

... 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 : Brick South Function Area #1
Drawing : FP-01
Location : Thompsons Point
Remote Area : #1
Contract :
Data File : Function area 1.WXF

HYDRAULIC CALCULATIONS
for

Project name: Brick South Function Area #1
Location: Thompsons Point
Drawing no: FP-01
Date: 1-2-17

Design

Remote area number: #1
Remote area location: Function Area
Occupancy classification: Ordinary Hazard 1
Density: .15 - Gpm/SqFt
Area of application: 1500 - SqFt
Coverage per sprinkler: 121 - SqFt
Type of sprinklers calculated: quick response upright
No. of sprinklers calculated: 20
In-rack demand: n/a - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 611 - GPM @ 61 - Psi
Type of system: Wet System
Volume of dry or preaction system: n/a - Gal

Water supply information

Date: 9-13-15
Location: Sewall Road
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.)

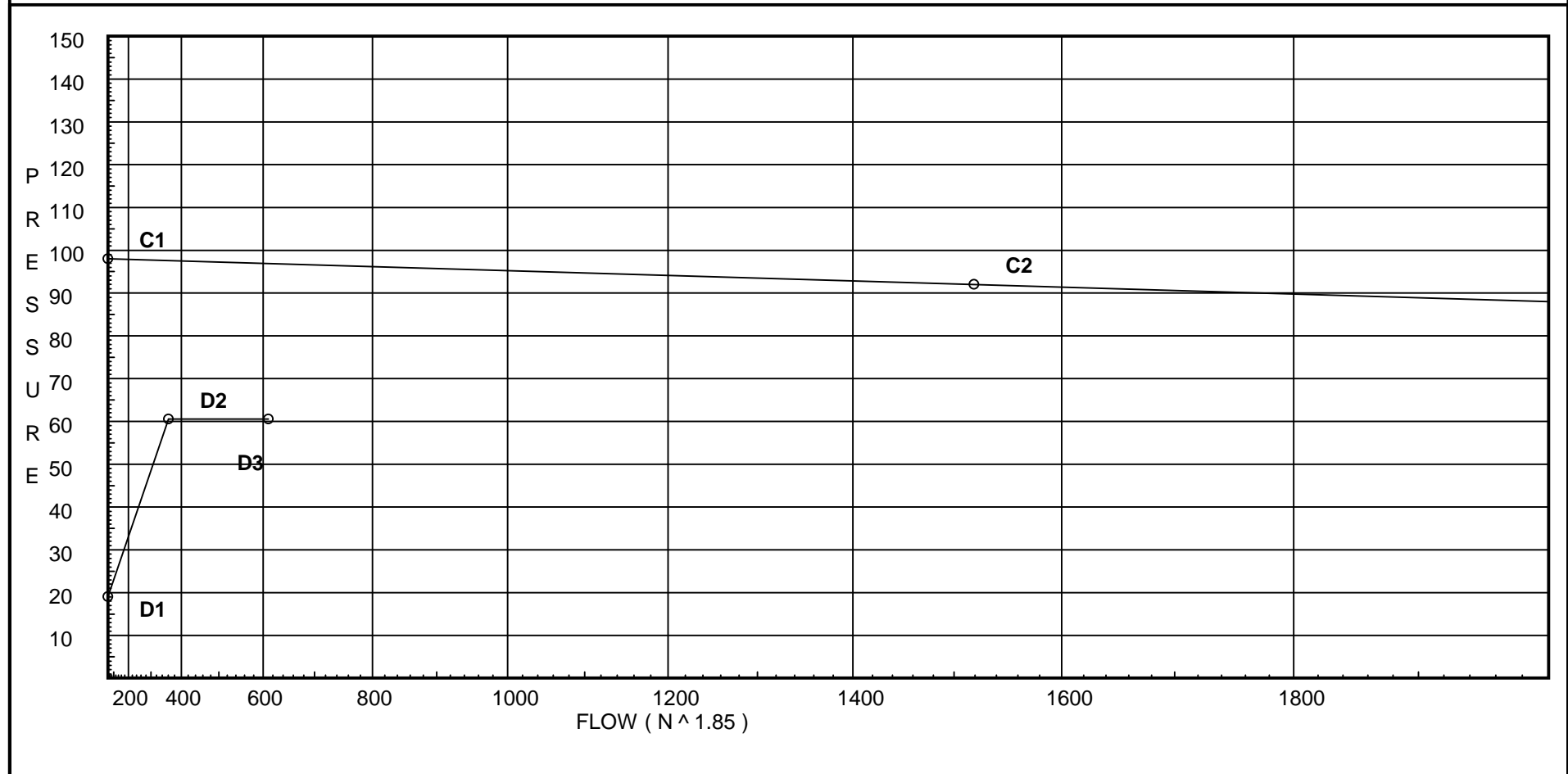
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 98
C2 - Residual Pressure: 92
C2 - Residual Flow : 1519

Demand:
D1 - Elevation : 19.056
D2 - System Flow : 360.44
D2 - System Pressure : 60.531
Hose (Demand) : 250
D3 - System Demand : 610.44
Safety Margin : 36.358



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
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
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.
10	25.0	5.6	10.5	na	18.15	0.15	121	7.0
11	25.0	5.6	10.62	na	18.25	0.15	121	7.0
12	25.0	5.6	11.06	na	18.62	0.15	121	7.0
13	25.0	5.6	11.99	na	19.39	0.15	121	7.0
14	25.0		13.19	na				
20	25.0	5.6	10.55	na	18.19	0.15	121	7.0
21	25.0	5.6	10.67	na	18.29	0.15	121	7.0
22	25.0	5.6	11.11	na	18.66	0.15	121	7.0
23	25.0	5.6	12.05	na	19.44	0.15	121	7.0
24	25.0		13.25	na				
30	25.0	5.6	10.72	na	18.34	0.15	121	7.0
31	25.0	5.6	10.84	na	18.44	0.15	121	7.0
32	25.0	5.6	11.29	na	18.81	0.15	121	7.0
33	25.0	5.6	12.24	na	19.59	0.15	121	7.0
34	25.0		13.46	na				
43	25.0	5.6	15.32	na	21.92	0.15	121	7.0
44	25.0		15.44	na				
15	24.0		15.24	na				
25	24.0		15.31	na				
35	24.0		15.54	na				
45	24.0		16.04	na				
50	24.0		22.18	na				
51	20.0		24.49	na				
C1	15.0	5.6	12.71	na	19.97	0.15	100	7.0
C2	25.0		10.72	na				
S1	25.0	5.6	10.72	na	18.33	0.15	100	7.0
S2	25.0	5.6	10.8	na	18.4	0.15	100	7.0
S3	25.0	5.6	10.96	na	18.54	0.15	100	7.0
C5	15.0	5.6	13.18	na	20.33	0.15	100	7.0
S4	25.0	5.6	11.23	na	18.76	0.15	100	7.0
C6	25.0		11.26	na				
S5	25.0		11.8	na				
S6	20.0		25.36	na				
S7	20.0		26.87	na				
209	20.0		26.98	na				
TOR	20.0		33.63	na				
FLW	7.0		42.82	na				
BOR	0.0		49.88	na				
BASE	0.0		51.14	na				
HOSE	0.0		51.63	na	250.0			
TEST	-19.0		60.53	na				

The maximum velocity is 13.85 and it occurs in the pipe between nodes S7 and 209

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	*****
10 to 11	18.15	1.682 120.0		0.0	11.000	10.504 0.0			K Factor = 5.60	
11 to 12	18.15	0.0109		0.0	11.000	0.120			Vel = 2.62	
11 to 12	18.25	1.682 120.0		0.0	11.000	10.624 0.0			K Factor = 5.60	
12 to 13	36.4	0.0395		0.0	11.000	0.435			Vel = 5.26	
12 to 13	18.63	1.682 120.0		0.0	11.000	11.059 0.0			K Factor = 5.60	
13 to 14	55.03	0.0849		0.0	11.000	0.934			Vel = 7.95	
13 to 14	19.39	1.682 120.0	1V	4.331	3.750	11.993 0.0			K Factor = 5.60	
14 to 15	74.42	0.1485		0.0	8.081	1.200			Vel = 10.75	
14 to 15	0.0	1.682 120.0	1T	9.9	1.000	13.193 0.433				
	74.42	0.1484		0.0	10.900	1.618			Vel = 10.75	
	0.0 74.42					15.244			K Factor = 19.06	
20 to 21	18.19	1.682 120.0		0.0	11.000	10.552 0.0			K Factor = 5.60	
21 to 22	18.19	0.0109		0.0	11.000	0.120			Vel = 2.63	
21 to 22	18.30	1.682 120.0		0.0	11.000	10.672 0.0			K Factor = 5.60	
22 to 23	36.49	0.0397		0.0	11.000	0.437			Vel = 5.27	
22 to 23	18.66	1.682 120.0		0.0	11.000	11.109 0.0			K Factor = 5.60	
23 to 24	55.15	0.0853		0.0	11.000	0.938			Vel = 7.96	
23 to 24	19.44	1.682 120.0	1V	4.331	3.750	12.047 0.0			K Factor = 5.60	
24 to 25	74.59	0.1490		0.0	8.081	1.204			Vel = 10.77	
24 to 25	0.0	1.682 120.0	1T	9.9	1.000	13.251 0.433				
	74.59	0.1491		0.0	10.900	1.625			Vel = 10.77	
	0.0 74.59					15.309			K Factor = 19.06	
30 to 31	18.34	1.682 120.0		0.0	11.000	10.722 0.0			K Factor = 5.60	
31 to 32	18.34	0.0112		0.0	11.000	0.123			Vel = 2.65	
31 to 32	18.44	1.682 120.0		0.0	11.000	10.845 0.0			K Factor = 5.60	
32 to 33	36.78	0.0403		0.0	11.000	0.443			Vel = 5.31	
32 to 33	18.81	1.682 120.0		0.0	11.000	11.288 0.0			K Factor = 5.60	
33 to 34	55.59	0.0865		0.0	11.000	0.952			Vel = 8.03	
33 to 34	19.59	1.682 120.0	1V	4.331	3.750	12.240 0.0			K Factor = 5.60	
34 to 35	75.18	0.1512		0.0	8.081	1.222			Vel = 10.86	
34 to 35	0.0	1.682 120.0	1T	9.9	1.000	13.462 0.433				
	75.18	0.1513		0.0	10.900	1.649			Vel = 10.86	

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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 75.18									
						15.544			K Factor = 19.07	
43 to 44	21.92	1.682 120.0	1V	4.331 0.0	3.750 4.331	15.318 0.0			K Factor = 5.60	
44 to 45	21.92	0.0155		0.0	8.081	0.125			Vel = 3.17	
	0.0	1.682 120.0	1T	9.9 0.0	1.000 9.900	15.443 0.433				
	21.92	0.0154		0.0	10.900	0.168			Vel = 3.17	
	0.0 21.92									
						16.044			K Factor = 5.47	
15 to 25	74.42	3.26 120.0		0.0 0.0	11.000 0.0	15.244 0.0				
25 to 35	74.42	0.0059		0.0	11.000	0.065			Vel = 2.86	
	74.59	3.26 120.0		0.0 0.0	11.000 0.0	15.309 0.0				
	149.01	0.0214		0.0	11.000	0.235			Vel = 5.73	
35 to 45	75.18	3.26 120.0		0.0 0.0	11.000 0.0	15.544 0.0				
	224.19	0.0455		0.0	11.000	0.500			Vel = 8.62	
45 to 50	21.92	3.26 120.0	1X	17.471 0.0	96.000 17.471	16.044 0.0				
	246.11	0.0541		0.0	113.471	6.134			Vel = 9.46	
50 to 51	0.0	3.26 120.0	1V	6.72 0.0	4.000 6.720	22.178 1.732				
	246.11	0.0541		0.0	10.720	0.580			Vel = 9.46	
51 to S7	0.0	3.26 120.0		0.0 0.0	44.000 0.0	24.490 0.0				
	246.11	0.0541		0.0	44.000	2.379			Vel = 9.46	
	0.0 246.11									
						26.869			K Factor = 47.48	
C1 to C2	19.97	1.049 120.0	1E 1T	2.0 5.0	11.000 7.000	12.713 -4.331			K Factor = 5.60	
	19.97	0.1297		0.0	18.000	2.335			Vel = 7.41	
C2 to S1	0.0	2.157 120.0		0.0 0.0	0.500 0.0	10.717 0.0				
	19.97	0.0040		0.0	0.500	0.002			Vel = 1.75	
S1 to S2	18.33	2.157 120.0		0.0 0.0	6.000 0.0	10.719 0.0			K Factor = 5.60	
	38.3	0.0128		0.0	6.000	0.077			Vel = 3.36	
S2 to S3	18.40	2.157 120.0		0.0 0.0	6.000 0.0	10.796 0.0			K Factor = 5.60	
	56.7	0.0268		0.0	6.000	0.161			Vel = 4.98	
S3 to S4	18.54	2.157 120.0		0.0 0.0	6.000 0.0	10.957 0.0			K Factor = 5.60	
	75.24	0.0450		0.0	6.000	0.270			Vel = 6.61	
	0.0 75.24									
						11.227			K Factor = 22.46	

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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	*****
C5 to C6	20.33 20.33	1.049 120.0 0.1342	1E 1T	2.0 5.0 0.0	11.000 7.000 18.000	13.178 -4.331 2.415			K Factor = 5.60 Vel = 7.55	
	0.0 20.33						11.262		K Factor = 6.06	
S4 to C6	94.00 94.0	2.157 120.0 0.0700		0.0 0.0 0.0	0.500 0.0 0.500	11.227 0.0 0.035			K Factor = 5.60 Vel = 8.25	
C6 to S5	20.33 114.33	2.157 120.0 0.0976		0.0 0.0 0.0	5.500 0.0 5.500	11.262 0.0 0.537			Vel = 10.04	
S5 to S6	0.0 114.33	2.157 120.0 0.0978	1X	10.461 0.0 0.0	106.000 10.461 116.461	11.799 2.166 11.392			Vel = 10.04	
S6 to S7	0.0 114.33	2.157 120.0 0.0978	1X	10.461 0.0 0.0	5.000 10.461 15.461	25.357 0.0 1.512			Vel = 10.04	
S7 to 209	246.11 360.44	3.26 120.0 0.1090		0.0 0.0 0.0	1.000 0.0 1.000	26.869 0.0 0.109			Vel = 13.85	
209 to TOR	0.0 360.44	3.26 120.0 0.1095	1V	6.72 0.0 0.0	54.000 6.720 60.720	26.978 0.0 6.649			Vel = 13.85	
TOR to FLW	0.0 360.44	4.26 120.0 0.0298	1Fsp	0.0 0.0 0.0	19.000 0.0 19.000	33.627 8.630 0.566			* Fixed loss = 3 Vel = 8.11	
FLW to BOR	0.0 360.44	4.26 120.0 0.0296	1Zib	0.0 0.0 0.0	5.000 0.0 5.000	42.823 6.911 0.148			* Fixed loss = 3.879 Vel = 8.11	
BOR to BASE	0.0 360.44	6.16 140.0 0.0037	1G 2E 1T	4.304 40.168 43.037	250.000 87.509 337.509	49.882 0.0 1.254			Vel = 3.88	
BASE to HOSE	0.0 360.44	8.27 140.0 0.0009		0.0 0.0 0.0	560.000 0.0 560.000	51.136 0.0 0.495			Vel = 2.15	
HOSE to TEST	250.00 610.44	12.46 100.0 0.0006	1G 1E 1T	5.275 23.735 52.745	1050.000 81.754 1131.754	51.631 8.229 0.671			Qa = 250 Vel = 1.61	
	0.0 610.44						60.531		K Factor = 78.46	