



... 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 ROOF GREENHOUSE 5G
Drawing : FP-03
Location : Roof Greenhouse
Remote Area : 5G
Contract : 101513-1
Data File : Calc #5G Green House.WXF

HYDRAULIC CALCULATIONS
for

Project name: 409 CUMBERLAND AVE APARTMENT COMPLEX
Location: Roof Greenhouse
Drawing no: FP-03
Date: 1-23-14

Design

Remote area number: 5G
Remote area location: Roof top Greenhouse
Occupancy classification: Light Hazard
Density: .1 - Gpm/SqFt
Area of application: 715 - SqFt
Coverage per sprinkler: 144 - SqFt
Type of sprinklers calculated: Quick response upright
No. of sprinklers calculated: 8
In-rack demand: n/a - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 236 - GPM @ 73 - Psi
Type of system: dry system
Volume of dry or preaction system: 146 - 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.)

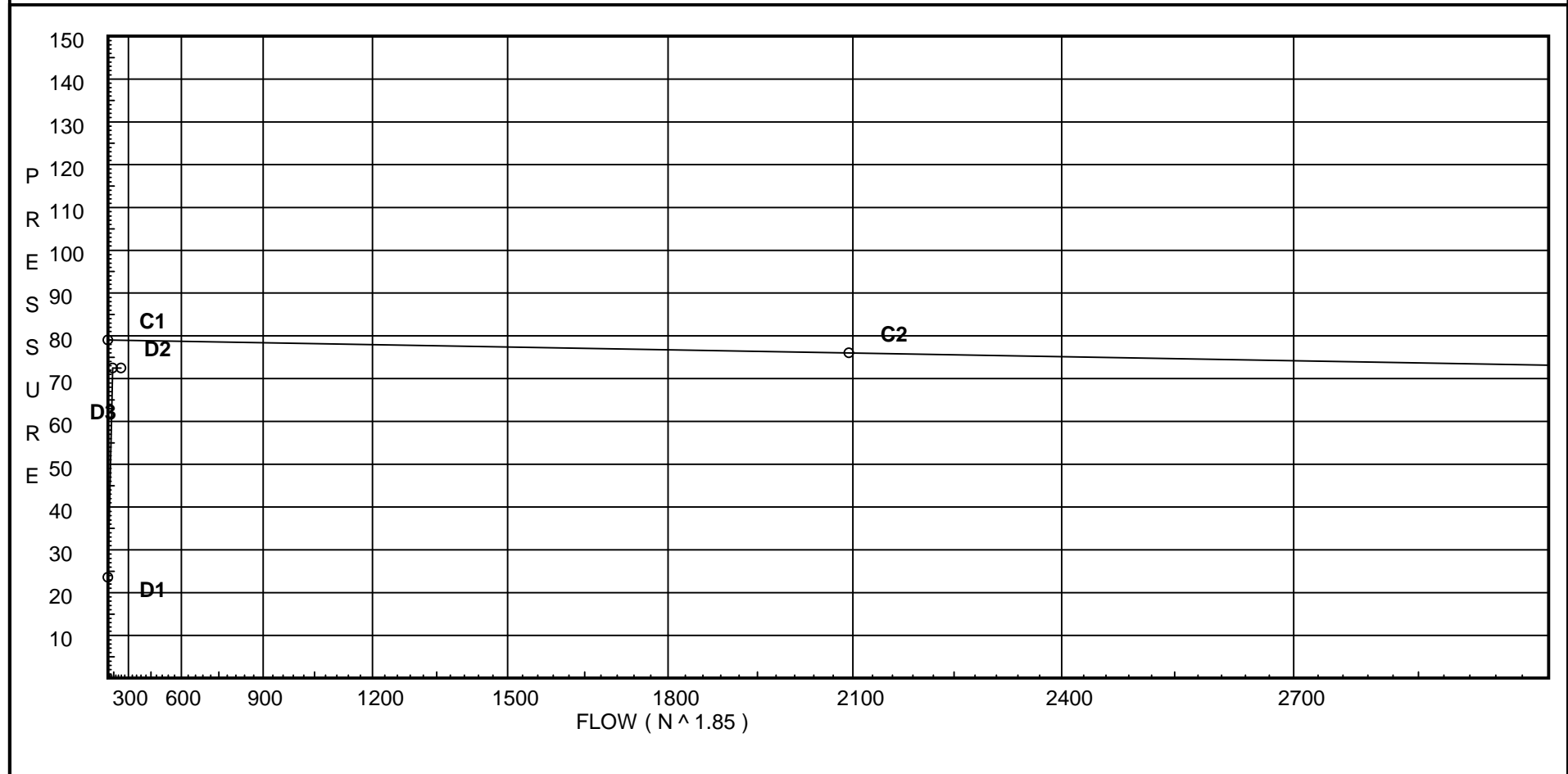
Water Supply Curve (C)

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

Demand:
D1 - Elevation : 23.604
D2 - System Flow : 135.408
D2 - System Pressure : 72.479
Hose (Demand) : 100
D3 - System Demand : 235.408
Safety Margin : 6.468



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
D	Dry Rel D										28		47								
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
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
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	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.
500	69.5	5.6	7.0	na	14.82	0.1	144	7.0
501	69.5	5.6	8.26	na	16.09	0.1	144	7.0
502	69.5	5.6	9.65	na	17.4	0.1	144	7.0
503	69.5	5.6	11.04	na	18.61	0.1	144	7.0
504	69.5		12.8	na				
505	68.5		14.05	na				
510	69.5	5.6	7.34	na	15.17	0.1	144	7.0
511	69.5	5.6	8.65	na	16.47	0.1	144	7.0
512	69.5	5.6	10.11	na	17.81	0.1	144	7.0
513	69.5	5.6	11.56	na	19.04	0.1	144	7.0
514	69.5		13.41	na				
515	68.5		15.32	na				
516	68.5		16.95	na				
517	56.5		25.49	na				
518	56.5		30.3	na				
519	9.3		60.03	na				
14	9.0		62.35	na				
54	8.7		67.8	na				
61	9.2		67.97	na				
63	8.6		68.61	na				
64	8.5		69.61	na				
65	8.4		70.77	na				
TOD	8.4		71.12	na				
BOD	3.0		73.76	na				
BASE	0.0		78.78	na				
HS1	10.0		74.51	na				
HS2	12.0		73.72	na				
HS3	12.0		73.72	na	100.0			
TEST	15.0		72.48	na				

The maximum velocity is 12.95 and it occurs in the pipe between nodes 515 and 516

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	*****
500 to 501	14.82	1.049 100.0		0.0	12.000	7.000			K Factor = 5.60	
501 to 502	14.82	0.1047		0.0	12.000	1.256			Vel = 5.50	
501 to 502	16.09	1.38 100.0		0.0	13.000	8.256			K Factor = 5.60	
502 to 503	30.91	0.1073		0.0	13.000	1.395			Vel = 6.63	
502 to 503	17.39	1.61 100.0		0.0	12.000	9.651			K Factor = 5.60	
503 to 504	48.3	0.1157		0.0	12.000	1.388			Vel = 7.61	
503 to 504	18.61	1.61 100.0	1E	2.855	5.500	11.039			K Factor = 5.60	
504 to 505	66.91	0.2114		0.0	8.355	1.766			Vel = 10.54	
504 to 505	0.0	1.61 100.0	1E	2.855	1.000	12.805				
505 to 515	66.91	0.2114		0.0	2.855	0.433			Vel = 10.54	
505 to 515	0.0	1.61 100.0		0.0	6.000	14.053				
515 to 510	66.91	0.2113		0.0	6.000	1.268			Vel = 10.54	
510 to 511	0.0 66.91					15.321			K Factor = 17.09	
510 to 511	15.17	1.049 100.0		0.0	12.000	7.342			K Factor = 5.60	
511 to 512	15.17	0.1094		0.0	12.000	1.313			Vel = 5.63	
511 to 512	16.48	1.38 100.0		0.0	13.000	8.655			K Factor = 5.60	
512 to 513	31.65	0.1121		0.0	13.000	1.457			Vel = 6.79	
512 to 513	17.81	1.61 100.0		0.0	12.000	10.112			K Factor = 5.60	
513 to 514	49.46	0.1208		0.0	12.000	1.450			Vel = 7.79	
513 to 514	19.04	1.61 100.0	1E	2.855	5.500	11.562			K Factor = 5.60	
514 to 515	68.5	0.2208		0.0	8.355	1.845			Vel = 10.80	
514 to 515	0.0	1.61 100.0	1T	5.71	1.000	13.407				
515 to 516	68.5	0.2207		0.0	5.710	0.433			Vel = 10.80	
515 to 516	66.91	2.067 100.0	1E	3.568	3.500	15.321				
516 to 517	135.41	0.2306		0.0	3.568	0.0			Vel = 12.95	
516 to 517	0.0	2.067 100.0	1V	2.498	12.000	16.951				
517 to 518	135.41	0.2307		0.0	2.498	5.197			Vel = 12.95	
517 to 518	0.0	2.157 100.0	2V	6.148	19.500	25.493				
518 to 519	135.41	0.1874		0.0	6.148	0.0			Vel = 11.89	
518 to 519	0.0	2.157 100.0	1V	3.074	46.500	30.300				
519 to 14	135.41	0.1874		0.0	3.074	20.442			Vel = 11.89	
519 to 14	0.0	2.157 100.0	1T	8.783	2.900	60.034				
14	135.41	0.1874		0.0	8.783	0.130			Vel = 11.89	

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	*****
14	0.0	2.635	1V	4.213	71.000	62.353				
to		100.0		0.0	4.213	0.130				
54	135.41	0.0707		0.0	75.213	5.319		Vel =	7.97	
	0.0									
	135.41					67.802		K Factor =	16.44	
54	135.41	3.26	1X	12.469	3.000	67.802				
to		100.0		0.0	12.469	-0.217				
61	135.41	0.0251		0.0	15.469	0.388		Vel =	5.20	
61	0.0	3.26		0.0	15.200	67.973				
to		100.0		0.0	0.0	0.260				
63	135.41	0.0251		0.0	15.200	0.381		Vel =	5.20	
63	0.0	3.26	1V	4.796	33.000	68.614				
to		100.0		0.0	4.795	0.043				
64	135.41	0.0251		0.0	37.795	0.948		Vel =	5.20	
64	0.0	3.26	2F	5.755	34.000	69.605				
to		100.0	1V	4.796	10.550	0.043				
65	135.41	0.0251		0.0	44.550	1.118		Vel =	5.20	
65	0.0	4.26	3V	19.171	33.000	70.766				
to		100.0		0.0	19.170	0.0				
TOD	135.41	0.0068		0.0	52.170	0.355		Vel =	3.05	
TOD	0.0	4.26	1D	26.313	6.000	71.121				
to		100.0	1B	11.277	37.589	2.339				
BOD	135.41	0.0068		0.0	43.589	0.297		Vel =	3.05	
BOD	0.0	4.26	1T	26.334	2.000	73.757				
to		120.0	1Zia	0.0	39.501	4.825		* Fixed loss =	3.526	
BASE	135.41	0.0049	1E	13.167	41.501	0.202		Vel =	3.05	
BASE	0.0	6.16	1G	4.304	25.000	78.784				
to		140.0	1T	43.037	67.425	-4.331				
HS1	135.41	0.0006	1E	20.084	92.425	0.056		Vel =	1.46	
HS1	0.0	6.16	1T	43.037	80.000	74.509				
to		140.0		0.0	43.037	-0.866				
HS2	135.41	0.0006		0.0	123.037	0.075		Vel =	1.46	
HS2	0.0	12.46	1T	52.745	20.000	73.718				
to		100.0		0.0	52.745	0.0				
HS3	135.41	0.0		0.0	72.745	0.002		Vel =	0.36	
HS3	100.00	6.16	1G	4.304	10.000	73.720		Qa =	100	
to		140.0	1E	20.084	24.388	-1.299				
TEST	235.41	0.0017		0.0	34.388	0.058		Vel =	2.53	
	0.0									
	235.41					72.479		K Factor =	27.65	