

**... Fire Protection by Computer Design**

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

Job Name : Courtyard by Marriott Area #7 Calc 6th Floor Guestroom  
Building : 7 of 8  
Location : Portland ME  
System : Area #7  
Contract : 4396CME  
Data File : 6th Floor Area #7 Guest Room Calc.WXF

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**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** Courtyard by Marriott

**Location:** Portland ME

**Drawing no:** 7 of 8

**Date:** 6-5-13

**Design**

**Remote area number:** Area #7

**Remote area location:** 6th Floor Guest Room

**Occupancy classification:** Light Hazard

**Density:** .10 - Gpm/SqFt

**Area of application:** Room Design - SqFt

**Coverage per sprinkler:** Varies - SqFt

**Type of sprinklers calculated:** QR Recessed Pendent

**No. of sprinklers calculated:** 9

**In-rack demand:** - GPM

**Hose streams:** 100 - GPM

**Total water required (including hose streams):** 264.21 - GPM @ 99.08 - 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.)** Room design method with sprinklers in remote room plus sprinklers in adjoining rooms not protected by self closing fire rated doors.

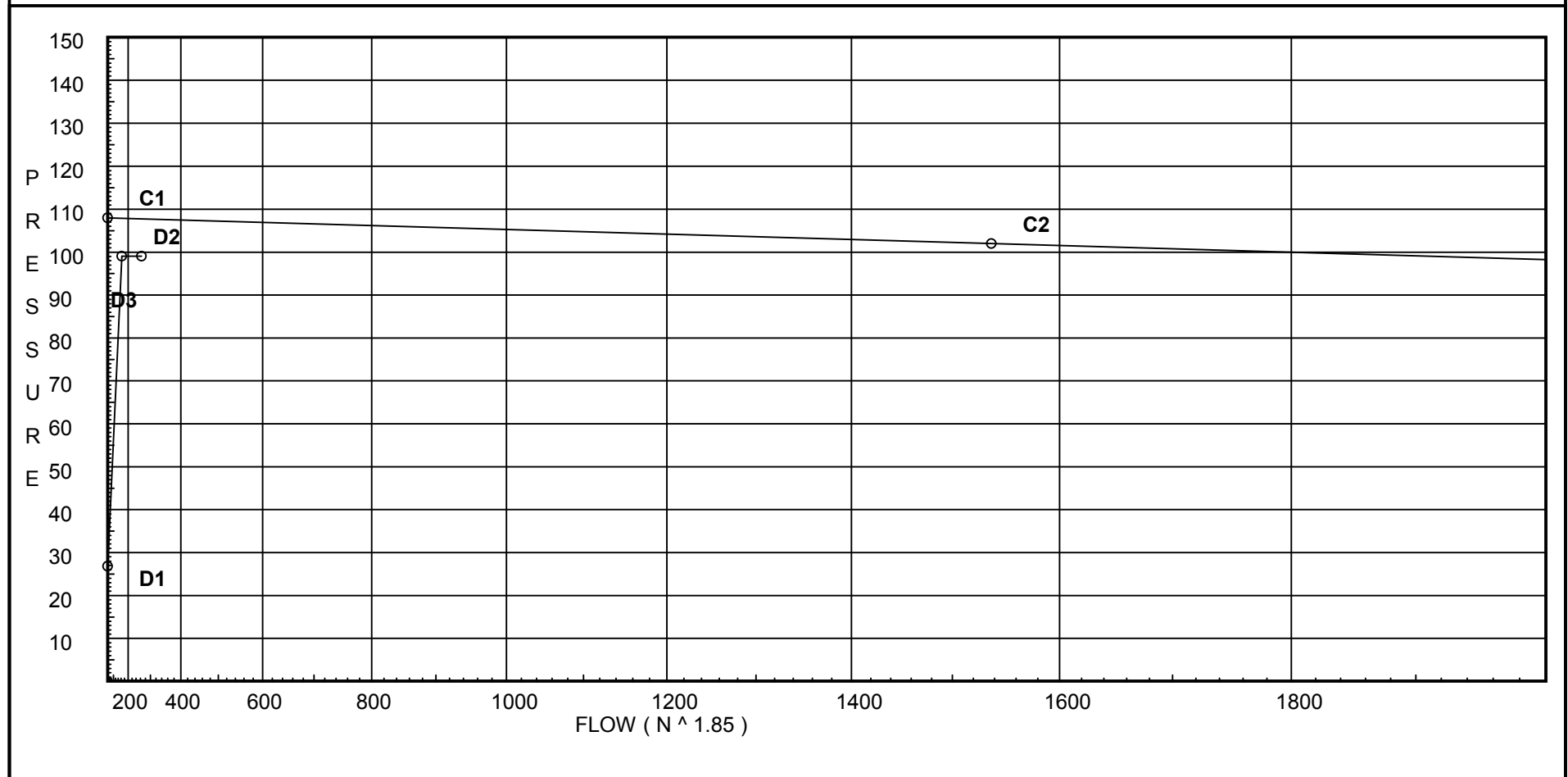
# Water Supply Curve C

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

Demand:  
D1 - Elevation : 26.852  
D2 - System Flow : 164.207  
D2 - System Pressure : 99.078  
Hose ( Demand ) : 100  
D3 - System Demand : 264.207  
Safety Margin : 8.691



# Fittings Used Summary

Hampshire Fire Protection  
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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.
701	62.0	5.6	8.28	na	16.11	0.1	160	7.0
750	62.0	5.6	8.16	na	16.0	0.1	160	7.0
702	62.0	5.6	9.22	na	17.0	0.1	150	7.0
751	62.0	5.6	9.15	na	16.94	0.1	150	7.0
703	62.0	5.6	13.73	na	20.75	0.1	150	7.0
704	62.0	5.6	12.63	na	19.9	0.1	160	7.0
705	62.0	5.6	13.11	na	20.27	0.1	150	7.0
706	62.0	4.2	14.51	na	16.0	0.1	100	7.0
707	62.0	5.6	14.37	na	21.23	0.1	150	7.0
721	62.58		9.02	na				
755	62.58		9.02	na				
722	62.58		10.1	na				
756	62.58		10.28	na				
723	62.58		13.58	na				
728	62.58		20.63	na				
724	62.58		12.73	na				
725	62.58		14.59	na				
726	62.58		14.76	na				
727	62.58		16.59	na				
730	62.58		20.13	na				
729	62.58		26.41	na				
731	62.58		27.38	na				
732	62.58		31.47	na				
821	62.58		32.53	na				
822	62.58		34.44	na				
823	62.58		36.35	na				
824	62.58		38.84	na				
825	62.58		41.71	na				
733	62.58		47.72	na				
6FL	62.58		65.79	na				
5FL	52.25		70.34	na				
4FL	42.25		74.74	na				
3FL	32.25		79.14	na				
2FL	22.25		83.54	na				
ST03	11.67		88.38	na				
ST02	11.67		88.44	na				
1FL	11.67		88.46	na	50.0			
TOR	11.67		88.48	na				
BOR	2.0		92.74	na				
SPG	2.0		97.76	na				
TEST	0.0		99.08	na	50.0			

The maximum velocity is 18.62 and it occurs in the pipe between nodes 723 and 728

# 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	*****
701 to 721	16.11  16.11	1.049 120.0 0.0872	1E 1T	2.0 5.0 0.0	4.420 7.000 11.420	8.279 -0.251 0.996			K Factor = 5.60  Vel = 5.98	
	0.0 16.11						9.024		K Factor = 5.36	
750 to 755	16.00  16.0	1.049 120.0 0.0861	1E 1T	2.0 5.0 0.0	5.920 7.000 12.920	8.163 -0.251 1.113			K Factor = 5.60  Vel = 5.94	
	0.0 16.00						9.025		K Factor = 5.33	
702 to 722	17.00  17.0	1.049 120.0 0.0964	1E 1T	2.0 5.0 0.0	4.790 7.000 11.790	9.215 -0.251 1.136			K Factor = 5.60  Vel = 6.31	
	0.0 17.00						10.100		K Factor = 5.35	
751 to 756	16.94  16.94	1.049 120.0 0.0957	2E 1T	4.0 5.0 0.0	5.420 9.000 14.420	9.151 -0.251 1.380			K Factor = 5.60  Vel = 6.29	
	0.0 16.94						10.280		K Factor = 5.28	
703 to 723	20.75  20.75	1.049 120.0 0.1400		0.0 0.0 0.0	0.750 0.0 0.750	13.728 -0.251 0.105			K Factor = 5.60  Vel = 7.70	
	0.0 20.75						13.582		K Factor = 5.63	
704 to 724	19.90  19.9	1.049 120.0 0.1287	1E	2.0 0.0 0.0	0.750 2.000 2.750	12.629 -0.251 0.354			K Factor = 5.60  Vel = 7.39	
	0.0 19.90						12.732		K Factor = 5.58	
705 to 725	20.27  20.27	1.049 120.0 0.1334	1E 1T	2.0 5.0 0.0	5.960 7.000 12.960	13.108 -0.251 1.729			K Factor = 5.60  Vel = 7.52	
	0.0 20.27						14.586		K Factor = 5.31	
706 to 726	16.00  16.0	1.049 120.0 0.0861	1T	5.0 0.0 0.0	0.750 5.000 5.750	14.514 -0.251 0.495			K Factor = 4.20  Vel = 5.94	
	0.0 16.00						14.758		K Factor = 4.16	
707 to 727	21.23  21.23	1.049 120.0 0.1453	2E 1T	4.0 5.0 0.0	8.000 9.000 17.000	14.371 -0.251 2.470			K Factor = 5.60  Vel = 7.88	
	0.0 21.23						16.590		K Factor = 5.21	
721 to 755	16.11  16.11	1.049 120.0 0.1000		0.0 0.0 0.0	0.010 0.0 0.010	9.024 0.0 0.001			Vel = 5.98	

# 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	*****
755	16.00	1.38	0.0	13.080	9.025				
to		120.0	0.0	0.0	0.0				
722	32.11	0.0822	0.0	13.080	1.075		Vel = 6.89		
722	17.00	1.38	0.0	1.000	10.100				
to		120.0	0.0	0.0	0.0				
756	49.11	0.1800	0.0	1.000	0.180		Vel = 10.53		
756	16.94	1.38	0.0	10.580	10.280				
to		120.0	0.0	0.0	0.0				
723	66.05	0.3121	0.0	10.580	3.302		Vel = 14.17		
723	20.75	1.38	0.0	13.630	13.582				
to		120.0	0.0	0.0	0.0				
728	86.8	0.5172	0.0	13.630	7.050		Vel = 18.62		
728	0.0	1.38	1T 6.0	5.170	20.632				
to		120.0	0.0	6.000	0.0				
729	86.8	0.5173	0.0	11.170	5.778		Vel = 18.62		
	0.0								
	86.80				26.410		K Factor = 16.89		
724	19.90	1.049	0.0	14.380	12.732				
to		120.0	0.0	0.0	0.0				
725	19.9	0.1289	0.0	14.380	1.854		Vel = 7.39		
725	20.28	1.38	0.0	1.380	14.586				
to		120.0	0.0	0.0	0.0				
726	40.18	0.1246	0.0	1.380	0.172		Vel = 8.62		
726	16.00	1.38	0.0	7.920	14.758				
to		120.0	0.0	0.0	0.0				
727	56.18	0.2313	0.0	7.920	1.832		Vel = 12.05		
727	21.22	1.38	0.0	8.460	16.590				
to		120.0	0.0	0.0	0.0				
730	77.4	0.4184	0.0	8.460	3.540		Vel = 16.60		
730	0.0	1.38	1T 6.0	11.330	20.130				
to		120.0	0.0	6.000	0.0				
731	77.4	0.4185	0.0	17.330	7.252		Vel = 16.60		
	0.0								
	77.40				27.382		K Factor = 14.79		
729	86.80	2.157	0.0	16.540	26.410				
to		120.0	0.0	0.0	0.0				
731	86.8	0.0588	0.0	16.540	0.972		Vel = 7.62		
731	77.41	2.157	1X 10.461	10.920	27.382				
to		120.0	0.0	10.461	0.0				
732	164.21	0.1911	0.0	21.381	4.086		Vel = 14.42		
732	0.0	2.157	0.0	5.540	31.468				
to		120.0	0.0	0.0	0.0				
821	164.21	0.1912	0.0	5.540	1.059		Vel = 14.42		
821	0.0	2.157	0.0	10.000	32.527				
to		120.0	0.0	0.0	0.0				
822	164.21	0.1911	0.0	10.000	1.911		Vel = 14.42		
822	0.0	2.157	0.0	10.000	34.438				
to		120.0	0.0	0.0	0.0				
823	164.21	0.1911	0.0	10.000	1.911		Vel = 14.42		

# 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	*****
823	0.0	2.157		0.0	13.040	36.349				
to		120.0		0.0	0.0	0.0				
824	164.21	0.1911		0.0	13.040	2.492		Vel = 14.42		
824	0.0	2.157		0.0	15.000	38.841				
to		120.0		0.0	0.0	0.0				
825	164.21	0.1911		0.0	15.000	2.867		Vel = 14.42		
825	0.0	2.157	1V	4.307	27.130	41.708				
to		120.0		0.0	4.307	0.0				
733	164.21	0.1911		0.0	31.437	6.007		Vel = 14.42		
733	0.0	2.635	4V	23.613	167.000	47.715				
to		120.0	1X	14.827	83.744	0.0				
6FL	164.21	0.0721	1T	16.474	250.744	18.079		Vel = 9.66		
			1S	19.22						
			1B	9.61						
6FL	0.0	4.26		0.0	10.330	65.794				
to		120.0		0.0	0.0	4.474				
5FL	164.21	0.0069		0.0	10.330	0.071		Vel = 3.70		
5FL	0.0	4.26		0.0	10.000	70.339				
to		120.0		0.0	0.0	4.331				
4FL	164.21	0.0070		0.0	10.000	0.070		Vel = 3.70		
4FL	0.0	4.26		0.0	10.000	74.740				
to		120.0		0.0	0.0	4.331				
3FL	164.21	0.0069		0.0	10.000	0.069		Vel = 3.70		
3FL	0.0	4.26		0.0	10.000	79.140				
to		120.0		0.0	0.0	4.331				
2FL	164.21	0.0070		0.0	10.000	0.070		Vel = 3.70		
2FL	0.0	4.26	2V	17.907	19.500	83.541				
to		120.0		0.0	17.907	4.582				
ST03	164.21	0.0070		0.0	37.407	0.260		Vel = 3.70		
ST03	0.0	6.357	1X	31.433	9.500	88.383				
to		120.0	1B	12.573	44.006	0.0				
ST02	164.21	0.0010		0.0	53.506	0.053		Vel = 1.66		
ST02	0.0	6.357		0.0	24.790	88.436				
to		120.0		0.0	0.0	0.0				
1FL	164.21	0.0010		0.0	24.790	0.024		Vel = 1.66		
1FL	50.00	6.357	1V	12.573	1.540	88.460		Qa = 50		
to		120.0		0.0	12.573	0.0				
TOR	214.21	0.0016		0.0	14.113	0.023		Vel = 2.17		
TOR	0.0	6.357	1X	31.433	9.670	88.483				
to		120.0		0.0	31.433	4.188				
BOR	214.21	0.0016		0.0	41.103	0.067		Vel = 2.17		
BOR	0.0	6.357	1V	12.573	2.000	92.738				
to		120.0		0.0	12.573	5.000		** Fixed Loss = 5		
SPG	214.21	0.0016		0.0	14.573	0.023		Vel = 2.17		
SPG	0.0	6.16	3E	60.252	210.000	97.761				
to		140.0	1T	43.037	107.593	0.866				
TEST	214.21	0.0014	1G	4.304	317.593	0.451		Vel = 2.31		
	50.00							Qa = 50.00		



# 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	*****
	264.21				99.078			K Factor = 26.54	

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