

**... 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 3RD FLOOR FUTURE TENANT SPACE #2  
Drawing : FP-02  
Location : 3RD FLOOR  
Remote Area : #2  
Contract : 062216-2  
Data File : 3RD FLOOR FUTURE TENANT SPACE.WXF

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**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** 16 MIDDLE STREET 3RD FLOOR FUTURE TENANT SPACE

**Location:** 3RD FLOOR

**Drawing no:** FP-02

**Date:** 7/26/17

**Design**

**Remote area number:** #2

**Remote area location:** 3RD FLOOR FUTURE 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

**No. of sprinklers calculated:** 10

**In-rack demand:** N/A - GPM

**Hose streams:** 100 - GPM

**Total water required (including hose streams):** 339 - GPM @ 76 - 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.)**

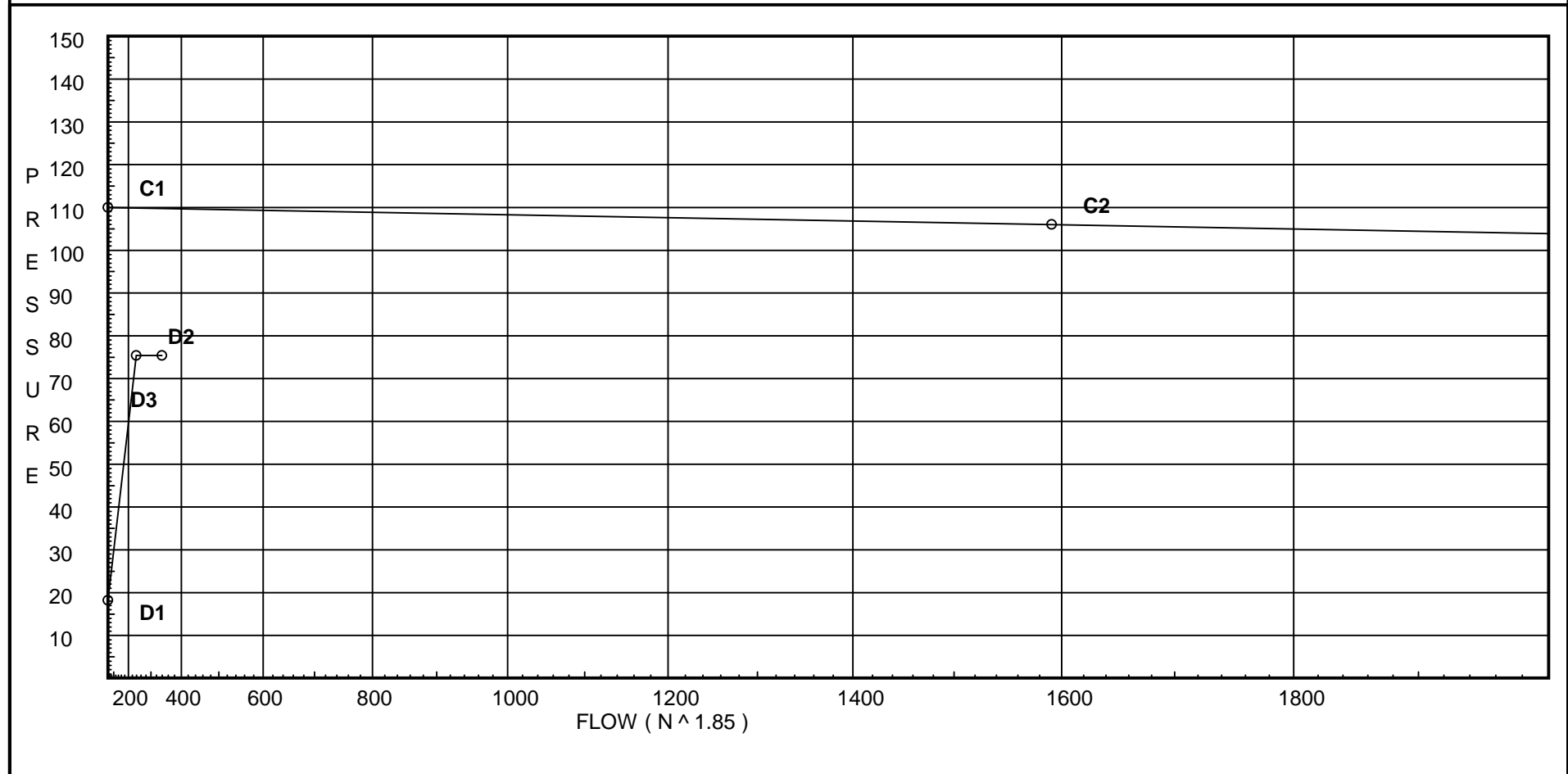
# Water Supply Curve (C)

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

Demand:  
D1 - Elevation : 18.190  
D2 - System Flow : 238.716  
D2 - System Pressure : 75.399  
Hose ( Demand ) : 100  
D3 - System Demand : 338.716  
Safety Margin : 34.372



# 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.
400	36.0	5.6	16.14	na	22.5	0.1	225	7.0
401	36.0	5.6	16.34	na	22.64	0.1	225	7.0
402	36.0	5.6	16.93	na	23.04	0.1	225	7.0
403	36.0	5.6	18.69	na	24.21	0.1	225	7.0
410	36.0	5.6	16.36	na	22.65	0.1	225	7.0
411	36.0	5.6	16.55	na	22.79	0.1	225	7.0
412	36.0	5.6	17.15	na	23.19	0.1	225	7.0
413	36.0	5.6	18.94	na	24.37	0.1	225	7.0
422	36.0	5.6	22.52	na	26.58	0.1	225	7.0
423	36.0	5.6	22.83	na	26.76	0.1	225	7.0
CA	36.0		23.01	na				
CB	36.0		23.31	na				
CC	36.0		24.39	na				
CD	36.0		36.18	na				
CE	36.0		47.13	na				
CF	10.0		58.85	na				
TOW	10.0		60.43	na				
BOW	4.0		66.6	na				
BASE	0.0		72.1	na				
H1	0.0		72.46	na				
H2	0.0		72.68	na				
H3	0.0		72.7	na	100.0			
TEST	-6.0		75.4	na				

The maximum velocity is 14.04 and it occurs in the pipe between nodes CC and CD

# 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	*****
400 to 401	22.50 22.5	1.682 120.0 0.0162		0.0 0.0 0.0	12.000 0.0 12.000	16.143 0.0 0.195			K Factor = 5.60 Vel = 3.25	
401 to 402	22.64 45.14	1.682 120.0 0.0588		0.0 0.0 0.0	10.000 0.0 10.000	16.338 0.0 0.588			K Factor = 5.60 Vel = 6.52	
402 to 403	23.03 68.17	1.682 120.0 0.1262		0.0 0.0 0.0	14.000 0.0 14.000	16.926 0.0 1.767			K Factor = 5.60 Vel = 9.84	
403 to CA	24.22 92.39	1.682 120.0 0.2215	1T	9.9 0.0 0.0	9.600 9.900 19.500	18.693 0.0 4.319			K Factor = 5.60 Vel = 13.34	
	0.0 92.39					23.012			K Factor = 19.26	
410 to 411	22.65 22.65	1.682 120.0 0.0164		0.0 0.0 0.0	12.000 0.0 12.000	16.358 0.0 0.197			K Factor = 5.60 Vel = 3.27	
411 to 412	22.78 45.43	1.682 120.0 0.0595		0.0 0.0 0.0	10.000 0.0 10.000	16.555 0.0 0.595			K Factor = 5.60 Vel = 6.56	
412 to 413	23.20 68.63	1.682 120.0 0.1278		0.0 0.0 0.0	14.000 0.0 14.000	17.150 0.0 1.789			K Factor = 5.60 Vel = 9.91	
413 to CB	24.37 93.0	1.682 120.0 0.2242	1T	9.9 0.0 0.0	9.600 9.900 19.500	18.939 0.0 4.371			K Factor = 5.60 Vel = 13.43	
	0.0 93.00					23.310			K Factor = 19.26	
422 to 423	26.58 26.58	1.682 120.0 0.0221		0.0 0.0 0.0	14.000 0.0 14.000	22.521 0.0 0.309			K Factor = 5.60 Vel = 3.84	
423 to CC	26.75 53.33	1.682 120.0 0.0802	1T	9.9 0.0 0.0	9.600 9.900 19.500	22.830 0.0 1.563			K Factor = 5.60 Vel = 7.70	
	0.0 53.33					24.393			K Factor = 10.80	
CA to CB	92.39 92.39	2.635 120.0 0.0248		0.0 0.0 0.0	12.000 0.0 12.000	23.012 0.0 0.298			Vel = 5.44	
CB to CC	92.99 185.38	2.635 120.0 0.0902		0.0 0.0 0.0	12.000 0.0 12.000	23.310 0.0 1.083			Vel = 10.91	
CC to CD	53.34 238.72	2.635 120.0 0.1440	1X	14.827 0.0 0.0	67.000 14.827 81.827	24.393 0.0 11.787			Vel = 14.04	
CD to CE	0.0 238.72	2.635 120.0 0.1441	1Fsp 1B 1S	0.0 9.61 19.22	4.000 51.207 55.207	36.180 3.000 7.953			* Fixed loss = 3 Vel = 14.04	

# 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	*****
			1T 16.474						
			1V 5.903						
CE to CF	0.0  238.72	4.26 120.0 0.0139	1V  0.0	8.954 8.954	24.000 32.954	47.133 11.261 0.458		Vel = 5.37	
CF to TOW	0.0  238.72	4.26 120.0 0.0139	5V  0.0	44.768 44.768	69.000 113.768	58.852 0.0 1.579		Vel = 5.37	
TOW to BOW	0.0  238.72	4.26 120.0 0.0139	1B 1Fsp 1X	15.8 0.0 21.067	4.000 36.867 40.867	60.431 5.599 0.567		* Fixed loss = 3 Vel = 5.37	
BOW to BASE	0.0  238.72	4.26 120.0 0.0139	1Zib 1X	0.0 21.067	3.000 21.067	66.597 5.165 0.334		* Fixed loss = 3.432 Vel = 5.37	
BASE to H1	0.0  238.72	6.16 140.0 0.0017	2E 1T 1G	40.168 43.037 4.304	125.000 87.509 212.509	72.096 0.0 0.368		Vel = 2.57	
H1 to H2	0.0  238.72	8.27 140.0 0.0004	1T  0.0	55.354 0.0	460.000 55.354	72.464 0.0 0.213		Vel = 1.43	
H2 to H3	0.0  238.72	12.34 140.0 0.0001	1T  0.0	93.767 0.0	360.000 93.767	72.677 0.0 0.026		Vel = 0.64	
H3 to TEST	100.00  338.72	6.16 140.0 0.0033	1E 1G	20.084 4.304	5.000 24.388	72.703 2.599 0.097		Qa = 100 Vel = 3.65	
	0.0 338.72					75.399		K Factor = 39.01	