

**... 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 : 3RD FLOOR UNIT 406  
Drawing : FP-02  
Location : NATHAN CLIFFORD RESIDENCE  
Remote Area : #3  
Contract : 020714-1  
Data File : 3rd floor unit 406.WXF

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**HYDRAULIC CALCULATIONS**  
*for*

**Project name:** 3RD FLOOR UNIT 406  
**Location:** NATHAN CLIFFORD RESIDENCE  
**Drawing no:** FP-02  
**Date:** 4/29/14

**Design**

**Remote area number:** #3  
**Remote area location:** 3RD FLOOR UNIT 406  
**Occupancy classification:** RESIDENTIAL  
**Density:** .05 - Gpm/SqFt  
**Area of application:** 4 - SqFt  
**Coverage per sprinkler:** 196 - SqFt  
**Type of sprinklers calculated:** RESIDENTIAL UPRIGHT  
**No. of sprinklers calculated:** 4  
**In-rack demand:** N/A - GPM  
**Hose streams:** 0 - GPM  
**Total water required (including hose streams):** 68 - GPM @ 72 - Psi  
**Type of system:** WET NFPA 13R  
**Volume of dry or preaction system:** N/A - Gal

**Water supply information**

**Date:** 4/30/14  
**Location:** TEST HYDRANT ON FALMOUTH ST. IN FRONT OF BUILDING  
**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.)**

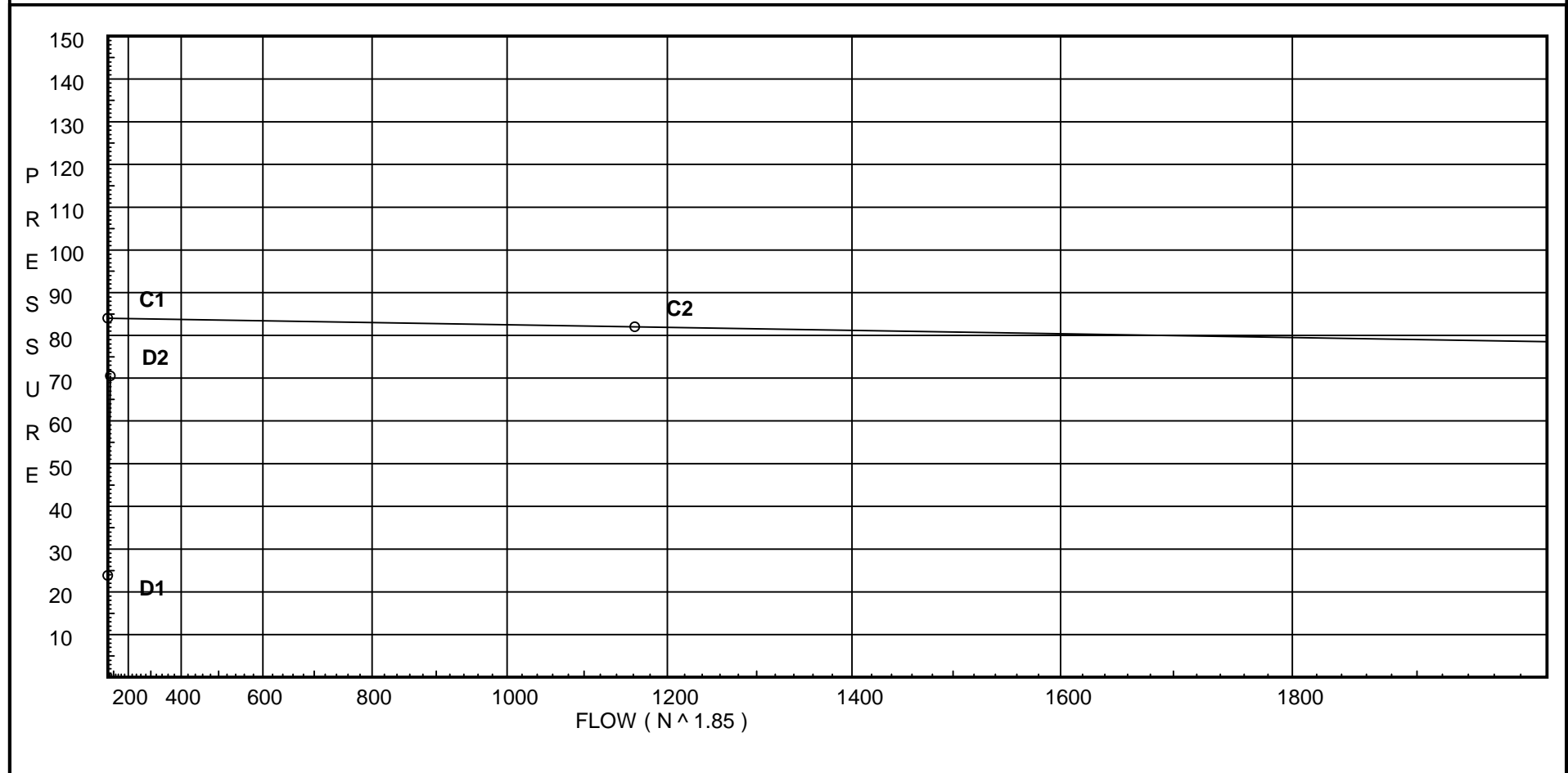
# Water Supply Curve (C)

HIGH TECH FIRE PROTECTION  
3RD FLOOR UNIT 406

Page 2  
Date 4/29/14

City Water Supply:  
C1 - Static Pressure : 84  
C2 - Residual Pressure: 82  
C2 - Residual Flow : 1162

Demand:  
D1 - Elevation : 23.820  
D2 - System Flow : 66.641  
D2 - System Pressure : 70.530  
Hose ( Demand ) : \_\_\_\_\_  
D3 - System Demand : 66.641  
Safety Margin : 13.460



# Fittings Used Summary

HIGH TECH FIRE PROTECTION  
3RD FLOOR UNIT 406

Page 3  
Date 4/29/14

## 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
N *	CPVC 90'EII Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
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' EII 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
Zia	Wilkins 350	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

HIGH TECH FIRE PROTECTION  
3RD FLOOR UNIT 406

Page 4  
Date 4/29/14

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	-1.0	4.9	7.0	na	12.96	0.05	256	7.0
400	67.0	4.9	9.37	na	15.0	0.05	196	9.37
401	67.0	4.9	9.84	na	15.37	0.05	196	9.37
402	67.0		10.52	na				
410	67.0	4.9	11.84	na	16.86	0.05	196	9.37
411	67.0		13.26	na				
412	67.0		13.89	na				
413	65.5		15.52	na				
420	65.5	K = K @ EQ01	15.27	na	19.41			
421	65.5		15.86	na				
422	65.5		19.26	na				
423	65.5		24.96	na				
424	63.0		28.14	na				
430	63.0		30.74	na				
435	63.0		35.29	na				
4B	63.0		39.67	na				
1B	10.0		62.73	na				
TOW	10.0		62.81	na				
BOW	3.0		68.91	na				
BASE	3.0		68.95	na				
UG	0.0		75.67	na				
HS1	0.0		75.72	na				
HS2	0.0		75.72	na				
TEST	12.0		70.53	na				

The maximum velocity is 14.01 and it occurs in the pipe between nodes 421 and 422

# Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION  
3RD FLOOR UNIT 406

Page 5  
Date 4/29/14

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	12.96 12.96	1.101 150.0 0.0305	1N	7.0 0.0 0.0	1.000 7.000 8.000	7.000 -0.433 0.244			K Factor = 4.90	
	0.0 12.96						6.811		K Factor = 4.97	
400 to 402	15.00 15.0	1.049 120.0 0.0764	1T	5.0 0.0 0.0	10.000 5.000 15.000	9.370 0.0 1.146			K Factor = 4.90	
	0.0 15.00						10.516		K Factor = 4.63	
401 to 402	15.37 15.37	1.049 120.0 0.0799	1T	5.0 0.0 0.0	3.500 5.000 8.500	9.837 0.0 0.679			K Factor = 4.90	
402 to 411	15.00 30.37	1.049 120.0 0.2818		0.0 0.0 0.0	9.750 0.0 9.750	10.516 0.0 2.748				Vel = 11.27
	0.0 30.37						13.264		K Factor = 8.34	
410 to 411	16.86 16.86	1.049 120.0 0.0949	1T	5.0 0.0 0.0	10.000 5.000 15.000	11.840 0.0 1.424			K Factor = 4.90	
411 to 412	30.37 47.23	1.38 120.0 0.1677	1E	3.0 0.0 0.0	0.750 3.000 3.750	13.264 0.0 0.629				Vel = 10.13
412 to 413	0.0 47.23	1.394 150.0 0.1057	1N	8.0 0.0 0.0	1.200 8.000 9.200	13.893 0.650 0.972				Vel = 9.93
413 to 421	0.0 47.23	1.394 150.0 0.1058		0.0 0.0 0.0	3.300 0.0 3.300	15.515 0.0 0.349				Vel = 9.93
	0.0 47.23						15.864		K Factor = 11.86	
420 to 421	19.41 19.41	1.101 150.0 0.0645	1O	5.0 0.0 0.0	4.200 5.000 9.200	15.271 0.0 0.593			K Factor @ node EQ01	
421 to 422	47.23 66.64	1.394 150.0 0.1999	1N	8.0 0.0 0.0	9.000 8.000 17.000	15.864 0.0 3.398				Vel = 14.01
422 to 423	0.0 66.64	1.394 150.0 0.1999	1N	8.0 0.0 0.0	20.500 8.000 28.500	19.262 0.0 5.696				Vel = 14.01
423 to 424	0.0 66.64	1.394 150.0 0.1998	1N	8.0 0.0 0.0	2.500 8.000 10.500	24.958 1.083 2.098				Vel = 14.01
424 to 430	0.0 66.64	1.394 150.0 0.1998	1O	6.0 0.0 0.0	7.000 6.000 13.000	28.139 0.0 2.598				Vel = 14.01
430 to 435	0.0 66.64	2.003 150.0 0.0342	3N	33.0 0.0 0.0	100.000 33.000 133.000	30.737 0.0 4.549				Vel = 6.79

# Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION  
3RD FLOOR UNIT 406

Page 6  
Date 4/29/14

Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
435 to 4B	0.0 66.64	2.157 120.0 0.0360	1B 7.384 1Fsp 0.0 1S 13.537 1X 10.461	7.000 31.382 38.382	35.286 3.000 1.383			* Fixed loss = 3 Vel = 5.85	
4B to 1B	0.0 66.64	4.26 120.0 0.0013	4V 35.814 0.0 0.0	45.000 35.814 80.814	39.669 22.954 0.107			Vel = 1.50	
1B to TOW	0.0 66.64	4.26 120.0 0.0013	2V 17.907 0.0 0.0	44.500 17.907 62.407	62.730 0.0 0.081			Vel = 1.50	
TOW to BOW	0.0 66.64	4.26 120.0 0.0013	1B 15.8 1T 26.334 1Fsp 0.0	6.000 42.134 48.134	62.811 6.032 0.063			* Fixed loss = 3 Vel = 1.50	
BOW to BASE	0.0 66.64	4.26 120.0 0.0013	1X 21.067 1V 8.954 0.0	4.000 30.021 34.021	68.906 0.0 0.045			Vel = 1.50	
BASE to UG	0.0 66.64	4.26 120.0 0.0013	1V 8.954 1Zia 0.0 0.0	1.000 8.954 9.954	68.951 6.707 0.013			* Fixed loss = 5.408 Vel = 1.50	
UG to HS1	0.0 66.64	6.16 140.0 0.0002	2V 28.692 1T 43.037 1G 4.304	210.000 76.033 286.033	75.671 0.0 0.046			Vel = 0.72	
HS1 to HS2	0.0 66.64	8.23 100.0 0.0001	1T 29.011 0.0 0.0	10.000 29.010 39.010	75.717 0.0 0.003			Vel = 0.40	
HS2 to TEST	0.0 66.64	6.14 100.0 0.0003	1G 2.273 1E 10.608 0.0	10.000 12.881 22.881	75.720 -5.197 0.007			Vel = 0.72	
	0.0 66.64								K Factor = 7.94