


Curtins Consulting Ltd		Page 1
Curtins House Columbus Quay Riverside Drive Liverpool L3 4DB	SFX College Liverpool	
Date 12-11-2014	Designed by J. Poole	
File Proposed drainage systems	Checked by A. O'Neill	
Micro Drainage	Network 2014.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - sports hall

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.200	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
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits





Time Area Diagram for Storm - sports hall

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.109	4-8	0.045

Total Area Contributing (ha) = 0.154

Total Pipe Volume (m³) = 2.821

Network Design Table for Storm - sports hall


PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.000	32.254	0.500	64.5	0.059	5.00	0.0	0.060	o	150	
S1.001	28.974	1.015	28.5	0.040	0.00	0.0	0.060	o	150	
S1.002	39.927	0.115	347.2	0.029	0.00	0.0	0.060	o	225	
S1.003	3.808	0.015	253.9	0.026	0.00	0.0	0.060	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)
S1.000	50.00	5.34	81.100	0.059	0.0	0.0	0.0	1.59	28.2	8.0
S1.001	50.00	5.54	80.600	0.099	0.0	0.0	0.0	2.44	43.1	13.4
S1.002	50.00	6.32	79.510	0.128	0.0	0.0	0.0	0.85	33.8	17.3
S1.003	50.00	6.38	79.395	0.154	0.0	0.0	0.0	1.00	39.9	20.9

Free Flowing Outfall Details for Storm - sports hall

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.003	S	80.880	79.380	79.380	1050	0


Curtins Consulting Ltd		Page 2
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Simulation Criteria for Storm - sports hall

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /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 Online Controls	0	Number of Storage Structures	0
		Number of Time/Area Diagrams	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)	19.200	Storm Duration (mins)	30
Ratio R	0.400		

Curtins Consulting Ltd		Page 3
Curtins House Columbus Quay Riverside Drive Liverpool L3 4DB	SFX College Liverpool	
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Summary of Critical Results by Maximum Level (Rank 1) for Storm - sports hall

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 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 FSR M5-60 (mm) 19.200 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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
 Return Period(s) (years) 1, 10, 100
 Climate Change (%) 0, 20, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	+20%	100/15	Summer			
S1.001	15 Winter	100	+20%	100/15	Summer			
S1.002	15 Winter	100	+20%	10/15	Summer			
S1.003	15 Winter	100	+20%	10/15	Summer			

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	
S1.000	S1	81.663	0.413	0.000	0.96	0.0	25.4	FLOOD RISK
S1.001	S2	81.195	0.445	0.000	1.03	0.0	41.2	FLOOD RISK
S1.002	S3	80.130	0.395	0.000	1.69	0.0	52.9	SURCHARGED
S1.003	S3	79.807	0.187	0.000	2.32	0.0	64.3	SURCHARGED

Curtins Consulting Ltd		Page 4
Curtins House Columbus Quay Riverside Drive Liverpool L3 4DB	SFX College Liverpool	
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Design Audit Report for Storm - sports hall

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Filename      T:\LI1195A St Francis Xavier's College\Calculations
               \Microdrainage\Proposed drainage systems
               03-03-2015.mdx
Network Name   Storm - sports hall
Date Audited   06/03/2015 15:43
Pipes          4
Current Network Slope (1:X) 63.8
Storms Used (mins) 15min Summer, 30min Summer, 60min Summer, 120min
                  Summer, 180min Summer, 240min Summer, 360min Summer,
                  480min Summer, 600min Summer, 720min Summer, 960min
                  Summer, 1440min Summer, 2160min Summer, 2880min
                  Summer, 15min Winter, 30min Winter, 60min Winter,
                  120min Winter, 180min Winter, 240min Winter, 360min
                  Winter, 480min Winter, 600min Winter, 720min Winter,
                  960min Winter, 1440min Winter, 2160min Winter,
                  2880min Winter

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Audit	Failures	Status
Manhole Sizes	4	Failed
Surcharge	2	Failed
Flood	0	Passed
Storage	0	Passed
Pipe Diameters	0	Passed
Pipe Lengths	0	Passed
Coordinate Accuracy	0	Passed
Cover Levels	0	Passed
Backdrops	0	Passed
Full Bore Velocity	1	Failed
Proportional Velocity	2	Failed
Crossings/Conflicts	0	Passed
Manhole Headloss	2	Failed
ICP Audit	0	Not Run

Manhole Size Audit

The following Manhole sizes are smaller than those specified.

US/MH Name	PN	US/MH Dia/Len (mm)	US/MH Width (mm)	Min Dia/Len (mm)	Min Width (mm)
S 1 S 1.000		450	0	1050	0
S 2 S 1.001		450	0	1050	0
S 3 S 1.002		900	675	1050	0
S 3 S 1.003		900	675	1050	0


Surcharge Audit

The following pipes exceeded the 20 mm surcharge limit for the 10 year +20% climate change storm.

PN	US/MH Name	Storm (mins)	Sur. Depth (mm)
S1.002	S3 15min Winter		147
S1.003	S3 15min Winter		79

Flood Audit

No pipes flood for the 100 year +20% climate change storm.

Curtins Consulting Ltd		Page 5
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Storage Audit

Storage Volume is at typical design values.

Pipe Diameter Audit

All pipe diameters are ≥ 150 mm.

Pipe Length Audit

All pipe lengths are ≤ 100.000 m.

Coordinate Accuracy Audit

All pipe lengths are within 1.000 m of coordinates.

Upstream Cover Level Audit

All pipes have Upstream Cover Depths within the range 0.500-6.000 m.

Downstream Cover Level Audit

All pipes have Downstream Cover Depths within the range 0.500-6.000 m.

Backdrop Audit

All backdrops are within the range 0.200-1.500m.

Full Bore Velocity Audit

The following pipes have Full Bore Velocity outside of the range 1.00-3.00 m/s.

PN	Velocity (m/s)
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S1.002	0.85
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Proportional Velocity Audit

The following pipes have Proportional Velocity outside of the range 1.00-3.00 m/s for the 1 year +0% climate change storm.


PN	Storm (mins)	Velocity (m/s)
S1.002	15min Winter	0.78
S1.003	15min Winter	0.74

Crossings / Conflicts Audit

The following filter settings were used to determine the crossings and conflicts.

Vertical Separation (m): 0.500
Horizontal Separation (m): 0.500
Networks included: Storm - car park, Storm - science bk system 1, Storm - sports hall, Storm - science bk system 2
Networks excluded:

No crossings or conflicts were located for the current network based on the settings above.

Curtins Consulting Ltd		Page 6
Curtins House Columbus Quay Riverside Drive Liverpool L3 4DB	SFX College Liverpool	
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Manhole Headloss Audit

The following manholes may have insufficient headloss.

PN	USMH	Angle (degrees)	Headloss	Recommended Value
S1.001	S2	89.9	0.500	0.900
S1.002	S3	89.6	0.500	0.900

Interim Code of Practice

The Interim Code of Practice Audit was not completed by user request