

Rogers Cory Partnership		Page 0
The Old School Old School Road Hook Hampshire RG27 9NJ		
Date 26/07/2021 12:16 File SW3-FEH REVIEW.MDX		
Designed by Tim K Checked by Terry S		
Innovyze		Network 2017.1.2

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Net 3

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 489800 99500 SZ 89800 99500
Data Type	Catchment
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	10
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm - Net 3

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	14.282	0.024	585.0	0.036	5.00	0.0	0.600	o	600	Pipe/Conduit	
S1.001	23.685	0.040	585.0	0.089	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.002	63.535	0.109	585.0	0.111	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.003	20.138	0.034	585.0	0.047	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.004	26.439	0.045	585.0	0.053	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.005	9.354	0.016	584.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.006	4.409	0.008	585.0	0.000	0.00	0.0	0.600	o	600	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)
S1.000	-11.45	5.24	4.288	0.036	0.0	0.0	0.0	1.00	282.6	0.0
S1.001	-10.65	5.63	4.263	0.125	0.0	0.0	0.0	1.00	282.6	0.0
S1.002	-8.97	6.69	4.223	0.236	0.0	0.0	0.0	1.00	282.6	0.0
S1.003	-8.54	7.03	4.114	0.283	0.0	0.0	0.0	1.00	282.6	0.0
S1.004	-8.03	7.47	4.080	0.336	0.0	0.0	0.0	1.00	282.6	0.0
S1.005	-7.87	7.62	4.035	0.336	0.0	0.0	0.0	1.00	282.7	0.0
S1.006	-7.79	7.70	4.019	0.336	0.0	0.0	0.0	1.00	282.6	0.0

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<u>Manhole Schedules for Storm - Net 3</u>											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S58	6.320	2.032	Open Manhole	1500	S1.000	4.288	600				
S59	6.360	2.097	Open Manhole	1500	S1.001	4.263	600	S1.000	4.264	600	1
S60	6.130	1.907	Open Manhole	1500	S1.002	4.223	600	S1.001	4.223	600	
S61	5.910	1.796	Open Manhole	1500	S1.003	4.114	600	S1.002	4.114	600	
S62	5.970	1.890	Open Manhole	1500	S1.004	4.080	600	S1.003	4.080	600	
S63	5.620	1.585	Open Manhole	1500	S1.005	4.035	600	S1.004	4.035	600	
S64	5.500	1.481	Open Manhole	2100	S1.006	4.019	600	S1.005	4.019	600	
S65	5.500	1.489	Open Manhole	0		OUTFALL		S1.006	4.011	600	
<u>Free Flowing Outfall Details for Storm - Net 3</u>											
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)					
S1.006	S65	5.500	4.011	0.000	0	0					
<u>Simulation Criteria for Storm - Net 3</u>											
Volumetric Runoff Coeff	0.840	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)	480								
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	4								
Number of Input Hydrographs	0	Number of Storage Structures	1								
Number of Online Controls	1	Number of Time/Area Diagrams	0								
Number of Offline Controls	0	Number of Real Time Controls	0								
<u>Synthetic Rainfall Details</u>											
Rainfall Model	FEH										
Return Period (years)	100										
FEH Rainfall Version	2013										
Site Location	GB 489800 99500 SZ 89800 99500										
Data Type	Catchment										
Summer Storms	No										
Winter Storms	Yes										
Cv (Summer)	0.750										
Cv (Winter)	0.840										
Storm Duration (mins)	240										
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Online Controls for Storm - Net 3

Hydro-Brake® Optimum Manhole: S64, DS/PN: S1.006, Volume (m³): 7.3

Unit Reference MD-SHE-0082-3000-1000-3000	
Design Head (m)	1.000
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82
Invert Level (m)	4.019
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0	Kick-Flo®	0.623	2.4
Flush-Flo™	0.297	3.0	Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		

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Storage Structures for Storm - Net 3

Tank or Pond Manhole: S63, DS/PN: S1.005

Invert Level (m) 4.197

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	184.1	1.000	378.0	1.300	450.0

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 3

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 Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S58	240 Winter	30	+0%	100/360 Winter				4.528
S1.001	S59	240 Winter	30	+0%	100/360 Winter				4.528
S1.002	S60	240 Winter	30	+0%	100/180 Winter				4.528
S1.003	S61	240 Winter	30	+0%	100/120 Summer				4.528
S1.004	S62	240 Winter	30	+0%	100/60 Winter				4.527
S1.005	S63	240 Winter	30	+0%	100/60 Winter				4.525
S1.006	S64	2160 Summer	30	+0%	30/2160 Summer				4.658

PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S58	-0.360	0.000	0.02		2.4	OK	
S1.001	S59	-0.335	0.000	0.04		8.3	OK	
S1.002	S60	-0.295	0.000	0.06		15.5	OK	
S1.003	S61	-0.186	0.000	0.09		16.1	OK	
S1.004	S62	-0.153	0.000	0.09		18.9	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank
1) for Storm - Net 3

PN	US/MH Name	Surcharged		Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow (l/s)			Flow (l/s)		
S1.005	S63	-0.110	0.000	0.03		4.0		OK	
S1.006	S64	0.039	0.000	0.01		2.8		SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 3

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 Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S58	360 Winter	100	+40%	100/360 Winter				4.907
S1.001	S59	360 Winter	100	+40%	100/360 Winter				4.907
S1.002	S60	360 Winter	100	+40%	100/180 Winter				4.907
S1.003	S61	360 Winter	100	+40%	100/120 Summer				4.907
S1.004	S62	360 Winter	100	+40%	100/60 Winter				4.906
S1.005	S63	360 Winter	100	+40%	100/60 Winter				4.906
S1.006	S64	1440 Winter	100	+40%	30/2160 Summer				4.996

PN	US/MH Name	Depth (m)	Surcharged Volume (m ³)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S58	0.019	0.000	0.02		3.1		SURCHARGED	
S1.001	S59	0.044	0.000	0.05		10.5		SURCHARGED	
S1.002	S60	0.084	0.000	0.08		19.7		SURCHARGED	
S1.003	S61	0.193	0.000	0.13		23.6		SURCHARGED	
S1.004	S62	0.226	0.000	0.13		28.0		SURCHARGED	

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