



... 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 : Basement Library 112
Drawing : FP-01
Location : NATHAN CLIFFORD RESIDENCE
Remote Area : #1
Contract : 020714-1
Data File : Basement Library.WXF

HYDRAULIC CALCULATIONS
for

Project name: Basement Library 112
Location: NATHAN CLIFFORD RESIDENCE
Drawing no: FP-01
Date: 4/29/14

Design

Remote area number: #1
Remote area location: LOWER LEVEL LIBRARY
Occupancy classification: LIGHT HAZARD
Density: .1 - Gpm/SqFt
Area of application: 900 - SqFt
Coverage per sprinkler: 196 - SqFt
Type of sprinklers calculated: QUICK RESPONSE UPRIGHT
No. of sprinklers calculated: 10
In-rack demand: N/A - GPM
Hose streams: 0 - GPM
Total water required (including hose streams): 255 - GPM @ 68 - 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.)

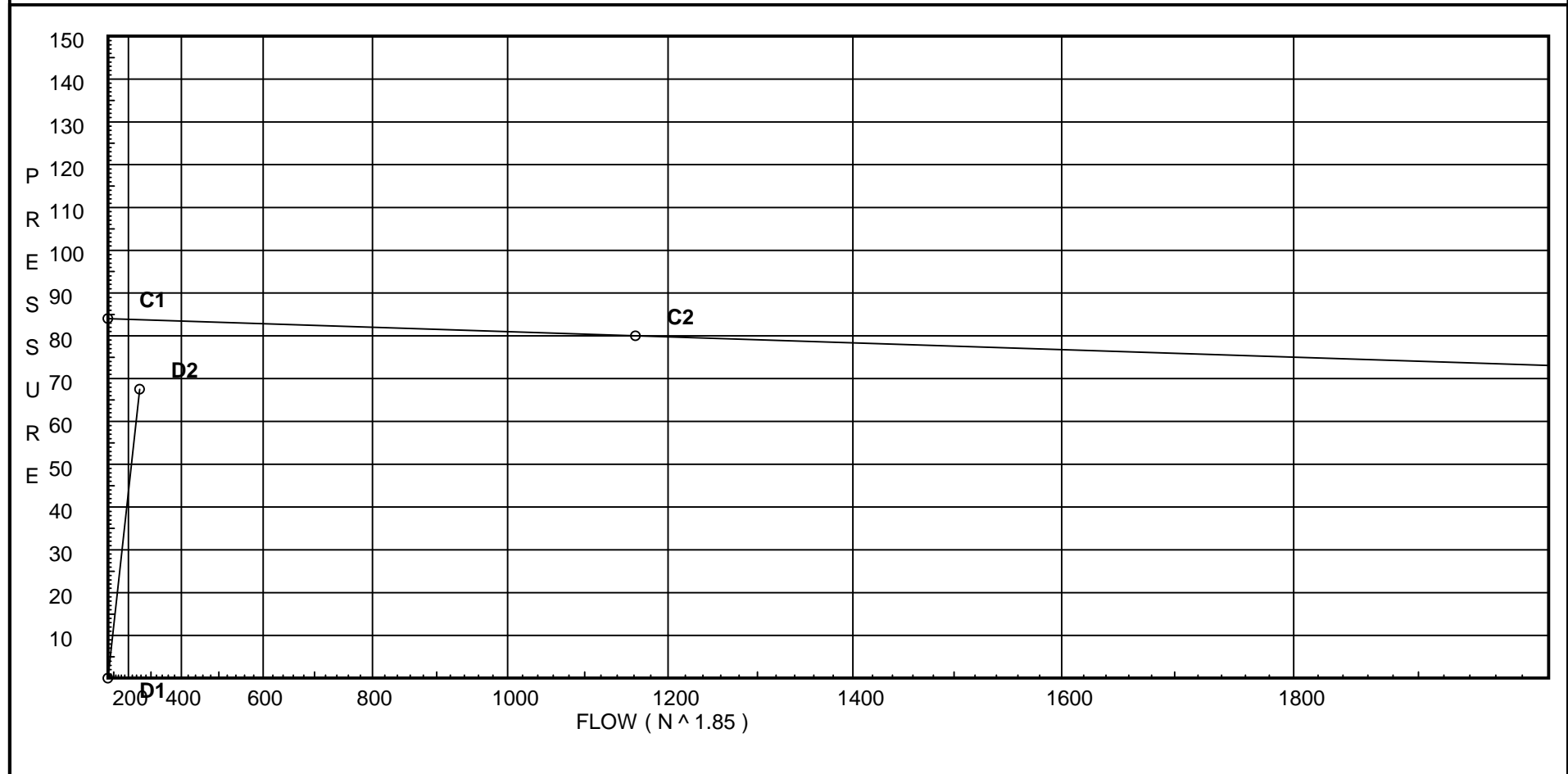
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 84
C2 - Residual Pressure: 80
C2 - Residual Flow : 1162

Demand:
D1 - Elevation : -0.866
D2 - System Flow : 254.39
D2 - System Pressure : 67.503
Hose (Demand) : _____
D3 - System Demand : 254.39
Safety Margin : 16.256



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	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

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
100	10.0	5.6	12.25	na	19.6	0.1	196	7.0
101	10.0	5.6	13.6	na	20.65	0.1	196	7.0
102	10.0	5.6	21.14	na	25.75	0.1	196	7.0
103	9.5		23.39	na				
110	10.0	5.6	15.21	na	21.84	0.1	196	7.0
111	10.0	5.6	16.86	na	22.99	0.1	196	7.0
112	10.0	5.6	26.07	na	28.59	0.1	196	7.0
113	9.5		34.36	na				
120	10.0	5.6	19.21	na	24.54	0.1	196	7.0
121	10.0	5.6	21.25	na	25.82	0.1	196	7.0
122	10.0	5.6	32.67	na	32.01	0.1	196	7.0
123	9.5		35.94	na				
131	10.0	5.6	33.88	na	32.6	0.1	196	7.0
132	10.0		38.99	na				
133	9.5		39.76	na				
134	9.5		40.25	na				
140	9.5		43.18	na				
141	9.0		43.98	na				
142	9.0		44.57	na				
143	9.75		44.59	na				
144	9.75		46.53	na				
145	9.75		48.0	na				
146	9.75		49.08	na				
147	9.75		49.6	na				
TOW	10.0		62.14	na				
BOW	3.0		66.38	na				
BASE	3.0		66.91	na				
UG	0.0		72.02	na				
HS1	0.0		72.58	na				
HS2	0.0		72.62	na				
TEST	12.0		67.5	na				

The maximum velocity is 29.91 and it occurs in the pipe between nodes 112 and 113

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	*****
100 to 101	19.60 19.6	1.049 120.0 0.1254		0.0 0.0 0.0	10.750 0.0 10.750	12.250 0.0 1.348			K Factor = 5.60 Vel = 7.28	
101 to 102	20.65 40.25	1.049 120.0 0.4745	1T	5.0 0.0 0.0	10.900 5.000 15.900	13.598 0.0 7.545			K Factor = 5.60 Vel = 14.94	
102 to 103	25.75 66.0	1.38 120.0 0.3115	1T	6.0 0.0 0.0	0.500 6.000 6.500	21.143 0.217 2.025			K Factor = 5.60 Vel = 14.16	
103 to 112	0.0 66.0	1.38 120.0 0.3116		0.0 0.0 0.0	9.300 0.0 9.300	23.385 -0.217 2.898			Vel = 14.16	
	0.0 66.00					26.066			K Factor = 12.93	
110 to 111	21.84 21.84	1.049 120.0 0.1531		0.0 0.0 0.0	10.750 0.0 10.750	15.210 0.0 1.646			K Factor = 5.60 Vel = 8.11	
111 to 112	22.99 44.83	1.049 120.0 0.5792	1T	5.0 0.0 0.0	10.900 5.000 15.900	16.856 0.0 9.210			K Factor = 5.60 Vel = 16.64	
112 to 113	94.59 139.42	1.38 120.0 1.2429	1T	6.0 0.0 0.0	0.500 6.000 6.500	26.066 0.217 8.079			K Factor = 5.60 Vel = 29.91	
113 to 123	0.0 139.42	2.067 120.0 0.1737		0.0 0.0 0.0	9.100 0.0 9.100	34.362 0.0 1.581			Vel = 13.33	
	0.0 139.42					35.943			K Factor = 23.26	
120 to 121	24.54 24.54	1.049 120.0 0.1900		0.0 0.0 0.0	10.750 0.0 10.750	19.210 0.0 2.043			K Factor = 5.60 Vel = 9.11	
121 to 122	25.82 50.36	1.049 120.0 0.7184	1T	5.0 0.0 0.0	10.900 5.000 15.900	21.253 0.0 11.422			K Factor = 5.60 Vel = 18.69	
122 to 123	32.01 82.37	1.38 120.0 0.4694	1T	6.0 0.0 0.0	0.500 6.000 6.500	32.675 0.217 3.051			K Factor = 5.60 Vel = 17.67	
123 to 133	139.42 221.79	2.067 120.0 0.4102		0.0 0.0 0.0	9.300 0.0 9.300	35.943 0.0 3.815			Vel = 21.21	
	0.0 221.79					39.758			K Factor = 35.17	
131 to 132	32.60 32.6	1.049 120.0 0.3213	1T	5.0 0.0 0.0	10.900 5.000 15.900	33.884 0.0 5.108			K Factor = 5.60 Vel = 12.10	
132 to 133	0.0 32.6	1.38 120.0 0.0845	1T	6.0 0.0 0.0	0.500 6.000 6.500	38.992 0.217 0.549			Vel = 6.99	

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	*****
133	221.79	2.469		0.0	2.200	39.758				
to		120.0		0.0	0.0	0.0				
134	254.39	0.2223		0.0	2.200	0.489		Vel = 17.05		
134	0.0	3.068	1T	15.0	23.000	40.247				
to		120.0		0.0	15.000	0.0				
140	254.39	0.0772		0.0	38.000	2.935		Vel = 11.04		
140	0.0	3.068	1E	7.0	0.500	43.182				
to		120.0		0.0	7.000	0.217				
141	254.39	0.0772		0.0	7.500	0.579		Vel = 11.04		
141	0.0	3.548	1E	8.0	7.500	43.978				
to		120.0		0.0	8.000	0.0				
142	254.39	0.0381		0.0	15.500	0.590		Vel = 8.26		
142	0.0	3.548	1E	8.0	1.100	44.568				
to		120.0		0.0	8.000	-0.325				
143	254.39	0.0380		0.0	9.100	0.346		Vel = 8.26		
143	0.0	3.548	2E	16.0	35.000	44.589				
to		120.0		0.0	16.000	0.0				
144	254.39	0.0381		0.0	51.000	1.941		Vel = 8.26		
144	0.0	4.026	2E	20.0	51.300	46.530				
to		120.0		0.0	20.000	0.0				
145	254.39	0.0206		0.0	71.300	1.466		Vel = 6.41		
145	0.0	4.26	1E	13.167	30.000	47.996				
to		120.0	1T	26.334	39.501	0.0				
146	254.39	0.0156		0.0	69.501	1.086		Vel = 5.73		
146	0.0	5.047	1T	25.0	39.000	49.082				
to		120.0	1E	12.0	37.000	0.0				
147	254.39	0.0068		0.0	76.000	0.520		Vel = 4.08		
147	0.0	2.635	1E	8.237	6.000	49.602				
to		120.0	1T	16.474	53.541	2.892			* Fixed loss = 3	
TOW	254.39	0.1620	1S	19.22	59.541	9.648		Vel = 14.97		
			1Fsp	0.0						
			1B	9.61						
TOW	0.0	4.26	1B	15.8	6.000	62.142				
to		120.0	1S	28.968	71.102	3.032				
BOW	254.39	0.0156	1T	26.334	77.102	1.203		Vel = 5.73		
BOW	0.0	4.26	1V	8.954	4.000	66.377				
to		120.0	1X	21.067	30.021	0.0				
BASE	254.39	0.0156		0.0	34.021	0.532		Vel = 5.73		
BASE	0.0	4.26	1V	8.954	1.000	66.909				
to		120.0	1Zia	0.0	8.954	4.959			* Fixed loss = 3.66	
UG	254.39	0.0157		0.0	9.954	0.156		Vel = 5.73		
UG	0.0	6.16	2V	28.692	210.000	72.024				
to		140.0	1T	43.037	76.033	0.0				
HS1	254.39	0.0019	1G	4.304	286.033	0.557		Vel = 2.74		
HS1	0.0	8.23	1T	29.011	10.000	72.581				
to		100.0		0.0	29.010	0.0				
HS2	254.39	0.0009		0.0	39.010	0.035		Vel = 1.53		
HS2	0.0	6.14	1G	2.273	10.000	72.616				
to		100.0	1E	10.608	12.881	-5.197				
TEST	254.39	0.0037		0.0	22.881	0.084		Vel = 2.76		

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	*****
	0.0 254.39				67.503			K Factor = 30.96	