157	225	1.000	120.157	225	
								2.000	120.499	225	342
4	120.450	1.776	Open Manhole	1200	1.002	118.674	225	1.001	118.674	225	
5	118.010	1.992	Open Manhole	1200	1.003	116.018	300	1.002	116.093	225	
6	123.360	1.425	Open Manhole	1050	3.000	121.935	225				
7	123.020	1.425	Open Manhole	1050	4.000	121.595	225				
8	122.360	1.565	Open Manhole	1050	3.001	120.795	225	3.000	121.252	225	456
								4.000	120.795	225	
9	118.210	1.425	Open Manhole	1050	5.000	116.785	225				
10	118.070	1.752	Open Manhole	1350	3.002	116.318	375	3.001	116.543	225	75
								5.000	116.468	225	
11	118.060	1.826	Open Manhole	1350	3.003	116.234	375	3.002	116.234	375	
12	116.480	2.051	Open Manhole	1500	1.004	114.429	525	1.003	114.654	300	
								3.003	115.175	375	596
	115.000	0.708	Open Manhole	0		OUTFALL		1.004	114.292	525	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	123.220	121.795	1.200	Open Manhole	1050
2.000	o	225	2	123.020	121.595	1.200	Open Manhole	1050
1.001	o	225	3	121.720	120.157	1.338	Open Manhole	1050
1.002	o	225	4	120.450	118.674	1.551	Open Manhole	1200
1.003	o	300	5	118.010	116.018	1.692	Open Manhole	1200
3.000	o	225	6	123.360	121.935	1.200	Open Manhole	1050
4.000	o	225	7	123.020	121.595	1.200	Open Manhole	1050
3.001	o	225	8	122.360	120.795	1.340	Open Manhole	1050
5.000	o	225	9	118.210	116.785	1.200	Open Manhole	1050
3.002	o	375	10	118.070	116.318	1.377	Open Manhole	1350
3.003	o	375	11	118.060	116.234	1.451	Open Manhole	1350
1.004	o	525	12	116.480	114.429	1.526	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	36.041	22.0	3	121.720	120.157	1.338	Open Manhole	1050
2.000	27.395	25.0	3	121.720	120.499	0.996	Open Manhole	1050
1.001	32.624	22.0	4	120.450	118.674	1.551	Open Manhole	1200
1.002	28.388	11.0	5	118.010	116.093	1.692	Open Manhole	1200
1.003	54.558	40.0	12	116.480	114.654	1.526	Open Manhole	1500
3.000	54.667	80.0	8	122.360	121.252	0.883	Open Manhole	1050
4.000	31.986	40.0	8	122.360	120.795	1.340	Open Manhole	1050
3.001	65.839	15.5	10	118.070	116.543	1.302	Open Manhole	1350
5.000	25.341	80.0	10	118.070	116.468	1.377	Open Manhole	1350
3.002	25.135	300.0	11	118.060	116.234	1.451	Open Manhole	1350
3.003	21.190	20.0	12	116.480	115.175	0.930	Open Manhole	1500
1.004	41.175	300.0		115.000	114.292	0.183	Open Manhole	0

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

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%	100/15 Summer				
2.000	15 Winter	30	0%	100/15 Winter				
1.001	15 Winter	30	0%	30/15 Winter				
1.002	15 Winter	30	0%	100/15 Summer				
1.003	15 Winter	30	0%	30/15 Summer				
3.000	15 Winter	30	0%	30/15 Summer				
4.000	15 Winter	30	0%	100/15 Summer				
3.001	15 Winter	30	0%	100/15 Summer				
5.000	15 Winter	30	0%	30/15 Winter				
3.002	15 Winter	30	0%	30/15 Summer				
3.003	15 Winter	30	0%					
1.004	15 Winter	30	0%	30/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	121.918	-0.102	0.000	0.57	0.0	60.1	OK
2.000	2	121.692	-0.128	0.000	0.39	0.0	37.5	OK
1.001	3	120.385	0.004	0.000	0.99	0.0	103.5	SURCHARGED
1.002	4	118.815	-0.084	0.000	0.71	0.0	104.2	OK
1.003	5	116.503	0.185	0.000	1.00	0.0	167.6	SURCHARGED
3.000	6	122.280	0.120	0.000	1.09	0.0	60.8	SURCHARGED
4.000	7	121.727	-0.093	0.000	0.63	0.0	48.7	OK
3.001	8	120.954	-0.066	0.000	0.84	0.0	107.7	OK
5.000	9	117.019	0.009	0.000	0.65	0.0	34.8	SURCHARGED
3.002	10	116.885	0.192	0.000	1.85	0.0	183.7	SURCHARGED
3.003	11	116.435	-0.174	0.000	0.55	0.0	210.5	OK
1.004	12	115.123	0.169	0.000	1.54	0.0	374.1	SURCHARGED