



... Fire Protection by Computer Design

HIGH TECH FIRE PROTECTION
84 HACKETT MILLS ROAD
P.O. BOX 156
POLAND, ME 04274
207-998-2551

Job Name : 420 FORE STREET LOFT/UPRIGHT CALC
Drawing :
Location : 420 Fore Street Portland Maine
Remote Area : 2
Contract :
Data File : UPRIGHT CALCS.WXF

HYDRAULIC CALCULATIONS
for

Project name: 420 Fore Street Loft/Upright Calc
Location: 420 Fore Street Portland Maine
Drawing no:
Date: 5/22/2015

Design

Remote area number: 2
Remote area location: South Loft
Occupancy classification: Light
Density: .1 - Gpm/SqFt
Area of application: 650 - SqFt
Coverage per sprinkler: 196 - SqFt
Type of sprinklers calculated: Residential
No. of sprinklers calculated: 9
In-rack demand: - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 277 - GPM @ 88 - Psi
Type of system: Wet System
Volume of dry or preaction system: 0 - Gal

Water supply information

Date: 05-11-2013
Location: Corner Of Union Street And Fore Street
Source: Portland Water District

Name of contractor: HIGH TECH FIRE PROTECTION
Address: P.O. BOX 156 / / MINOT, ME 04258
Phone number: 207-998-2551
Name of designer: Ed Pennell
Authority having jurisdiction: State of Maine / Portland Fire Department
Notes: (Include peaking information or gridded systems here.)

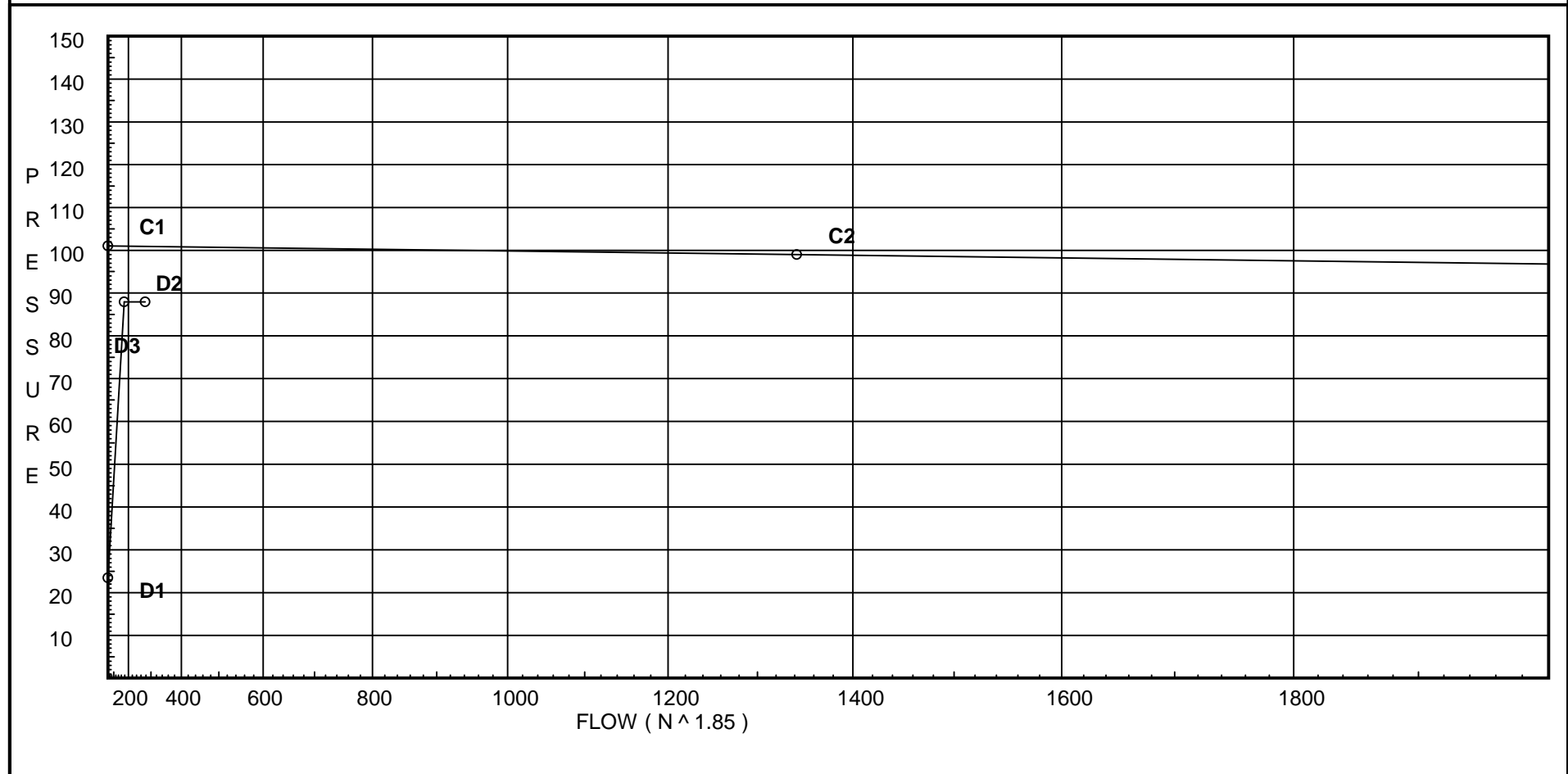
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 101
C2 - Residual Pressure: 99
C2 - Residual Flow : 1342

Demand:
D1 - Elevation : 23.496
D2 - System Flow : 176.699
D2 - System Pressure : 87.921
Hose (Demand) : 100
D3 - System Demand : 276.699
Safety Margin : 12.971



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
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
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
Zac	Ames 2000SS	Fitting generates a Fixed Loss Based on Flow																			

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.
B1	54.25	5.6	12.25	na	19.6	0.1	196	7.0
B2	53.25		13.81	na				
B3	56.0	5.6	13.75	na	20.76	0.1	196	7.0
B4	56.0	5.6	17.09	na	23.15	0.1	196	7.0
B5	56.0		23.71	na				
B6	56.0		26.03	na				
B11	54.25	5.6	12.71	na	19.97	0.1	196	7.0
B13	54.25	5.6	13.17	na	20.32	0.1	196	7.0
B12	53.25		14.62	na				
B14	56.0		15.91	na				
B10	56.0	5.6	17.45	na	23.39	0.1	196	7.0
B9	56.0	5.6	18.49	na	24.08	0.1	196	7.0
B15	56.0	5.6	20.61	na	25.43	0.1	196	7.0
B8	56.0		24.5	na				
B7	43.5		34.62	na				
B16	37.0		39.3	na				
B17	37.0		43.74	na				
C1	23.11		55.78	na				
C2	14.5		60.56	na				
C3	6.4		65.14	na				
C4	6.4		66.37	na				
C5	5.75		70.03	na				
C6	5.75		70.57	na				
TOR	2.0		80.16	na				
BOR	2.0		83.7	na				
H1	10.0		81.08	na				
H2	10.0		82.42	na				
H3	10.0		82.49	na				
H4	10.0		83.24	na	100.0			
TEST	0.0		87.92	na				

The maximum velocity is 24.28 and it occurs in the pipe between nodes B15 and B8

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftn'g's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
B1 to B2	19.60 19.6	1.049 120.0 0.1253	2E	4.0 0.0	5.000 4.000 9.000	12.250 0.433 1.128			K Factor = 5.60 Vel = 7.28	
B2 to B3	0.0 19.6	1.049 120.0 0.1253	2E	4.0 0.0	5.000 4.000 9.000	13.811 -1.191 1.128			K Factor = 5.60 Vel = 7.28	
B3 to B4	20.76 40.36	1.049 120.0 0.4771	1E	2.0 0.0	5.000 2.000 7.000	13.748 0.0 3.340			K Factor = 5.60 Vel = 14.98	
B4 to B5	23.15 63.51	1.049 120.0 1.1035		0.0 0.0	6.000 0.0 6.000	17.088 0.0 6.621			K Factor = 5.60 Vel = 23.58	
B5 to B6	0.0 63.51	1.38 120.0 0.2902		0.0 0.0	8.000 0.0 8.000	23.709 0.0 2.322			Vel = 13.62	
B6 to B7	0.0 63.51	1.61 120.0 0.1370	1T 1E	8.0 4.0 0.0	11.200 12.000 23.200	26.031 5.414 3.178			Vel = 10.01	
	0.0 63.51					34.623			K Factor = 10.79	
B11 to B12	19.97 19.97	1.049 120.0 0.1297	1T	5.0 0.0	6.400 5.000 11.400	12.713 0.433 1.479			K Factor = 5.60 Vel = 7.41	
	0.0 19.97					14.625			K Factor = 5.22	
B13 to B12	20.32 20.32	1.049 120.0 0.1341	1T	5.0 0.0	2.600 5.000 7.600	13.173 0.433 1.019			K Factor = 5.60 Vel = 7.54	
B12 to B14	19.97 40.29	1.049 120.0 0.4754	2E	4.0 0.0	1.200 4.000 5.200	14.625 -1.191 2.472			Vel = 14.96	
B14 to B15	0.0 40.29	1.049 120.0 0.4756	1T	5.0 0.0	4.900 5.000 9.900	15.906 0.0 4.708			Vel = 14.96	
	0.0 40.29					20.614			K Factor = 8.87	
B10 to B9	23.39 23.39	1.049 120.0 0.1740		0.0 0.0	6.000 0.0 6.000	17.445 0.0 1.044			K Factor = 5.60 Vel = 8.68	
B9 to B15	24.08 47.47	1.049 120.0 0.6439		0.0 0.0	3.300 0.0 3.300	18.489 0.0 2.125			K Factor = 5.60 Vel = 17.62	
B15 to B8	65.72 113.19	1.38 120.0 0.8450		0.0 0.0	4.600 0.0 4.600	20.614 0.0 3.887			K Factor = 5.60 Vel = 24.28	
B8 to B7	0.0 113.19	1.61 120.0 0.3990	1T	8.0 0.0	3.800 8.000 11.800	24.501 5.414 4.708			Vel = 17.84	

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftn'g's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 113.19						34.623		K Factor = 19.24	
B7 to B16	176.70 176.7	2.157 120.0 0.2188		0.0	8.500 0.0 8.500	34.623 2.815 1.860			Vel = 15.51	
B16 to B17	0.0 176.7	2.157 120.0 0.2189	1T	12.307 0.0	8.000 12.307 20.307	39.298 0.0 4.445			Vel = 15.51	
B17 to C1	0.0 176.7	2.469 120.0 0.1134	3E	18.0 0.0	35.100 18.000 53.100	43.743 6.016 6.019			Vel = 11.84	
C1 to C2	0.0 176.7	2.635 120.0 0.0826		0.0	12.750 0.0 12.750	55.778 3.729 1.053			Vel = 10.40	
C2 to C3	0.0 176.7	2.635 120.0 0.0825		0.0	13.000 0.0 13.000	60.560 3.508 1.073			Vel = 10.40	
C3 to C4	0.0 176.7	2.635 120.0 0.0826	1V	5.903 0.0	9.000 5.903 14.903	65.141 0.0 1.231			Vel = 10.40	
C4 to C5	0.0 176.7	2.635 120.0 0.0826	2V	11.807 0.0	29.100 11.807 40.907	66.372 0.282 3.377			Vel = 10.40	
C5 to C6	0.0 176.7	2.635 120.0 0.0826	1V	5.903 0.0	0.670 5.903 6.573	70.031 0.0 0.543			Vel = 10.40	
C6 to TOR	0.0 176.7	2.635 120.0 0.0826	1V 1T 1B 1Fsp	5.903 16.474 9.61 0.0	28.100 31.987 60.087 0.0	70.574 4.624 4.962 0.0			* Fixed loss = 3 Vel = 10.40	
TOR to BOR	0.0 176.7	2.635 120.0 0.0826	1E 1Zac	8.237 0.0	3.000 8.237 11.237	80.160 2.615 0.928			* Fixed loss = 2.615 Vel = 10.40	
BOR to H1	0.0 176.7	2.635 120.0 0.0825	1E	8.237 0.0	2.000 8.237 10.237	83.703 -3.465 0.845			Vel = 10.40	
H1 to H2	0.0 176.7	2.635 120.0 0.0826	1E	8.237 0.0	8.000 8.237 16.237	81.083 0.0 1.341			Vel = 10.40	
H2 to H3	0.0 176.7	6.14 100.0 0.0019	1T	22.732 0.0	15.000 22.732 37.732	82.424 0.0 0.071			Vel = 1.91	
H3 to H4	0.0 176.7	6.14 100.0 0.0019	1T	22.732 0.0	375.000 22.732 397.732	82.495 0.0 0.747			Vel = 1.91	
H4 to TEST	100.00 276.7	6.14 100.0 0.0043	1E 1G 1T	10.608 2.273 22.732	45.000 35.613 80.613	83.242 4.331 0.348			Qa = 100 Vel = 3.00	

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	*****
	0.0 276.70				87.921			K Factor = 29.51	