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13 Capricorn Centre Cranes Farm Road Basildon SS14 3JJ		
Date 11/05/2016 15:26 File storm without bl...	Designed by austin.ba... Checked by	
Micro Drainage	Network W.12.6	

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)	20.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.400	Maximum Backdrop Height (m)	1.500
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.	0.750	Min Slope for Optimisation (1:X)	500
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	30.000	0.200	150.0	0.078	5.00	0.0	0.600	o	150
1.001	11.000	0.073	150.7	0.000	0.00	0.0	0.600	o	150
1.002	10.000	0.125	80.0	0.000	0.00	0.0	0.600	o	150


Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.61	5.650	0.078	0.0	0.0	0.0	0.82	14.5	10.6
1.001	50.00	5.84	5.450	0.078	0.0	0.0	0.0	0.82	14.4	10.6
1.002	50.00	5.98	5.377	0.078	0.0	0.0	0.0	1.12	19.9	10.6

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Manhole Schedules for Storm

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)
1	6.990	1.340	Open Manhole	1200	1.000	5.650	150				
2	7.120	1.670	Open Manhole	1500	1.001	5.450	150	1.000	5.450	150	
3	8.000	2.623	Open Manhole	1200	1.002	5.377	150	1.001	5.377	150	
	7.500	2.248	Open Manhole	0		OUTFALL		1.002	5.252	150	

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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	150	1	6.990	5.650	1.190	Open Manhole	1200
1.001	o	150	2	7.120	5.450	1.520	Open Manhole	1500
1.002	o	150	3	8.000	5.377	2.473	Open Manhole	1200

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	30.000	150.0	2	7.120	5.450	1.520	Open Manhole	1500
1.001	11.000	150.7	3	8.000	5.377	2.473	Open Manhole	1200
1.002	10.000	80.0		7.500	5.252	2.098	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002		7.500	5.252	4.700	0	0


Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	15
Ratio R	0.400		


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Online Controls for Storm

Hydro-Brake® Manhole: 2, DS/PN: 1.001, Volume (m³): 3.5

Design Head (m) 1.400 Hydro-Brake® Type Md6 SW Only Invert Level (m) 5.450  
Design Flow (l/s) 5.0 Diameter (mm) 86

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	4.6	3.000	7.3	7.000	11.2
0.200	3.3	1.400	5.0	3.500	7.9	7.500	11.6
0.300	3.1	1.600	5.3	4.000	8.4	8.000	11.9
0.400	3.0	1.800	5.7	4.500	9.0	8.500	12.3
0.500	3.1	2.000	6.0	5.000	9.4	9.000	12.7
0.600	3.3	2.200	6.3	5.500	9.9	9.500	13.0
0.800	3.8	2.400	6.5	6.000	10.3		
1.000	4.2	2.600	6.8	6.500	10.8		


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Storage Structures for Storm

Tank or Pond Manhole: 1, DS/PN: 1.000

Invert Level (m) 5.650

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	21.3	2.800	0.0	5.600	0.0	8.400	0.0
0.400	21.3	3.200	0.0	6.000	0.0	8.800	0.0
0.800	21.3	3.600	0.0	6.400	0.0	9.200	0.0
0.801	0.0	4.000	0.0	6.800	0.0	9.600	0.0
1.600	0.0	4.400	0.0	7.200	0.0	10.000	0.0
2.000	0.0	4.800	0.0	7.600	0.0		
2.400	0.0	5.200	0.0	8.000	0.0		

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Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 450.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 DVD Status OFF  
 Inertia Status OFF

PN	US/MH Name	Water			Surcharged		Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (1/s)	Flow (1/s)			
1.000	1	6.326	0.526	0.000	0.73	0.0	10.1	SURCHARGED		
1.001	2	6.303	0.703	0.000	0.30	0.0	3.9	SURCHARGED		
1.002	3	5.425	-0.102	0.000	0.22	0.0	3.9	OK		