



... Fire Protection by Computer Design

High Tech Fire Protection
84 Hackett Mills Road Poland
P.O. Box 154 Minot, ME
Poland, ME 04274
207-998-2551

Job Name : 409 CUMBERLAND AVE APARTMENT COMPLEX 1st FLOOR Kitchen 121 1A
Drawing : FP-01
Location : 1st Floor Kitchen
Remote Area : 1A
Contract : 101513-1
Data File : Calc #1A 1st floor Kitchen 121.WXF

HYDRAULIC CALCULATIONS
for

Project name: 409 CUMBERLAND AVE APARTMENT COMPLEX
Location: 1st Floor Kitchen
Drawing no: FP-01
Date: 1-23-14

Design

Remote area number: 1A
Remote area location: 1st Floor Kitchenette/ Lobby
Occupancy classification: Ordinary hazard group 1
Density: .15 - Gpm/SqFt
Area of application: 900 - SqFt
Coverage per sprinkler: 130 - SqFt
Type of sprinklers calculated: quick response pendent
No. of sprinklers calculated: 11
In-rack demand: n/a - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 508 - GPM @ 71 - Psi
Type of system: wet system
Volume of dry or preaction system: n/a - Gal

Water supply information

Date: 5-19-05
Location: Corner of Cumberland ave and Mechanic Street
Source: City of Portland

Name of contractor: High Tech Fire Protection
Address: 84 Hackett Mills Road Poland / P.O. Box 154 Minot, ME / Pola
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.)

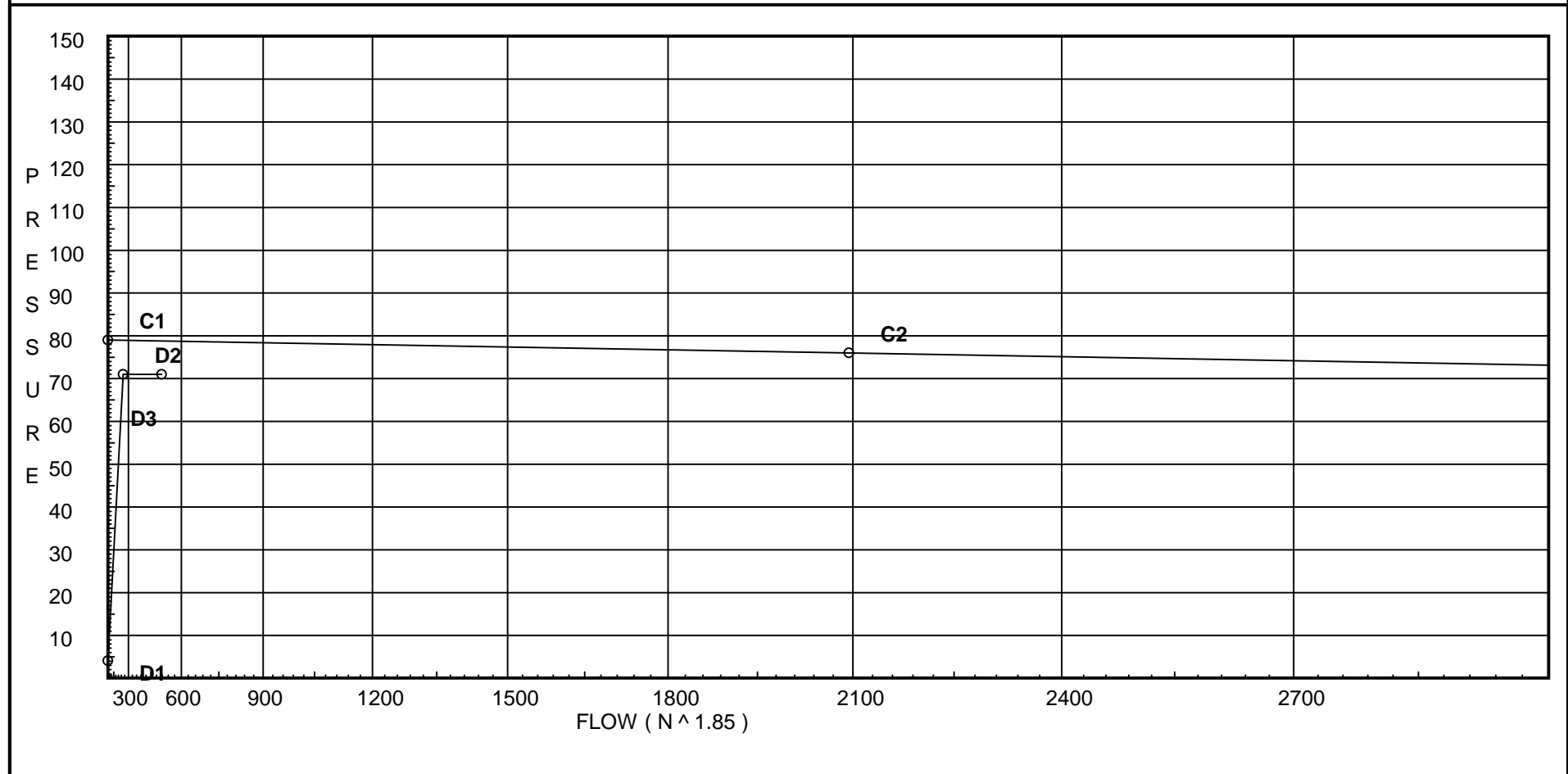
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 79
C2 - Residual Pressure: 76
C2 - Residual Flow : 2094

Demand:
D1 - Elevation : 4.114
D2 - System Flow : 257.261
D2 - System Pressure : 70.987
Hose (Demand) : 250
D3 - System Demand : 507.261
Safety Margin : 7.795



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.
DP1	-1.0	5.6	12.13	na	19.5	0.15	130	7.0
DP2	-1.0	5.6	12.13	na	19.5	0.15	130	7.0
100	24.5	K = K @ EQ01	12.31	na	19.7			
101	24.5		13.13	na				
102	24.5	K = K @ EQ02	13.23	na	20.11			
103	24.5	K = K @ EQ01	12.06	na	19.5			
104	24.5		13.37	na				
105	24.5	K = K @ EQ01	14.2	na	21.15			
106	24.5		14.99	na				
107	24.5		17.38	na				
108	24.5		20.21	na				
110	24.5	K = K @ EQ01	13.3	na	20.48			
111	24.5		14.32	na				
112	24.5	K = K @ EQ01	13.47	na	20.6			
113	24.5		14.43	na				
114	24.5	K = K @ EQ01	14.44	na	21.33			
115	24.5		15.24	na				
120	24.5	K = K @ EQ02	16.5	na	22.46			
121	24.5	K = K @ EQ02	16.63	na	22.55			
122	24.5	K = K @ EQ02	17.21	na	22.94			
130	24.5	K = K @ EQ01	16.45	na	22.77			
131	24.5		18.19	na				
132	24.5	K = K @ EQ02	18.33	na	23.67			
133	24.5		19.64	na				
123	24.5		19.86	na				
140	24.5		22.11	na				
141	24.5		35.68	na				
SA1	24.5		56.9	na				
SA0	8.9		64.04	na				
TOR	8.9		65.31	na				
BOR	3.0		71.18	na				
BASE	0.0		76.81	na				
HS1	10.0		72.66	na				
HS2	12.0		72.04	na				
HS3	12.0		72.05	na	250.0			
TEST	15.0		70.99	na				

The maximum velocity is 22.59 and it occurs in the pipe between nodes 140 and 141

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	19.50 19.5	1.049 120.0 0.1243	1E	2.0 0.0 0.0	1.000 2.000 3.000	12.125 -0.433 0.373			K Factor = 5.60 Vel = 7.24	
	0.0 19.50						12.065		K Factor = 5.61	
DP2 to EQ02	19.50 19.5	1.049 120.0 0.1242	1T	5.0 0.0 0.0	1.000 5.000 6.000	12.125 -0.433 0.745			K Factor = 5.60 Vel = 7.24	
	0.0 19.50						12.437		K Factor = 5.53	
100 to 101	19.70 19.7	1.049 120.0 0.1265	1T	5.0 0.0 0.0	1.500 5.000 6.500	12.310 0.0 0.822			K Factor @ node EQ01 Vel = 7.31	
101 to 102	0.0 19.7	1.682 120.0 0.0126		0.0 0.0 0.0	8.000 0.0 8.000	13.132 0.0 0.101			Vel = 2.84	
102 to 104	20.11 39.81	1.682 120.0 0.0469		0.0 0.0 0.0	2.900 0.0 2.900	13.233 0.0 0.136			K Factor @ node EQ02 Vel = 5.75	
	0.0 39.81						13.369		K Factor = 10.89	
103 to 104	19.50 19.5	1.049 120.0 0.1242	1T	5.0 0.0 0.0	5.500 5.000 10.500	12.065 0.0 1.304			K Factor @ node EQ01 Vel = 7.24	
104 to 106	39.81 59.31	1.682 120.0 0.0975	1T	9.9 0.0 0.0	6.750 9.900 16.650	13.369 0.0 1.624			Vel = 8.56	
	0.0 59.31						14.993		K Factor = 15.32	
105 to 106	21.15 21.15	1.049 120.0 0.1444	1T	5.0 0.0 0.0	0.500 5.000 5.500	14.199 0.0 0.794			K Factor @ node EQ01 Vel = 7.85	
106 to 107	59.32 80.47	1.682 120.0 0.1714	1T	9.9 0.0 0.0	4.000 9.900 13.900	14.993 0.0 2.383			Vel = 11.62	
107 to 108	62.41 142.88	2.157 120.0 0.1477	1X	10.461 0.0 0.0	8.750 10.461 19.211	17.376 0.0 2.838			Vel = 12.54	
108 to 140	0.0 142.88	2.157 120.0 0.1477	1V	4.307 0.0 0.0	8.500 4.307 12.807	20.214 0.0 1.892			Vel = 12.54	
	0.0 142.88						22.106		K Factor = 30.39	
110 to 111	20.48 20.48	1.049 120.0 0.1359	1T	5.0 0.0 0.0	2.500 5.000 7.500	13.302 0.0 1.019			K Factor @ node EQ01 Vel = 7.60	
111 to 113	0.0 20.48	1.682 120.0 0.0136		0.0 0.0 0.0	8.000 0.0 8.000	14.321 0.0 0.109			Vel = 2.96	

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 20.48						14.430		K Factor = 5.39	
112 to 113	20.60 20.6	1.049 120.0 0.1374	1T	5.0 0.0 0.0	2.000 5.000 7.000	13.468 0.0 0.962			K Factor @ node EQ01	
113 to 115	20.48 41.08	1.682 120.0 0.0495	1E	4.95 0.0 0.0	11.500 4.950 16.450	14.430 0.0 0.814			Vel = 7.65	
	0.0 41.08						15.244		K Factor = 10.52	
114 to 115	21.33 21.33	1.049 120.0 0.1467	1T	5.0 0.0 0.0	0.500 5.000 5.500	14.437 0.0 0.807			K Factor @ node EQ01	
115 to 107	41.08 62.41	1.682 120.0 0.1071	1T	9.9 0.0 0.0	10.000 9.900 19.900	15.244 0.0 2.132			Vel = 7.92	
	0.0 62.41						17.376		K Factor = 14.97	
120 to 121	22.46 22.46	1.682 120.0 0.0162		0.0 0.0 0.0	8.000 0.0 8.000	16.497 0.0 0.130			K Factor @ node EQ02	
121 to 122	22.54 45.0	1.682 120.0 0.0585		0.0 0.0 0.0	10.000 0.0 10.000	16.627 0.0 0.585			K Factor @ node EQ02	
122 to 123	22.94 67.94	1.682 120.0 0.1255	1T	9.9 0.0 0.0	11.200 9.900 21.100	17.212 0.0 2.647			K Factor @ node EQ02	
	0.0 67.94						19.859		K Factor = 15.25	
130 to 131	22.77 22.77	1.049 120.0 0.1654	1E 1T	2.0 5.0 0.0	3.500 7.000 10.500	16.450 0.0 1.737			K Factor @ node EQ01	
131 to 132	0.0 22.77	1.682 120.0 0.0166		0.0 0.0 0.0	8.500 0.0 8.500	18.187 0.0 0.141			Vel = 8.45	
132 to 133	23.67 46.44	1.682 120.0 0.0620	1T	9.9 0.0 0.0	11.200 9.900 21.100	18.328 0.0 1.309			K Factor @ node EQ02	
	0.0 46.44						19.637		K Factor = 10.48	
133 to 123	46.44 46.44	2.157 120.0 0.0185		0.0 0.0 0.0	12.000 0.0 12.000	19.637 0.0 0.222			Vel = 4.08	
123 to 140	67.95 114.39	2.157 120.0 0.0979	1X	10.461 0.0 0.0	12.500 10.461 22.961	19.859 0.0 2.247			Vel = 10.04	
140 to 141	142.87 257.26	2.157 120.0 0.4386	1X	10.461 0.0 0.0	20.500 10.461 30.961	22.106 0.0 13.578			Vel = 22.59	

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	*****
141 to SA1	0.0 257.26	2.157 120.0 0.4385	1B 1Fsp 1S 1T 1V	7.384 0.0 13.537 12.307 4.307	4.000 37.535 41.535	35.684 3.000 18.214		* Fixed loss = 3 Vel = 22.59		
SA1 to SA0	0.0 257.26	4.26 120.0 0.0159	1V	8.954 0.0 0.0	15.500 8.954 24.454	56.898 6.756 0.390		Vel = 5.79		
SA0 to TOR	0.0 257.26	4.26 120.0 0.0160	3V 1X	26.861 21.067 0.0	31.500 47.928 79.428	64.044 0.0 1.267		Vel = 5.79		
TOR to BOR	0.0 257.26	4.26 120.0 0.0160	1B 1Fsp	15.8 0.0 0.0	4.000 15.800 19.800	65.311 5.555 0.316		* Fixed loss = 3 Vel = 5.79		
BOR to BASE	0.0 257.26	4.26 120.0 0.0159	1Zia 1E 1T	0.0 13.167 26.334	2.000 39.501 41.501	71.182 4.963 0.661		* Fixed loss = 3.664 Vel = 5.79		
BASE to HS1	0.0 257.26	6.16 140.0 0.0020	1G 1T 1E	4.304 43.037 20.084	25.000 67.425 92.425	76.806 -4.331 0.184		Vel = 2.77		
HS1 to HS2	0.0 257.26	6.16 140.0 0.0020	1T	43.037 0.0 0.0	80.000 43.037 123.037	72.659 -0.866 0.245		Vel = 2.77		
HS2 to HS3	0.0 257.26	12.46 100.0 0.0001	1T	52.745 0.0 0.0	20.000 52.745 72.745	72.038 0.0 0.008		Vel = 0.68		
HS3 to TEST	250.00 507.26	6.16 140.0 0.0070	1G 1E	4.304 20.084 0.0	10.000 24.388 34.388	72.046 -1.299 0.240		Qa = 250 Vel = 5.46		
	0.0 507.26					70.987		K Factor = 60.21		