

... Fire Protection by Computer Design

Hampshire Fire Protection
8 N Wentworth Ave
Londonderry, NH 03053
603-432-8221

Job Name : Courtyard by Marriott Area #1 Calc Retail Shell Space
Building : 2 of 8
Location : Portland ME
System : Area #1
Contract : 4396CME
Data File : 1st Floor Area #1 Retail Shell Space Calc.WXF

HYDRAULIC CALCULATIONS
for

Project name: Courtyard by Marriott

Location: Portland ME

Drawing no: 2 of 8

Date: 6-5-13

Design

Remote area number: Area #1

Remote area location: 1st Floor Retail Tenant Space

Occupancy classification: Ordinary Hazard II

Density: .20 - Gpm/SqFt

Area of application: 979 - SqFt

Coverage per sprinkler: Varies - SqFt

Type of sprinklers calculated: QR Brass Upright

No. of sprinklers calculated: 9

In-rack demand: - GPM

Hose streams: 250 - GPM

Total water required (including hose streams): 509.68 - GPM @ 91.60 - Psi

Type of system: Wet

Volume of dry or preaction system: N/A - Gal

Water supply information

Date: 5-11-13

Location: Commercial St & Maple St

Source: Portland Water

Name of contractor: Hampshire Fire

Address: N Wentworth Ave Londonderry NH 03053

Phone number: 603-432-8221

Name of designer: E Vance Wooten

Authority having jurisdiction: Portland

Notes: (Include peaking information or gridded systems here.) Area reduced for QR Sprinklers and ceiling height of 13'-6"

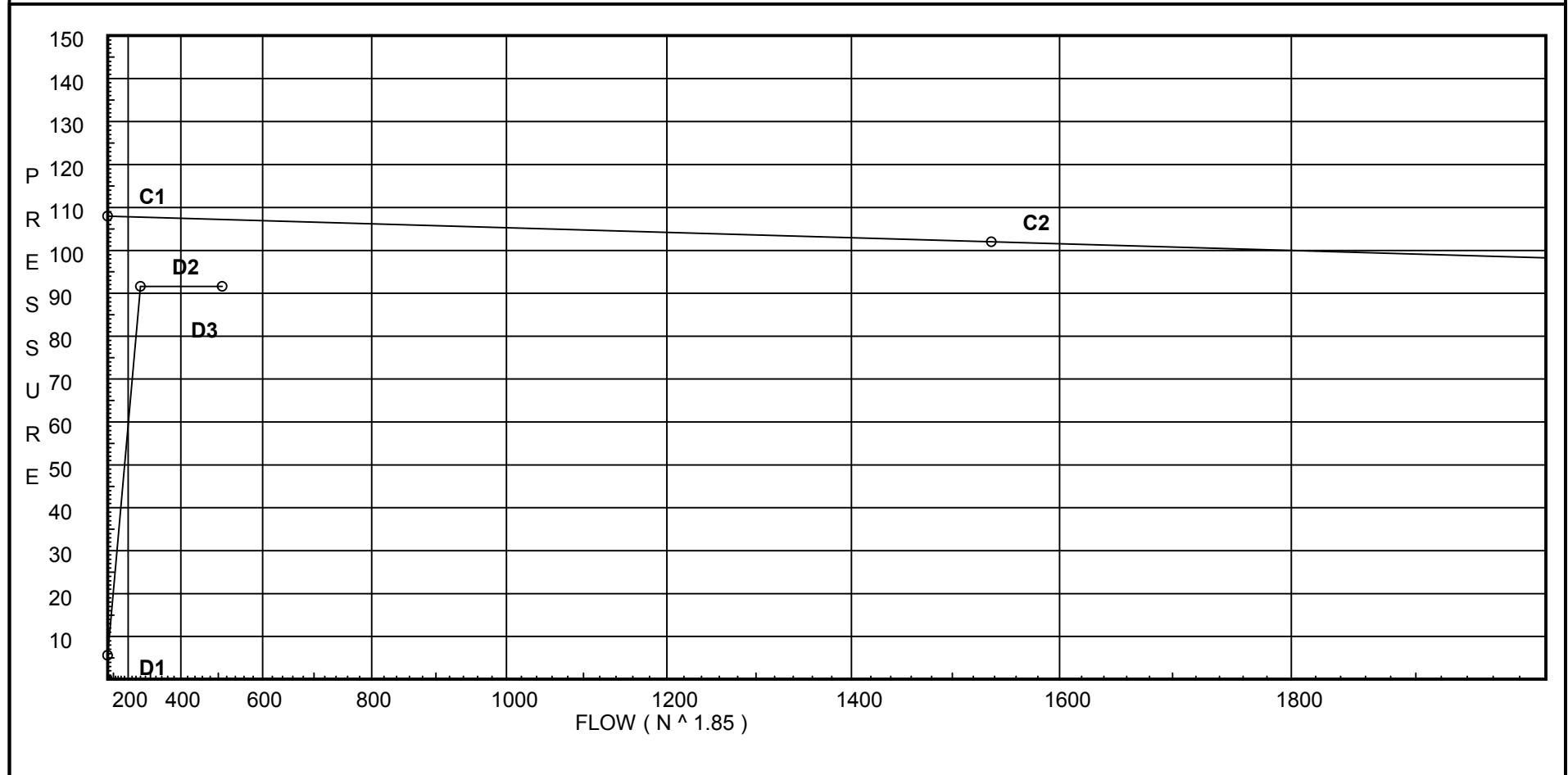
Water Supply Curve C

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City Water Supply:
C1 - Static Pressure : 108
C2 - Residual Pressure: 102
C2 - Residual Flow : 1537

Demand:
D1 - Elevation : 5.630
D2 - System Flow : 259.679
D2 - System Pressure : 91.600
Hose (Demand) : 250
D3 - System Demand : 509.679
Safety Margin : 15.622



Fittings Used Summary

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Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X	90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0

Units Summary

Diameter Units Inches
 Length Units Feet
 Flow Units US Gallons per Minute
 Pressure Units Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
101	13.0	5.6	19.04	na	24.44	0.2	85.7	7.0
102	13.0	5.6	19.73	na	24.87	0.2	124.37	7.0
103	13.0	5.6	21.45	na	25.94	0.2	128	7.0
104	13.0	5.6	25.32	na	28.18	0.2	128	7.0
105	13.0	5.6	32.31	na	31.83	0.2	128	7.0
106	13.0	5.6	27.82	na	29.54	0.2	124.37	7.0
107	13.0	5.6	28.49	na	29.89	0.2	128	7.0
108	13.0	5.6	30.99	na	31.18	0.2	128	7.0
109	13.0	5.6	36.46	na	33.82	0.2	128	7.0
121	12.67		19.59	na				
122	12.67		20.88	na				
123	12.67		22.68	na				
124	12.67		26.74	na				
125	12.67		34.04	na				
126	12.67		29.35	na				
127	12.67		30.05	na				
128	12.67		32.67	na				
129	12.67		38.38	na				
130	12.67		59.97	na				
131	12.67		60.6	na				
132	12.67		61.9	na				
1FL	11.67		80.08	na	100.0			
TOR	11.67		80.14	na				
BOR	2.0		84.5	na				
SPG	2.0		89.56	na				
TEST	0.0		91.6	na	150.0			

The maximum velocity is 22.19 and it occurs in the pipe between nodes 124 and 125

Final Calculations - Hazen-Williams - 2007

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
101 to 121	24.44 24.44	1.049 120.0 0.1885	1E	2.0 0.0 0.0	0.170 2.000 2.170	19.040 0.143 0.409			K Factor = 5.60 Vel = 9.07	
	0.0 24.44						19.592		K Factor = 5.52	
102 to 122	24.87 24.87	1.049 120.0 0.1948	1T	5.0 0.0 0.0	0.170 5.000 5.170	19.730 0.143 1.007			K Factor = 5.60 Vel = 9.23	
	0.0 24.87						20.880		K Factor = 5.44	
103 to 123	25.94 25.94	1.049 120.0 0.2104	1T	5.0 0.0 0.0	0.170 5.000 5.170	21.451 0.143 1.088			K Factor = 5.60 Vel = 9.63	
	0.0 25.94						22.682		K Factor = 5.45	
104 to 124	28.18 28.18	1.049 120.0 0.2455	1T	5.0 0.0 0.0	0.170 5.000 5.170	25.325 0.143 1.269			K Factor = 5.60 Vel = 10.46	
	0.0 28.18						26.737		K Factor = 5.45	
105 to 125	31.83 31.83	1.049 120.0 0.3074	1T	5.0 0.0 0.0	0.170 5.000 5.170	32.308 0.143 1.589			K Factor = 5.60 Vel = 11.82	
	0.0 31.83						34.040		K Factor = 5.46	
106 to 126	29.54 29.54	1.049 120.0 0.2677	1T	5.0 0.0 0.0	0.170 5.000 5.170	27.821 0.143 1.384			K Factor = 5.60 Vel = 10.97	
	0.0 29.54						29.348		K Factor = 5.45	
107 to 127	29.89 29.89	1.049 120.0 0.2737	1T	5.0 0.0 0.0	0.170 5.000 5.170	28.489 0.143 1.415			K Factor = 5.60 Vel = 11.10	
	0.0 29.89						30.047		K Factor = 5.45	
108 to 128	31.18 31.18	1.049 120.0 0.2957	1T	5.0 0.0 0.0	0.170 5.000 5.170	30.995 0.143 1.529			K Factor = 5.60 Vel = 11.57	
	0.0 31.18						32.667		K Factor = 5.46	
109 to 129	33.82 33.82	1.049 120.0 0.3439	1T	5.0 0.0 0.0	0.170 5.000 5.170	36.464 0.143 1.778			K Factor = 5.60 Vel = 12.55	
	0.0 33.82						38.385		K Factor = 5.46	
121 to 122	24.44 24.44	1.049 120.0 0.1886		0.0 0.0 0.0	6.830 0.0 6.830	19.592 0.0 1.288			Vel = 9.07	

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
122	24.87	1.38		9.920	20.880				
to		120.0	0.0	0.0	0.0				
123	49.31	0.1817	0.0	9.920	1.802		Vel = 10.58		
123	25.94	1.38	0.0	10.210	22.682				
to		120.0	0.0	0.0	0.0				
124	75.25	0.3972	0.0	10.210	4.055		Vel = 16.14		
124	28.18	1.38	0.0	10.210	26.737				
to		120.0	0.0	0.0	0.0				
125	103.43	0.7153	0.0	10.210	7.303		Vel = 22.19		
125	31.83	1.61	1T 8.0	38.750	34.040				
to		120.0	0.0	8.000	0.0				
130	135.26	0.5547	0.0	46.750	25.933		Vel = 21.32		
	0.0								
	135.26				59.973		K Factor = 17.47		
126	29.54	1.38	0.0	9.920	29.348				
to		120.0	0.0	0.0	0.0				
127	29.54	0.0705	0.0	9.920	0.699		Vel = 6.34		
127	29.89	1.38	0.0	10.210	30.047				
to		120.0	0.0	0.0	0.0				
128	59.43	0.2566	0.0	10.210	2.620		Vel = 12.75		
128	31.17	1.38	0.0	10.210	32.667				
to		120.0	0.0	0.0	0.0				
129	90.6	0.5600	0.0	10.210	5.718		Vel = 19.43		
129	33.82	1.61	1T 8.0	38.750	38.385				
to		120.0	0.0	8.000	0.0				
131	124.42	0.4753	0.0	46.750	22.220		Vel = 19.61		
	0.0								
	124.42				60.605		K Factor = 15.98		
130	135.26	2.635	0.0	12.540	59.973				
to		120.0	0.0	0.0	0.0				
131	135.26	0.0504	0.0	12.540	0.632		Vel = 7.96		
131	124.42	2.635	0.0	7.710	60.605				
to		120.0	0.0	0.0	0.0				
132	259.68	0.1682	0.0	7.710	1.297		Vel = 15.28		
132	0.0	2.635	3V 17.71	42.380	61.902				
to		120.0	1T 16.474	63.014	0.433				
1FL	259.68	0.1683	1S 19.22	105.394	17.741		Vel = 15.28		
			1B 9.61						
1FL	100.00	6.357	1V 12.573	1.540	80.076		Qa = 100		
to		120.0	0.0	12.573	0.0				
TOR	359.68	0.0043	0.0	14.113	0.060		Vel = 3.64		
TOR	0.0	6.357	1X 31.433	9.670	80.136				
to		120.0	0.0	31.433	4.188				
BOR	359.68	0.0042	0.0	41.103	0.173		Vel = 3.64		
BOR	0.0	6.357	1V 12.573	2.000	84.497				
to		120.0	0.0	12.573	5.000		** Fixed Loss = 5		
SPG	359.68	0.0043	0.0	14.573	0.062		Vel = 3.64		
SPG	0.0	6.16	3E 60.252	210.000	89.559				
to		140.0	1T 43.037	107.593	0.866				
TEST	359.68	0.0037	1G 4.304	317.593	1.175		Vel = 3.87		

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	150.00						Qa = 150.00		
	509.68				91.600		K Factor = 53.25		