



**... 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 : Grand Trunk 3rd floor  
Drawing : FP-01  
Location : 3rd Floor Office  
Remote Area : #1  
Contract :  
Data File : 3rd fl. calc.wxf

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**HYDRAULIC CALCULATIONS**  
*for*

**Project name:** Grand Trunk 3rd floor  
**Location:** 3rd Floor Office  
**Drawing no:** FP-01  
**Date:** 10-17-16

**Design**

**Remote area number:** #1  
**Remote area location:** 3rd floor office  
**Occupancy classification:** Light Hazard  
**Density:** .1 - Gpm/SqFt  
**Area of application:** 1000 - SqFt  
**Coverage per sprinkler:** 225 - SqFt  
**Type of sprinklers calculated:** quick response pendants  
**No. of sprinklers calculated:** 7  
**In-rack demand:** N/A - GPM  
**Hose streams:** 100 - GPM  
**Total water required (including hose streams):** 267 - GPM @ 63 - Psi  
**Type of system:** WET  
**Volume of dry or preaction system:** N/A - Gal

**Water supply information**

**Date:** 10-14-16  
**Location:** Corner of Thames St. and India St.  
**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.)**

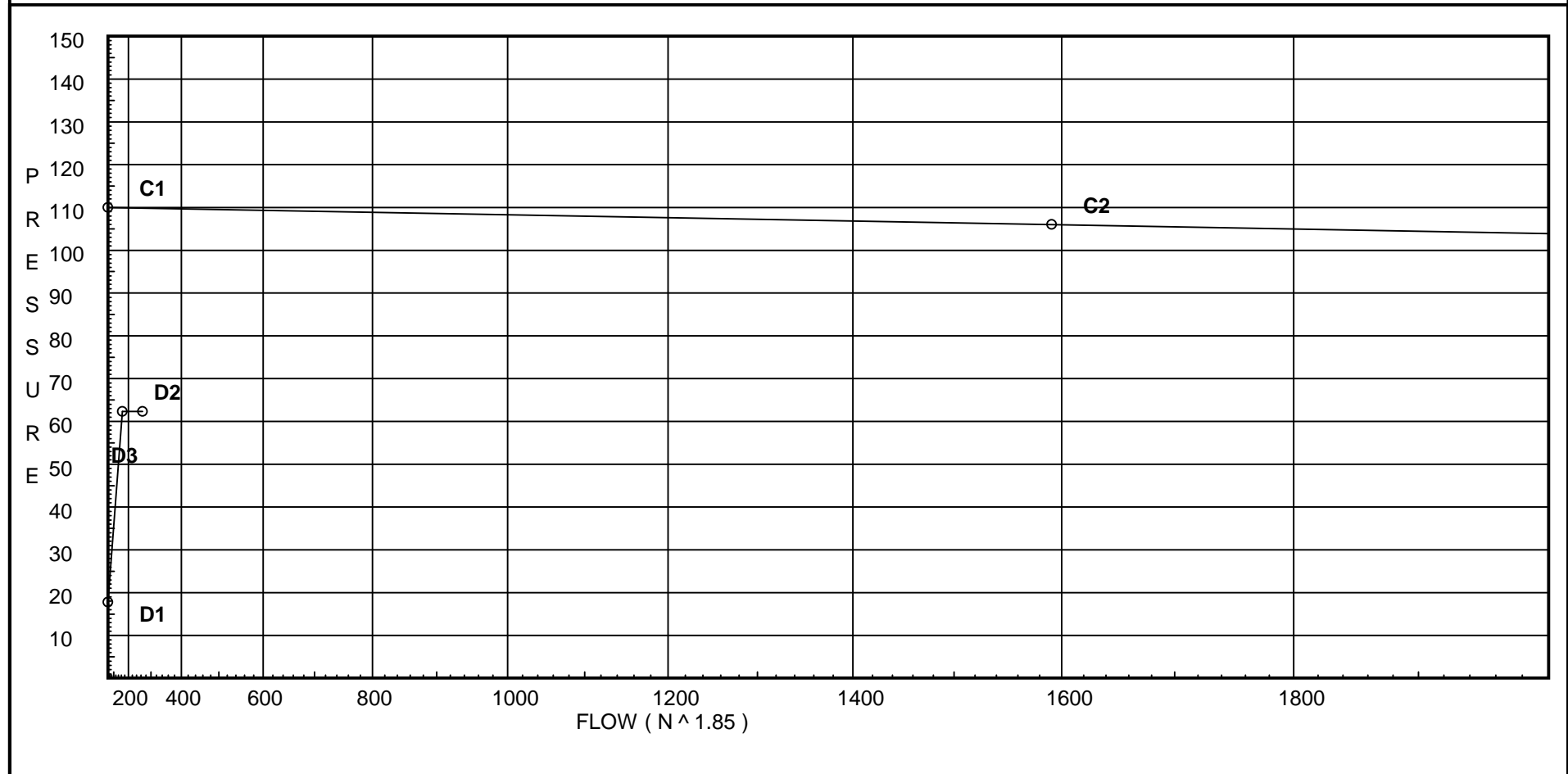
# Water Supply Curve (C)

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

Demand:  
D1 - Elevation : 17.757  
D2 - System Flow : 166.171  
D2 - System Pressure : 62.308  
Hose ( Demand ) : 100  
D3 - System Demand : 266.171  
Safety Margin : 47.546



# 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
DP2	-1.0	5.6	16.14	na	22.5	0.1	225	7.0
300	43.0	K = K @ EQ01	16.2	na	22.5			
310	43.0	K = K @ EQ01	16.27	na	22.55			
320	43.0	K = K @ EQ01	16.54	na	22.74			
301	43.0		18.88	na				
305	43.0	K = K @ EQ02	18.88	na	23.94			
311	43.0		18.97	na				
312	43.0	K = K @ EQ02	18.99	na	24.0			
321	43.0		19.28	na				
322	43.0	K = K @ EQ02	19.3	na	24.2			
CA	43.0		20.94	na				
CB	43.0		22.45	na				
350	43.0	K = K @ EQ01	22.02	na	26.24			
351	43.0		23.78	na				
CC	43.0		23.94	na				
CD	43.0		24.65	na				
CE	8.0		42.9	na				
CF	8.0		49.92	na				
CG	-2.0		55.12	na				
CH	-2.0		57.17	na				
TOR	-2.0		57.33	na				
BOR	-4.0		61.39	na				
BASE	-4.0		64.65	na				
H1	-4.0		64.83	na				
H2	-4.0		64.83	na	100.0			
TEST	2.0		62.31	na				

The maximum velocity is 9.78 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	*****
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	
	0.0 22.50						16.196		K Factor = 5.59	
DP2 to EQ02	22.50 22.5	1.049 120.0 0.1618	1T	5.0 0.0 0.0	1.000 5.000 6.000	16.143 -0.433 0.971			K Factor = 5.60	
	0.0 22.50						16.681		K Factor = 5.51	
300 to 301	22.50 22.5	1.049 120.0 0.1618	1T	5.0 0.0 0.0	11.600 5.000 16.600	16.196 0.0 2.686			K Factor @ node EQ01	
	0.0 22.50						18.882		K Factor = 5.18	
310 to 311	22.55 22.55	1.049 120.0 0.1625	1T	5.0 0.0 0.0	11.600 5.000 16.600	16.274 0.0 2.698			K Factor @ node EQ01	
	0.0 22.55						18.972		K Factor = 5.18	
320 to 321	22.74 22.74	1.049 120.0 0.1649	1T	5.0 0.0 0.0	11.600 5.000 16.600	16.538 0.0 2.738			K Factor @ node EQ01	
	0.0 22.74						19.276		K Factor = 5.18	
301 to 305	22.50 22.5	2.635 120.0 0.0017		0.0 0.0 0.0	1.200 0.0 1.200	18.882 0.0 0.002				Vel = 1.32
305 to 311	23.94 46.44	2.635 120.0 0.0069		0.0 0.0 0.0	12.700 0.0 12.700	18.884 0.0 0.088			K Factor @ node EQ02	Vel = 2.73
311 to 312	22.55 68.99	2.635 120.0 0.0150		0.0 0.0 0.0	1.000 0.0 1.000	18.972 0.0 0.015				Vel = 4.06
312 to 321	24.01 93.0	2.635 120.0 0.0251		0.0 0.0 0.0	11.500 0.0 11.500	18.987 0.0 0.289			K Factor @ node EQ02	Vel = 5.47
321 to 322	22.74 115.74	2.635 120.0 0.0380		0.0 0.0 0.0	0.500 0.0 0.500	19.276 0.0 0.019				Vel = 6.81
322 to CA	24.20 139.94	2.635 120.0 0.0536	1X	14.827 0.0 0.0	15.900 14.827 30.727	19.295 0.0 1.648			K Factor @ node EQ02	Vel = 8.23
CA to CB	0.0 139.94	2.635 120.0 0.0536	1X	14.827 0.0 0.0	13.200 14.827 28.027	20.943 0.0 1.503				Vel = 8.23
CB to CC	0.0 139.94	2.635 120.0 0.0537	1X	14.827 0.0 0.0	13.000 14.827 27.827	22.446 0.0 1.493				Vel = 8.23

# 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	*****
	0.0 139.94						23.939		K Factor = 28.60	
350 to 351	26.24	1.049 120.0	1T	5.0 0.0	3.200 5.000	22.020 0.0			K Factor @ node EQ01	
351 to CC	26.24	0.2150 120.0		0.0 0.0	8.200 0.0	1.763 0.0			Vel = 9.74	
351 to CC	0.0	1.682 120.0		0.0 0.0	7.200 0.0	23.783 0.0				
CC to CD	26.24	0.0217 120.0		0.0 0.0	7.200 0.0	0.156 0.0			Vel = 3.79	
CC to CD	139.93	2.635 120.0	1V	5.903 0.0	3.750 5.903	23.939 0.0				
CD to CE	166.17	0.0737 120.0		0.0 0.0	9.653 5.903	0.711 15.158			Vel = 9.78	
CD to CE	0.0	2.635 120.0	1V	5.903 0.0	36.000 5.903	24.650 15.158				
CE to CF	166.17	0.0737 120.0		0.0 0.0	41.903 46.540	3.089 3.000			Vel = 9.78	* Fixed loss = 3
CE to CF	0.0	2.635 120.0	3V 1S	17.71 19.22	8.000 46.540	42.897 3.000				
CF to CG	166.17	0.0737 120.0	1B 1Fsp	9.61 0.0	54.540 0.0	4.020 0.0			Vel = 9.78	
CF to CG	0.0	2.635 120.0	1V	5.903 0.0	6.000 5.903	49.917 4.331				
CG to CH	166.17	0.0737 120.0		0.0 0.0	11.903 14.827	0.877 20.730			Vel = 9.78	
CG to CH	0.0	2.635 120.0	1V 1X	5.903 14.827	7.000 20.730	55.125 0.0				
CH to TOR	166.17	0.0737 120.0		0.0 0.0	27.730 21.067	2.044 0.0			Vel = 9.78	
CH to TOR	0.0	4.26 120.0	1X	21.067 0.0	2.000 21.067	57.169 0.0				
TOR to BOR	166.17	0.0071 120.0		0.0 0.0	23.067 24.754	0.163 3.866			Vel = 3.74	
TOR to BOR	0.0	4.26 120.0	1B 1Fsp	15.8 0.0	2.000 24.754	57.332 3.866				* Fixed loss = 3
BOR to BASE	166.17	0.0071 120.0	1V	8.954	26.754	0.191			Vel = 3.74	
BOR to BASE	0.0	4.26 120.0	1E 1Zib	13.167 0.0	1.000 13.167	61.389 3.163				* Fixed loss = 3.163
BASE to H1	166.17	0.0071 140.0		0.0	14.167	0.100			Vel = 3.74	
BASE to H1	0.0	6.16 140.0	2E 1G	40.168 4.304	113.000 87.509	64.652 0.0				
H1 to H2	166.17	0.0009 140.0	1T	43.037	200.509	0.178			Vel = 1.79	
H1 to H2	0.0	12.34 140.0	1T	93.767 0.0	25.000 93.767	64.830 0.0				
H2 to TEST	166.17	0.0 140.0		0.0	118.767	0.003			Vel = 0.45	
H2 to TEST	100.00	6.16 140.0	1G 1E	4.304 20.084	10.000 24.388	64.833 -2.599			Qa = 100	
TEST	266.17	0.0022		0.0	34.388	0.074			Vel = 2.87	
	0.0 266.17						62.308		K Factor = 33.72	