Reviewed for Code Compliance
Inspections Division
Approved with Conditions

Date: 08/01/13

. . . 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

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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 0f 13'-6"

Water Supply Curve C

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

Demand:
D1 - Ele
D2 - Sys
D2 - Sys
Hose (I
D3 - Sys
Safety Margin : 15.622

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Fittings Used Summary

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	1				4
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	2				
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	2				1
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6				3
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	6				
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		
101	13.0	5.6	19.04	na	24.44	0.2		
102	13.0	5.6	19.73	na	24.87	0.2		
103	13.0	5.6	21.45	na	25.94	0.2		
104	13.0	5.6	25.32	na	28.18	0.2		
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	**
101	24.44	1.049	1E	2.0	0.170	19.040		K [illegible]
to		120.0		0.0	2.000	0.143		
121	24.44	0.1885		0.0	2.170	0.409		Vel = 9.07
	0.0							
	24.44					19.592		K Factor = 5.52
102	24.87	1.049	1T	5.0	0.170	19.730		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
122	24.87	0.1948		0.0	5.170	1.007		Vel = 9.23
	0.0							
	24.87					20.880		K Factor = 5.44
103	25.94	1.049	1T	5.0	0.170	21.451		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
123	25.94	0.2104		0.0	5.170	1.088		Vel = 9.63
	0.0							
	25.94					22.682		K Factor = 5.45
104	28.18	1.049	1T	5.0	0.170	25.325		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
124	28.18	0.2455		0.0	5.170	1.269		Vel = 10.46
	0.0							
	28.18					26.737		K Factor = 5.45
105	31.83	1.049	1T	5.0	0.170	32.308		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
125	31.83	0.3074		0.0	5.170	1.589		Vel = 11.82
	0.0							
	31.83					34.040		K Factor = 5.46
106	29.54	1.049	1T	5.0	0.170	27.821		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
126	29.54	0.2677		0.0	5.170	1.384		Vel = 10.97
	0.0							
	29.54					29.348		K Factor = 5.45
107	29.89	1.049	1T	5.0	0.170	28.489		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
127	29.89	0.2737		0.0	5.170	1.415		Vel = 11.10
	0.0							
	29.89					30.047		K Factor = 5.45
108	31.18	1.049	1T	5.0	0.170	30.995		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
128	31.18	0.2957		0.0	5.170	1.529		Vel = 11.57
	0.0							
	31.18					32.667		K Factor = 5.46
109	33.82	1.049	1T	5.0	0.170	36.464		K Factor = 5.60
to		120.0		0.0	5.000	0.143		
129	33.82	0.3439		0.0	5.170	1.778		Vel = 12.55
	0.0							
	33.82					38.385		K Factor = 5.46
121	24.44	1.049		0.0	6.830	19.592		
to		120.0		0.0	0.0	0.0		
122	24.44	0.1886		0.0	6.830	1.288		Vel = 9.07

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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	**
122	24.87	1.38		0.0	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

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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	**
	150.00						Qa = 150.00	
	509.68					91.600	K Factor = 53.25	