

... 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 : 16 MIDDLE STREET 5TH FLOOR TENANT SPACE #1
Drawing : FP-03
Location : 5TH FLOOR
Remote Area : #1
Contract : 062216-2
Data File : 5TH FLOOR TENANT SPACE.WXF

HYDRAULIC CALCULATIONS
for

Project name: 16 MIDDLE STREET 5TH FLOOR TENANT SPACE
Location: 5TH FLOOR
Drawing no: FP-03
Date: 7/26/17

Design

Remote area number: #1
Remote area location: 5TH FLOOR BUSINESS TENANT SPACE
Occupancy classification: LIGHT HAZARD
Density: .1 - Gpm/SqFt
Area of application: 1500 - SqFt
Coverage per sprinkler: 225 - SqFt
Type of sprinklers calculated: QUICK RESPONSE UPRIGHT / PENDENTS
No. of sprinklers calculated: 12
In-rack demand: N/A - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 379 - GPM @ 98 - Psi
Type of system: WET NFPA 13
Volume of dry or preaction system: N/A - Gal

Water supply information

Date: 10-14-2016
Location: CORNER OF THAMES AND INDIA STREET
Source: PORTLAND WATER DISTRICT

Name of contractor: HIGH TECH FIRE PROTECTION
Address: 84 HACKETT MILLS ROAD / P.O. BOX 156 / POLAND, ME 04274
Phone number: 207-998-2551
Name of designer: ED POULIN
Authority having jurisdiction: STATE OF MAINE / CITY OF PORTLAND
Notes: (Include peaking information or gridded systems here.)

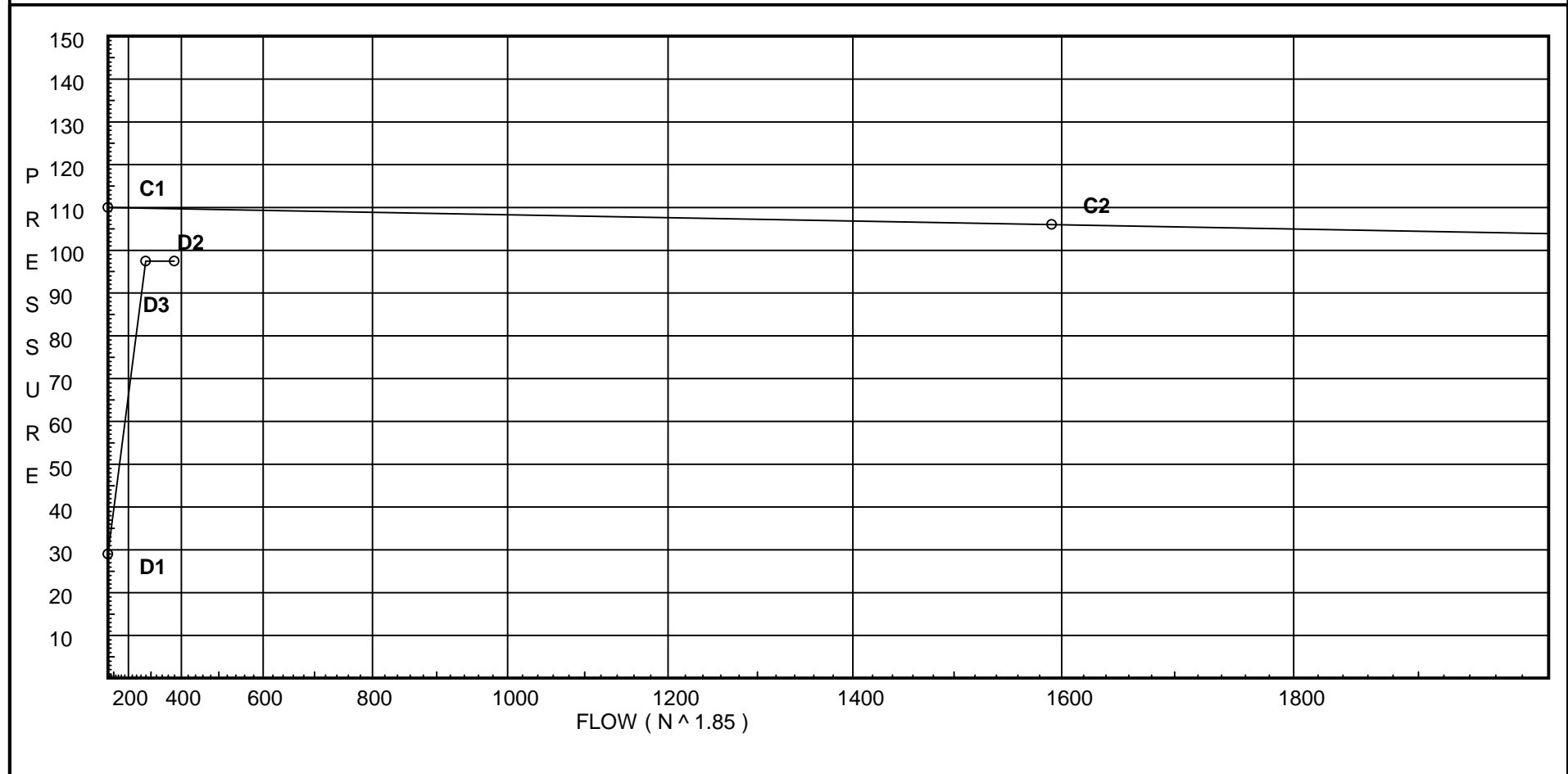
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 106
C2 - Residual Flow : 1591

Demand:
D1 - Elevation : 29.018
D2 - System Flow : 279.004
D2 - System Pressure : 97.476
Hose (Demand) : 100
D3 - System Demand : 379.004
Safety Margin : 12.242



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
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	3.5	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	8	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zib	Wilkins 350A	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.
DP1	-1.0	5.6	16.14	na	22.5	0.1	225	7.0
500	61.0	5.6	16.14	na	22.5	0.1	225	7.0
501	61.0	5.6	16.3	na	22.61	0.1	225	7.0
502	61.0	5.6	16.97	na	23.07	0.1	225	7.0
510	61.0	K = K @ EQ01	18.63	na	24.13			
520	61.0	5.6	16.4	na	22.68	0.1	225	7.0
521	61.0	5.6	16.56	na	22.79	0.1	225	7.0
522	61.0	5.6	17.24	na	23.25	0.1	225	7.0
530	61.0	5.6	18.29	na	23.95	0.1	225	7.0
531	61.0	5.6	18.46	na	24.06	0.1	225	7.0
540	61.0	K = K @ EQ01	18.42	na	24.0			
541	61.0	K = K @ EQ01	16.74	na	22.88			
542	61.0	K = K @ EQ01	17.07	na	23.1			
543	61.0		18.59	na				
EA	61.0		18.98	na				
EB	61.0		19.28	na				
EC	61.0		20.84	na				
ED	61.0		30.85	na				
EE	61.0		41.75	na				
EF	36.0		67.35	na				
CF	10.0		79.73	na				
TOW	10.0		81.83	na				
BOW	4.0		88.19	na				
BASE	0.0		93.95	na				
H1	0.0		94.44	na				
H2	0.0		94.72	na				
H3	0.0		94.76	na	100.0			
TEST	-6.0		97.48	na				

The maximum velocity is 16.41 and it occurs in the pipe between nodes EC and ED

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	*****
DP1 to EQ01	22.50 22.5	1.049 120.0 0.1620	1E	2.0 0.0 0.0	1.000 2.000 3.000	16.143 -0.433 0.486			K Factor = 5.60 Vel = 8.35	
	0.0 22.50						16.196		K Factor = 5.59	
500 to 501	22.50 22.5	1.682 120.0 0.0162		0.0 0.0 0.0	9.500 0.0 9.500	16.143 0.0 0.154			K Factor = 5.60 Vel = 3.25	
501 to 502	22.61 45.11	1.682 120.0 0.0588		0.0 0.0 0.0	11.500 0.0 11.500	16.297 0.0 0.676			K Factor = 5.60 Vel = 6.51	
502 to EA	23.07 68.18	1.682 120.0 0.1262	1T	9.9 0.0 0.0	6.000 9.900 15.900	16.973 0.0 2.007			K Factor = 5.60 Vel = 9.84	
	0.0 68.18						18.980		K Factor = 15.65	
510 to EA	24.13 24.13	1.682 120.0 0.0185	1T	9.9 0.0 0.0	9.000 9.900 18.900	18.631 0.0 0.349			K Factor @ node EQ01 Vel = 3.48	
	0.0 24.13						18.980		K Factor = 5.54	
520 to 521	22.68 22.68	1.682 120.0 0.0164		0.0 0.0 0.0	9.500 0.0 9.500	16.400 0.0 0.156			K Factor = 5.60 Vel = 3.27	
521 to 522	22.78 45.46	1.682 120.0 0.0597		0.0 0.0 0.0	11.500 0.0 11.500	16.556 0.0 0.686			K Factor = 5.60 Vel = 6.56	
522 to EB	23.26 68.72	1.682 120.0 0.1281	1T	9.9 0.0 0.0	6.000 9.900 15.900	17.242 0.0 2.036			K Factor = 5.60 Vel = 9.92	
	0.0 68.72						19.278		K Factor = 15.65	
530 to 531	23.95 23.95	1.682 120.0 0.0181		0.0 0.0 0.0	9.600 0.0 9.600	18.286 0.0 0.174			K Factor = 5.60 Vel = 3.46	
531 to EB	24.06 48.01	1.682 120.0 0.0660	1T	9.9 0.0 0.0	2.500 9.900 12.400	18.460 0.0 0.818			K Factor = 5.60 Vel = 6.93	
	0.0 48.01						19.278		K Factor = 10.93	
540 to 543	24.00 24.0	1.682 120.0 0.0183		0.0 0.0 0.0	9.400 0.0 9.400	18.422 0.0 0.172			K Factor @ node EQ01 Vel = 3.47	
	0.0 24.00						18.594		K Factor = 5.57	
541 to 543	22.88 22.88	1.049 120.0 0.1668	1T	5.0 0.0 0.0	6.100 5.000 11.100	16.742 0.0 1.852			K Factor @ node EQ01 Vel = 8.49	

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 22.88						18.594		K Factor = 5.31	
542 to 543	23.10 23.1	1.049 120.0 0.1699	1T	5.0 0.0 0.0	4.000 5.000 9.000	17.065 0.0 1.529			K Factor @ node EQ01	
543 to EC	46.87 69.97	1.682 120.0 0.1324	1T	9.9 0.0 0.0	7.100 9.900 17.000	18.594 0.0 2.251			Vel = 8.58	
	0.0 69.97						20.845		K Factor = 15.33	
EA to EB	92.31 92.31	2.635 120.0 0.0248		0.0 0.0 0.0	12.000 0.0 12.000	18.980 0.0 0.298			Vel = 5.43	
EB to EC	116.73 209.04	2.635 120.0 0.1127		0.0 0.0 0.0	13.900 0.0 13.900	19.278 0.0 1.567			Vel = 12.30	
EC to ED	69.96 279.0	2.635 120.0 0.1922	1X	14.827 0.0 0.0	37.200 14.827 52.027	20.845 0.0 10.001			Vel = 16.41	
ED to EE	0.0 279.0	2.635 120.0 0.1922	1V 1X	5.903 14.827 0.0	36.000 20.730 56.730	30.846 0.0 10.906			Vel = 16.41	
EE to EF	0.0 279.0	2.635 120.0 0.1922	1Fsp 1B 1S 1T 1V	0.0 9.61 19.22 16.474 5.903	10.000 51.207 61.207	41.752 13.828 11.765		* Fixed loss = 3 Vel = 16.41		
EF to CF	0.0 279.0	4.26 120.0 0.0185	1V	8.954 0.0 0.0	51.500 8.954 60.454	67.345 11.261 1.120			Vel = 6.28	
CF to TOW	0.0 279.0	4.26 120.0 0.0185	5V	44.768 0.0 0.0	69.000 44.768 113.768	79.726 0.0 2.108			Vel = 6.28	
TOW to BOW	0.0 279.0	4.26 120.0 0.0185	1B 1Fsp 1X	15.8 0.0 21.067	4.000 36.867 40.867	81.834 5.599 0.756			* Fixed loss = 3 Vel = 6.28	
BOW to BASE	0.0 279.0	4.26 120.0 0.0186	1Zib 1X	0.0 21.067 0.0	3.000 21.067 24.067	88.189 5.312 0.447			* Fixed loss = 3.58 Vel = 6.28	
BASE to H1	0.0 279.0	6.16 140.0 0.0023	2E 1T 1G	40.168 43.037 4.304	125.000 87.509 212.509	93.948 0.0 0.491			Vel = 3.00	
H1 to H2	0.0 279.0	8.27 140.0 0.0005	1T	55.354 0.0 0.0	460.000 55.354 515.354	94.439 0.0 0.283			Vel = 1.67	
H2 to H3	0.0 279.0	12.34 140.0 0.0001	1T	93.767 0.0 0.0	360.000 93.767 453.767	94.722 0.0 0.036			Vel = 0.75	

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	*****
H3 to TEST	100.00 379.0	6.16 140.0 0.0040	1E 20.084 1G 4.304 0.0	5.000 24.388 29.388	94.758 2.599 0.119		Qa = 100 Vel = 4.08		
	0.0 379.00				97.476		K Factor = 38.39		