



... 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, Second Floor #4
Drawing : FP-01
Location : 420 Fore Street Portland Maine
Remote Area : 4
Contract :
Data File : SECOND FLOOR.WXF

HYDRAULIC CALCULATIONS
for

Project name: 420 Fore Street Second Floor
Location: 420 Fore Street Portland Maine
Drawing no: FP-01
Date: 5/22/2015

Design

Remote area number: 4
Remote area location: Second Floor
Occupancy classification: Light Hazard
Density: .1 - Gpm/SqFt
Area of application: 1000 - SqFt
Coverage per sprinkler: 144 - SqFt
Type of sprinklers calculated: Commercial
No. of sprinklers calculated: 15
In-rack demand: N/A - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 394 - GPM @ 96 - 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.)

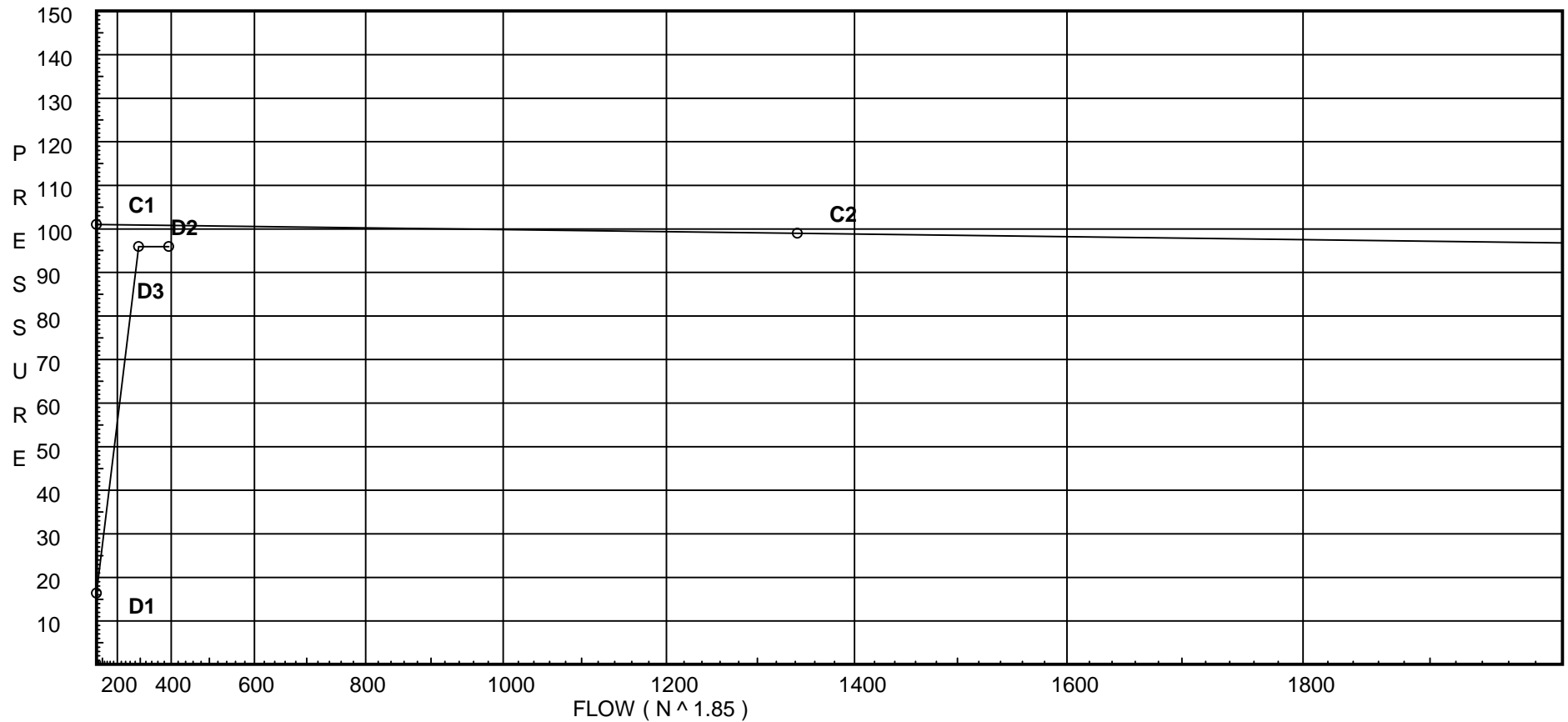
Water Supply Curve (C)

HIGH TECH FIRE PROTECTION
420 Fore Street, Second Floor #4

Page 2
Date 5/12/2015

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

Demand:
D1 - Elevation : 16.350
D2 - System Flow : 293.498
D2 - System Pressure : 95.943
Hose (Demand) : 100
D3 - System Demand : 393.498
Safety Margin : 4.850



Fittings Used Summary

HIGH TECH FIRE PROTECTION
420 Fore Street, Second Floor #4

Page 3
Date 5/12/2015

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
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

HIGH TECH FIRE PROTECTION
420 Fore Street, Second Floor #4

Page 4
Date 5/12/2015

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
D2	37.75	5.6	10.2	na	17.89	0.1	144	7.0
D3	37.75	5.6	11.1	na	18.66	0.1	144	7.0
D16	37.25		14.1	na				
D1	37.75	5.6	7.16	na	14.99	0.1	144	7.0
D1A	37.75		7.6	na				
D1B	37.75	5.6	7.87	na	15.71	0.1	144	7.0
D4	37.75	5.6	8.66	na	16.48	0.1	144	7.0
D5	37.75		13.96	na				
D18	37.25		15.29	na				
D9	37.75	5.6	7.0	na	14.82	0.1	144	7.0
D8	37.75	5.6	7.75	na	15.59	0.1	144	7.0
D6	37.75	5.6	11.43	na	18.93	0.1	144	7.0
D7	37.75	5.6	12.94	na	20.15	0.1	144	7.0
D20	37.25		15.44	na				
D10	37.75	5.6	11.75	na	19.19	0.1	144	7.0
D11	37.75	5.6	12.47	na	19.77	0.1	144	7.0
D22	37.25		15.22	na				
D14	37.25	5.6	21.58	na	26.01	0.1	144	7.0
D15	37.25	5.6	21.2	na	25.78	0.1	144	7.0
D17	37.25		16.28	na				
D19	37.25		16.38	na				
D21	37.25		16.82	na				
D23	37.25	5.6	17.67	na	23.54	0.1	144	7.0
D12	37.25	5.6	21.52	na	25.98	0.1	144	7.0
D13	37.25		22.45	na				
D14B	37.25		23.01	na				
C1	27.7		33.58	na				
C2	14.5		41.3	na				
C3	6.4		47.59	na				
C4	6.4		50.74	na				
C5	5.75		59.66	na				
C6	5.75		61.05	na				
TOR	2.0		78.36	na				
BOR	2.0		86.73	na				
H1	10.0		85.42	na				
H2	10.0		88.85	na				
H3	10.0		89.03	na				
H4	10.0		90.95	na	100.0			
TEST	0.0		95.94	na				

The maximum velocity is 17.51 and it occurs in the pipe between nodes D4 and D5

Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION
420 Fore Street, Second Floor #4

Page 5
Date 5/12/2015

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
D2 to D3	17.89	1.049 120.0		0.0	8.500	10.205 0.0			K Factor = 5.60	
D3 to D16	17.89	0.1059 120.0		0.0	8.500	0.900			Vel = 6.64	
D3 to D16	18.66	1.049 120.0	1E	2.0	5.000	11.105 2.000			K Factor = 5.60	
D16 to D17	36.55	0.3969 120.0		0.0	7.000	2.778			Vel = 13.57	
D16 to D17	0.0	1.049 120.0	1T	5.0	0.500	14.100 0.0				
	36.55	0.3971		0.0	5.500	2.184			Vel = 13.57	
	0.0 36.55					16.284			K Factor = 9.06	
D1 to D1A	14.99	1.049 120.0	2E	4.0	1.750	7.163 0.0			K Factor = 5.60	
D1A to D1B	14.99	0.0763 120.0		0.0	5.750	0.439			Vel = 5.56	
D1A to D1B	0.0	1.049 120.0	1E	2.0	1.500	7.602 0.0				
D1B to D4	14.99	0.0763 120.0		0.0	3.500	0.267			Vel = 5.56	
D1B to D4	15.71	1.049 120.0		0.0	2.750	7.869 0.0			K Factor = 5.60	
D4 to D5	30.7	0.2876 120.0		0.0	2.750	0.791			Vel = 11.40	
D4 to D5	16.48	1.049 120.0		0.0	8.330	8.660 0.0			K Factor = 5.60	
D5 to D18	47.18	0.6366 120.0		0.0	8.330	5.303			Vel = 17.51	
D5 to D18	0.0	1.38 120.0	1E	3.0	3.660	13.963 0.217				
D18 to D19	47.18	0.1674 120.0		0.0	6.660	1.115			Vel = 10.12	
D18 to D19	0.0	1.38 120.0	1T	6.0	0.500	15.295 0.0				
	47.18	0.1674		0.0	6.500	1.088			Vel = 10.12	
	0.0 47.18					16.383			K Factor = 11.66	
D9 to D8	14.82	1.049 120.0		0.0	10.100	7.000 0.0			K Factor = 5.60	
D8 to D6	14.82	0.0747 120.0		0.0	10.100	0.754			Vel = 5.50	
D8 to D6	15.59	1.049 120.0	1E	2.0	6.000	7.754 0.0			K Factor = 5.60	
D6 to D7	30.41	0.2825 120.0	1T	5.0	7.000	3.673			Vel = 11.29	
D6 to D7	18.93	1.38 120.0		0.0	8.330	11.427 0.0			K Factor = 5.60	
D7 to D20	49.34	0.1820 120.0		0.0	8.330	1.516			Vel = 10.58	
D7 to D20	20.15	1.38 120.0	1E	3.0	3.660	12.943 0.217			K Factor = 5.60	
D20 to D21	69.49	0.3426 120.0		0.0	6.660	2.282			Vel = 14.91	
D20 to D21	0.0	1.61 120.0	1T	8.0	0.500	15.442 0.0				
	69.49	0.1618		0.0	8.500	1.375			Vel = 10.95	
	0.0 69.49					16.817			K Factor = 16.95	

Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION
420 Fore Street, Second Floor #4

Page 6
Date 5/12/2015

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
D10 to D11	19.19	1.049 120.0		0.0	6.000	11.746 0.0			K Factor = 5.60	
D11 to D22	19.19	0.1205		0.0	6.000	0.723			Vel = 7.12	
D11 to D22	19.78	1.049 120.0	1E	2.0	3.660	12.469 0.217			K Factor = 5.60	
D22 to D23	38.97	0.4468		0.0	5.660	2.529			Vel = 14.47	
D22 to D23	0.0	1.049 120.0	1T	5.0	0.500	15.215 0.0				
	38.97	0.4471		0.0	5.500	2.459			Vel = 14.47	
	0.0 38.97					17.674			K Factor = 9.27	
D14 to D14B	26.01	1.049 120.0	1T	5.0	1.750	21.578 0.0			K Factor = 5.60	
	26.01	0.2117		0.0	6.750	1.429			Vel = 9.66	
	0.0 26.01					23.007			K Factor = 5.42	
D15 to D14B	25.78	1.049 120.0	1T	5.0	3.700	21.196 0.0			K Factor = 5.60	
	25.78	0.2082		0.0	8.700	1.811			Vel = 9.57	
	0.0 25.78					23.007			K Factor = 5.37	
D17 to D19	36.55	2.157 120.0		0.0	8.330	16.284 0.0				
	36.55	0.0119		0.0	8.330	0.099			Vel = 3.21	
D19 to D21	47.18	2.157 120.0		0.0	7.900	16.383 0.0				
	83.73	0.0549		0.0	7.900	0.434			Vel = 7.35	
D21 to D23	69.49	2.635 120.0		0.0	13.500	16.817 0.0				
	153.22	0.0635		0.0	13.500	0.857			Vel = 9.01	
D23 to D12	62.50	2.635 120.0	3V	17.71	14.500	17.674 0.0			K Factor = 5.60	
	215.72	0.1194		0.0	32.210	3.847			Vel = 12.69	
D12 to D13	25.98	2.635 120.0		0.0	6.330	21.521 0.0			K Factor = 5.60	
	241.7	0.1474		0.0	6.330	0.933			Vel = 14.22	
D13 to D14B	0.0	2.635 120.0		0.0	3.750	22.454 0.0				
	241.7	0.1475		0.0	3.750	0.553			Vel = 14.22	
D14B to C1	51.80	2.635 120.0	1V 1X	5.903 14.827	9.750 20.730	23.007 4.136				
	293.5	0.2111		0.0	30.480	6.435			Vel = 17.27	
	0.0 293.50					33.578			K Factor = 50.65	
C1 to C2	293.50	2.635 120.0		0.0	9.500	33.578 5.717				
	293.5	0.2111		0.0	9.500	2.005			Vel = 17.27	

Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION
420 Fore Street, Second Floor #4

Page 7
Date 5/12/2015

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
C2 to C3	0.0 293.5	2.635 120.0 0.2111		0.0 0.0 0.0	13.200 0.0 13.200	41.300 3.508 2.787			Vel = 17.27	
C3 to C4	0.0 293.5	2.635 120.0 0.2111	1V	5.903 0.0 0.0	9.000 5.903 14.903	47.595 0.0 3.146			Vel = 17.27	
C4 to C5	0.0 293.5	2.635 120.0 0.2111	2V	11.807 0.0 0.0	29.100 11.807 40.907	50.741 0.282 8.636			Vel = 17.27	
C5 to C6	0.0 293.5	2.635 120.0 0.2110	1V	5.903 0.0 0.0	0.670 5.903 6.573	59.659 0.0 1.387			Vel = 17.27	
C6 to TOR	0.0 293.5	2.635 120.0 0.2111	1V 1T 1B 1Fsp	5.903 16.474 9.61 0.0	28.100 31.987 60.087	61.046 4.624 12.686		* Fixed loss = 3 Vel = 17.27		
TOR to BOR	0.0 293.5	2.635 120.0 0.2111	1E	8.237 0.0 0.0	3.000 8.237 11.237	78.356 6.000 2.372		* Fixed loss = 6 Vel = 17.27		
BOR to H1	0.0 293.5	2.635 120.0 0.2111	1E	8.237 0.0 0.0	2.000 8.237 10.237	86.728 -3.465 2.161		Vel = 17.27		
H1 to H2	0.0 293.5	2.635 120.0 0.2111	1E	8.237 0.0 0.0	8.000 8.237 16.237	85.424 0.0 3.428		Vel = 17.27		
H2 to H3	0.0 293.5	6.14 100.0 0.0048	1T	22.732 0.0 0.0	15.000 22.732 37.732	88.852 0.0 0.182		Vel = 3.18		
H3 to H4	0.0 293.5	6.14 100.0 0.0048	1T	22.732 0.0 0.0	375.000 22.732 397.732	89.034 0.0 1.911		Vel = 3.18		
H4 to TEST	100.00 393.5	6.14 100.0 0.0083	1E 1G 1T	10.608 2.273 22.732	45.000 35.613 80.613	90.945 4.331 0.667		Qa = 100 Vel = 4.26		
	0.0 393.50					95.943		K Factor = 40.17		