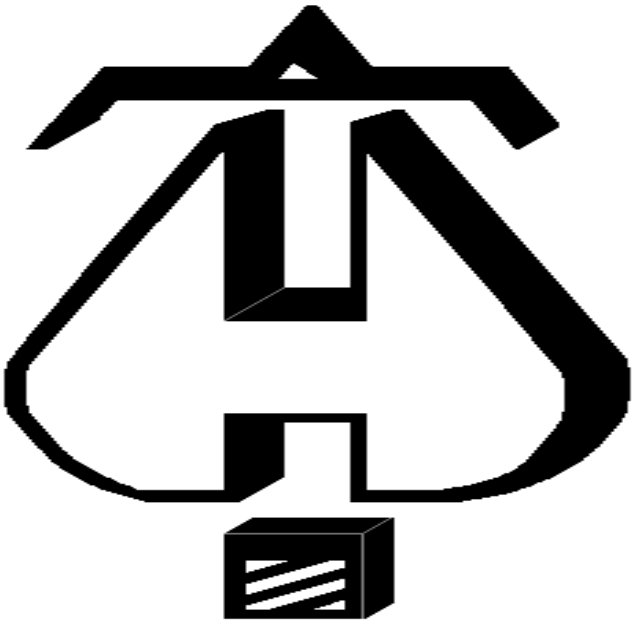


. . . Fire Protection by Computer Design

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

Job Name	:	Courtyard by Marriott Area #3 Calc Laundry Area
Building	:	3 of 8
Location	:	Portland ME
System	:	Area #3
Contract	:	4396CME
Data File	:	2nd Floor Area #3 Laudry Area Calc.WXF

HYDRAULIC CALCULATIONS
for

Project name: Courtyard by Marriott
Location: Portland ME
Drawing no: 3 of 8
Date: 6-5-13

Design

Remote area number: Area #3
Remote area location: 2nd Floor Laundry Room
Occupancy classification: Light Hazard/Ordinary Hazard I
Density: .10/.15 - Gpm/SqFt
Area of application: 900 - SqFt
Coverage per sprinkler: Varies - SqFt
Type of sprinklers calculated: QR Recessed Pendent
No. of sprinklers calculated: 12
In-rack demand: - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 468.24 - GPM @ 79.81 - 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 less than 10'-0"

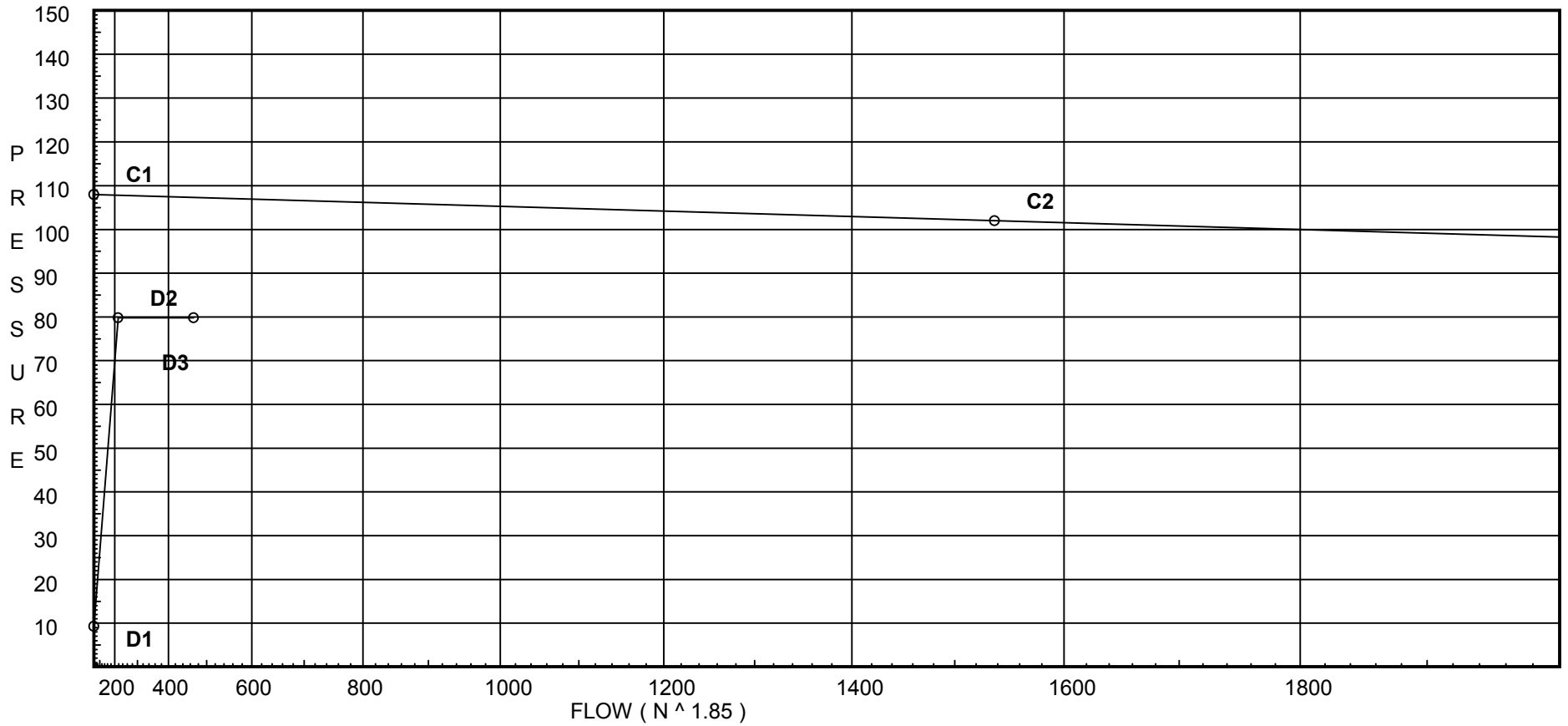
Water Supply Curve C

Hampshire Fire Protection
Courtyard by Marriott Area #3 Calc Laundry Area

Date 6-4-13

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

Demand:
- D1 - Elevation : 9.312
- D2 - System Flow : 218.244
- D2 - System Pressure : 79.805
- Hose (Demand) : 250
- D3 - System Demand : 468.244
- Safety Margin : 27.529



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
301	21.5	5.6	7.17	na	15.0	0.1	150	7.0
302	21.5	5.6	7.46	na	15.29	0.1	150	7.0
303	21.5	5.6	10.72	na	18.33	0.1	150	7.0
304	21.5	5.6	15.69	na	22.18	0.1	150	7.0
305	21.5	5.6	8.62	na	16.44	0.1	150	7.0
306	21.5	5.6	9.71	na	17.45	0.1	150	7.0
307	21.5	5.6	12.26	na	19.61	0.1	150	7.0
308	22.0	5.6	13.3	na	20.42	0.15	110	7.0
309	22.0	5.6	14.28	na	21.16	0.15	110	7.0
310	22.0	5.6	8.47	na	16.3	0.15	100	7.0
311	22.0	5.6	8.96	na	16.76	0.15	100	7.0
312	22.0	5.6	11.87	na	19.29	0.15	100	7.0
321	22.0		7.37	na				
322	22.75		7.58	na				
323	22.75		11.14	na				
324	22.75		16.53	na				
325	22.0		8.86	na				
326	22.75		10.05	na				
327	22.75		12.81	na				
328	22.75		13.35	na				
329	22.75		14.79	na				
330	22.75		8.39	na				
331	22.75		9.18	na				
332	22.75		11.64	na				
333	22.75		19.67	na				
334	22.75		19.68	na				
335	22.75		19.92	na				
336	22.75		20.04	na				
337	22.75		31.8	na				
338	22.75		52.89	na				
2FL	22.25		63.43	na				
ST03	11.67		68.45	na				
ST02	11.67		68.54	na				
1FL	11.67		68.58	na	100.0			
TOR	11.67		68.63	na				
BOR	2.0		72.95	na				
SPG	2.0		78.0	na				
TEST	0.0		79.81	na	150.0			

The maximum velocity is 19.86 and it occurs in the pipe between nodes 327 and 333

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
301	15.00	1.049	2E	4.0	1.380	7.175		K Factor = 5.60
to		120.0		0.0	4.000	-0.217		
321	15.0	0.0764		0.0	5.380	0.411		Vel = 5.57
	0.0							
	15.00					7.369		K Factor = 5.53
302	15.29	1.049	1E	2.0	1.380	7.457		K Factor = 5.60
to		120.0	1T	5.0	7.000	-0.541		
322	15.29	0.0792		0.0	8.380	0.664		Vel = 5.68
	0.0							
	15.29					7.580		K Factor = 5.55
303	18.33	1.049	1E	2.0	1.750	10.717		K Factor = 5.60
to		120.0	1T	5.0	7.000	-0.541		
323	18.33	0.1107		0.0	8.750	0.969		Vel = 6.80
	0.0							
	18.33					11.145		K Factor = 5.49
304	22.18	1.049	1E	2.0	1.750	15.693		K Factor = 5.60
to		120.0	1T	5.0	7.000	-0.541		
324	22.18	0.1576		0.0	8.750	1.379		Vel = 8.23
	0.0							
	22.18					16.531		K Factor = 5.46
305	16.44	1.049	2E	4.0	1.000	8.622		K Factor = 5.60
to		120.0		0.0	4.000	-0.217		
325	16.44	0.0906		0.0	5.000	0.453		Vel = 6.10
	0.0							
	16.44					8.858		K Factor = 5.52
306	17.45	1.049	1E	2.0	1.750	9.707		K Factor = 5.60
to		120.0	1T	5.0	7.000	-0.541		
326	17.45	0.1011		0.0	8.750	0.885		Vel = 6.48
	0.0							
	17.45					10.051		K Factor = 5.50
307	19.61	1.049	1E	2.0	1.750	12.257		K Factor = 5.60
to		120.0	1T	5.0	7.000	-0.541		
327	19.61	0.1254		0.0	8.750	1.097		Vel = 7.28
	0.0							
	19.61					12.813		K Factor = 5.48
308	20.42	1.049	1E	2.0	0.750	13.302		K Factor = 5.60
to		120.0		0.0	2.000	-0.325		
328	20.42	0.1353		0.0	2.750	0.372		Vel = 7.58
	0.0							
	20.42					13.349		K Factor = 5.59
309	21.16	1.049	1T	5.0	0.750	14.281		K Factor = 5.60
to		120.0		0.0	5.000	-0.325		
329	21.16	0.1445		0.0	5.750	0.831		Vel = 7.86
	0.0							
	21.16					14.787		K Factor = 5.50
310	16.30	1.049	1E	2.0	0.750	8.469		K Factor = 5.60
to		120.0		0.0	2.000	-0.325		
330	16.3	0.0891		0.0	2.750	0.245		Vel = 6.05

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
	0.0							
	16.30					8.389		K Factor = 5.63
311	16.76	1.049	1T	5.0	0.750	8.961		K Factor = 5.60
to		120.0		0.0	5.000	-0.325		
331	16.76	0.0939		0.0	5.750	0.540		Vel = 6.22
	0.0							
	16.76					9.176		K Factor = 5.53
312	19.29	1.049		0.0	0.750	11.869		K Factor = 5.60
to		120.0		0.0	0.0	-0.325		
332	19.29	0.1213		0.0	0.750	0.091		Vel = 7.16
	0.0							
	19.29					11.635		K Factor = 5.66
321	15.00	1.049		0.0	7.000	7.369		
to		120.0		0.0	0.0	-0.325		
322	15.0	0.0766		0.0	7.000	0.536		Vel = 5.57
322	15.29	1.049	2E	4.0	8.710	7.580		
to		120.0		0.0	4.000	0.0		
323	30.29	0.2805		0.0	12.710	3.565		Vel = 11.24
323	18.33	1.049		0.0	8.000	11.145		
to		120.0		0.0	0.0	0.0		
324	48.62	0.6732		0.0	8.000	5.386		Vel = 18.05
324	22.19	1.38	1T	6.0	3.540	16.531		
to		120.0		0.0	6.000	0.0		
335	70.81	0.3548		0.0	9.540	3.385		Vel = 15.19
	0.0							
	70.81					19.916		K Factor = 15.87
325	16.44	1.049	2E	4.0	12.750	8.858		
to		120.0		0.0	4.000	-0.325		
326	16.44	0.0906		0.0	16.750	1.518		Vel = 6.10
326	17.45	1.049		0.0	8.000	10.051		
to		120.0		0.0	0.0	0.0		
327	33.89	0.3452		0.0	8.000	2.762		Vel = 12.58
327	19.61	1.049	1T	5.0	3.540	12.813		
to		120.0		0.0	5.000	0.0		
333	53.5	0.8033		0.0	8.540	6.860		Vel = 19.86
	0.0							
	53.50					19.673		K Factor = 12.06
328	20.42	1.049		0.0	10.630	13.349		
to		120.0		0.0	0.0	0.0		
329	20.42	0.1353		0.0	10.630	1.438		Vel = 7.58
329	21.17	1.049	1T	5.0	5.420	14.787		
to		120.0		0.0	5.000	0.0		
336	41.59	0.5041		0.0	10.420	5.253		Vel = 15.44
	0.0							
	41.59					20.040		K Factor = 9.29
330	16.30	1.049		0.0	8.830	8.389		
to		120.0		0.0	0.0	0.0		
331	16.3	0.0891		0.0	8.830	0.787		Vel = 6.05

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
331	16.76	1.049		0.0	7.460	9.176		
to		120.0		0.0	0.0	0.0		
332	33.06	0.3296		0.0	7.460	2.459		Vel = 12.27
332	19.29	1.049	1T	5.0	5.420	11.635		
to		120.0		0.0	5.000	0.0		
334	52.35	0.7719		0.0	10.420	8.043		Vel = 19.43
	0.0							
	52.35					19.678		K Factor = 11.80
333	53.50	2.635		0.0	0.540	19.673		
to		120.0		0.0	0.0	0.0		
334	53.5	0.0093		0.0	0.540	0.005		Vel = 3.15
334	52.35	2.635		0.0	7.460	19.678		
to		120.0		0.0	0.0	0.0		
335	105.85	0.0319		0.0	7.460	0.238		Vel = 6.23
335	70.81	2.635		0.0	1.500	19.916		
to		120.0		0.0	0.0	0.0		
336	176.66	0.0827		0.0	1.500	0.124		Vel = 10.39
336	41.58	2.635	1V	5.903	90.460	20.040		
to		120.0		0.0	5.903	0.0		
337	218.24	0.1220		0.0	96.363	11.760		Vel = 12.84
337	0.0	2.635	1X	14.827	157.960	31.800		
to		120.0		0.0	14.827	0.0		
338	218.24	0.1220		0.0	172.787	21.087		Vel = 12.84
338	0.0	2.635	4V	23.613	15.670	52.887		
to		120.0	1T	16.474	68.917	0.217		
2FL	218.24	0.1220	1S	19.22	84.587	10.322		Vel = 12.84
			1B	9.61				
2FL	0.0	4.26	2V	17.907	19.500	63.426		
to		120.0		0.0	17.907	4.582		
ST03	218.24	0.0118		0.0	37.407	0.440		Vel = 4.91
ST03	0.0	6.357	1X	31.433	9.500	68.448		
to		120.0	1B	12.573	44.006	0.0		
ST02	218.24	0.0017		0.0	53.506	0.090		Vel = 2.21
ST02	0.0	6.357		0.0	24.790	68.538		
to		120.0		0.0	0.0	0.0		
1FL	218.24	0.0017		0.0	24.790	0.041		Vel = 2.21
1FL	100.00	6.357	1V	12.573	1.540	68.579		Qa = 100
to		120.0		0.0	12.573	0.0		
TOR	318.24	0.0034		0.0	14.113	0.048		Vel = 3.22
TOR	0.0	6.357	1X	31.433	9.670	68.627		
to		120.0		0.0	31.433	4.188		
BOR	318.24	0.0034		0.0	41.103	0.138		Vel = 3.22
BOR	0.0	6.357	1V	12.573	2.000	72.953		
to		120.0		0.0	12.573	5.000		* * Fixed Loss = 5
SPG	318.24	0.0034		0.0	14.573	0.049		Vel = 3.22
SPG	0.0	6.16	3E	60.252	210.000	78.002		
to		140.0	1T	43.037	107.593	0.866		
TEST	318.24	0.0030	1G	4.304	317.593	0.937		Vel = 3.43

Final Calculations - Hazen-Williams

Hampshire Fire Protection
Courtyard by Marriott Area #3 Calc Laundry Area

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		
	468.24				79.805		K Factor = 52.41		