

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

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

Job Name : Courtyard by Marriott Area #4 Calc 5th Floor Guestroom  
Building : 6 of 8  
Location : Portland ME  
System : Area #4  
Contract : 4396CME  
Data File : 5th Floor Area #4 Guest Room Calc.WXF

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**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** Courtyard by Marriott  
**Location:** Portland ME  
**Drawing no:** 6 of 8  
**Date:** 6-5-13

**Design**

**Remote area number:** Area #4  
**Remote area location:** 5th 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:** 3  
**In-rack demand:** - GPM  
**Hose streams:** 100 - GPM  
**Total water required (including hose streams):** 187.30 - GPM @ 90.03 - 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.

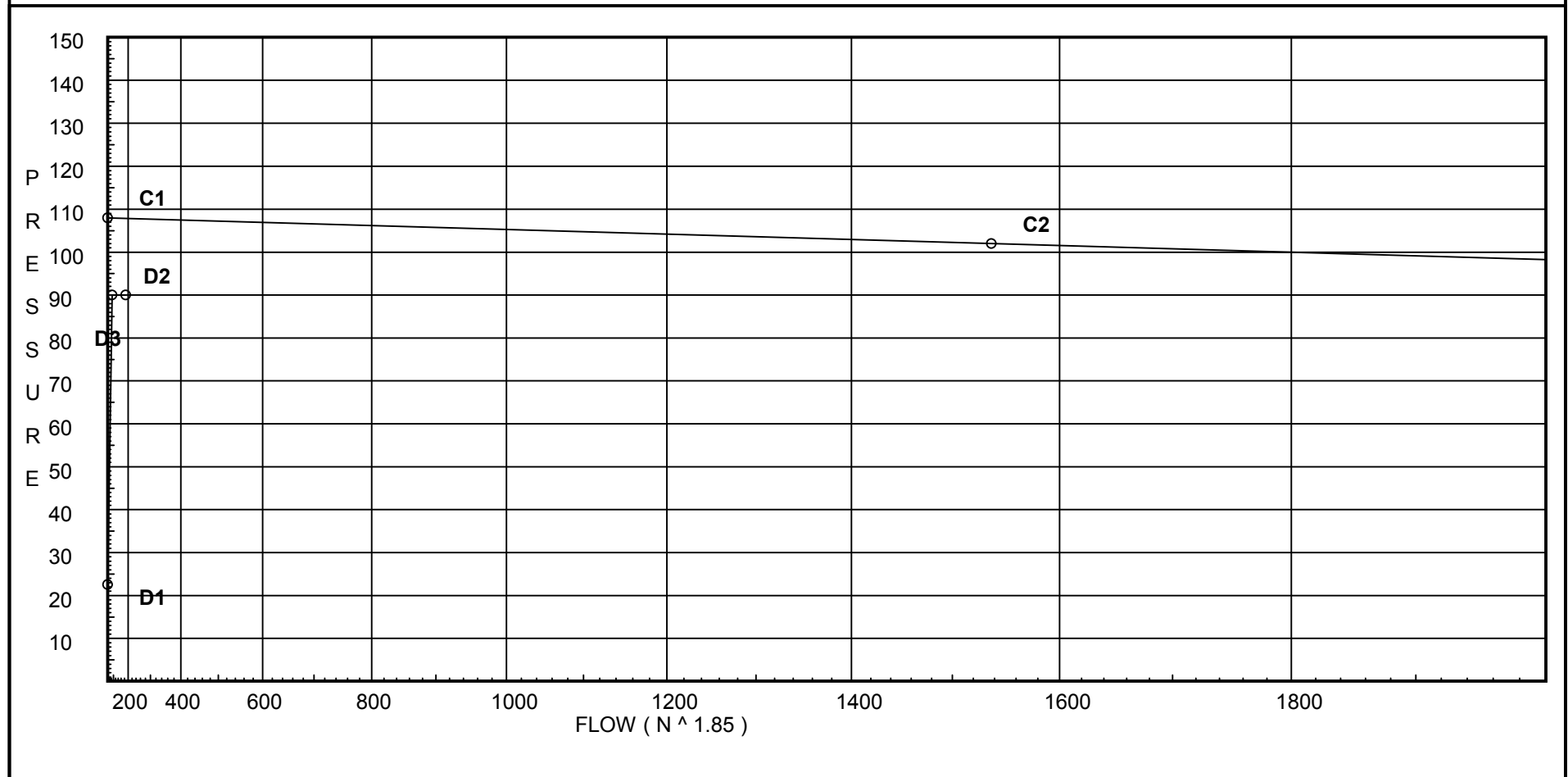
# Water Supply Curve C

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

Demand:  
D1 - Elevation : 22.521  
D2 - System Flow : 87.301  
D2 - System Pressure : 90.026  
Hose ( Demand ) : 100  
D3 - System Demand : 187.301  
Safety Margin : 17.852



# 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.
401	52.0	8	25.0	na	40.0	0.1	400	25.0
402	52.0	4.2	32.04	na	23.77	0.1	150	7.0
403	52.0	4.2	31.38	na	23.53	0.1	150	7.0
421	52.75		28.33	na				
422	52.75		33.57	na				
423	52.75		33.97	na				
626	52.75		41.95	na				
622	52.75		42.4	na				
623	52.75		43.28	na				
624	52.75		43.95	na				
627	52.75		44.61	na				
628	52.75		47.83	na				
5FL	52.25		61.98	na				
4FL	42.25		66.33	na				
3FL	32.25		70.68	na				
2FL	22.25		75.04	na				
ST03	11.67		79.7	na				
ST02	11.67		79.72	na				
1FL	11.67		79.72	na	50.0			
TOR	11.67		79.73	na				
BOR	2.0		83.95	na				
SPG	2.0		88.96	na				
TEST	0.0		90.03	na	50.0			

The maximum velocity is 18.73 and it occurs in the pipe between nodes 423 and 626

# Final Calculations - Hazen-Williams - 2007

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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	*****
401 to 421	40.00 40.0	1.049 120.0 0.4692	2E 4.0 0.0 0.0	3.790 4.000 7.790	25.000 -0.325 3.655		K Factor = 8.00 Vel = 14.85		
	0.0 40.00					28.330	K Factor = 7.52		
402 to 422	23.78 23.78	1.049 120.0 0.1792	1T 5.0 1E 2.0 0.0	3.330 7.000 10.330	32.044 -0.325 1.851		K Factor = 4.20 Vel = 8.83		
	0.0 23.78					33.570	K Factor = 4.10		
403 to 423	23.53 23.53	1.049 120.0 0.1757	2E 4.0 1T 5.0 0.0	7.630 9.000 16.630	31.376 -0.325 2.922		K Factor = 4.20 Vel = 8.73		
	0.0 23.53					33.973	K Factor = 4.04		
421 to 422	40.00 40.0	1.049 120.0 0.4691	0.0 0.0 0.0	11.170 0.0 11.170	28.330 0.0 5.240		Vel = 14.85		
422 to 423	23.78 63.78	1.38 120.0 0.2920	0.0 0.0 0.0	1.380 0.0 1.380	33.570 0.0 0.403		Vel = 13.68		
423 to 626	23.52 87.3	1.38 120.0 0.5228	1T 6.0 0.0 0.0	9.250 6.000 15.250	33.973 0.0 7.973		Vel = 18.73		
626 to 622	0.0 87.3	2.157 120.0 0.0594	0.0 0.0 0.0	7.580 0.0 7.580	41.946 0.0 0.450		Vel = 7.66		
622 to 623	0.0 87.3	2.157 120.0 0.0594	0.0 0.0 0.0	14.880 0.0 14.880	42.396 0.0 0.884		Vel = 7.66		
623 to 624	0.0 87.3	2.157 120.0 0.0594	0.0 0.0 0.0	11.250 0.0 11.250	43.280 0.0 0.668		Vel = 7.66		
624 to 627	0.0 87.3	2.157 120.0 0.0594	0.0 0.0 0.0	11.170 0.0 11.170	43.948 0.0 0.663		Vel = 7.66		
627 to 628	0.0 87.3	2.157 120.0 0.0594	1V 4.307 0.0 0.0	49.960 4.307 54.267	44.611 0.0 3.223		Vel = 7.66		
628 to 5FL	0.0 87.3	2.157 120.0 0.0594	4V 17.229 1X 10.461 1T 12.307 1S 13.537 1B 7.384	173.630 60.918 234.548	47.834 0.217 13.928		Vel = 7.66		
5FL to 4FL	0.0 87.3	4.26 120.0 0.0022	0.0 0.0 0.0	10.000 0.0 10.000	61.979 4.331 0.022		Vel = 1.97		
4FL to 3FL	0.0 87.3	4.26 120.0 0.0022	0.0 0.0 0.0	10.000 0.0 10.000	66.332 4.331 0.022		Vel = 1.97		

# 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	*****
3FL	0.0	4.26		0.0	10.000	70.685				
to		120.0		0.0	0.0	4.331				
2FL	87.3	0.0021		0.0	10.000	0.021		Vel =	1.97	
2FL	0.0	4.26	2V	17.907	19.500	75.037				
to		120.0		0.0	17.907	4.582				
ST03	87.3	0.0022		0.0	37.407	0.081		Vel =	1.97	
ST03	0.0	6.357	1X	31.433	9.500	79.700				
to		120.0	1B	12.573	44.006	0.0				
ST02	87.3	0.0003		0.0	53.506	0.017		Vel =	0.88	
ST02	0.0	6.357		0.0	24.790	79.717				
to		120.0		0.0	0.0	0.0				
1FL	87.3	0.0003		0.0	24.790	0.007		Vel =	0.88	
1FL	50.00	6.357	1V	12.573	1.540	79.724		Qa =	50	
to		120.0		0.0	12.573	0.0				
TOR	137.3	0.0007		0.0	14.113	0.010		Vel =	1.39	
TOR	0.0	6.357	1X	31.433	9.670	79.734				
to		120.0		0.0	31.433	4.188				
BOR	137.3	0.0007		0.0	41.103	0.030		Vel =	1.39	
BOR	0.0	6.357	1V	12.573	2.000	83.952				
to		120.0		0.0	12.573	5.000		** Fixed Loss =	5	
SPG	137.3	0.0007		0.0	14.573	0.010		Vel =	1.39	
SPG	0.0	6.16	3E	60.252	210.000	88.962				
to		140.0	1T	43.037	107.593	0.866				
TEST	137.3	0.0006	1G	4.304	317.593	0.198		Vel =	1.48	
	50.00							Qa =	50.00	
	187.30					90.026		K Factor =	19.74	