



... 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

cov. 3A

Job Name : 409 CUMBERLAND AVE APARTMENT COMPLEX 3rd FLOOR UNIT 315 & 313 above
Drawing : FP-02
Location : 3rd Floor Unit 315 & 313 Above Ceiling
Remote Area : 3A
Contract : 101513-1
Data File : Calc #3A 3rd floor unit 315 - 313 above coverage.WXF

HYDRAULIC CALCULATIONS
for

Project name: 409 CUMBERLAND AVE APARTMENT COMPLEX
Location: 3rd Floor Unit 315 & 313 Above Ceiling
Drawing no: FP-02
Date: 1-23-14

Design

Remote area number: 3A
Remote area location: 3rd Floor Unit 315 & 313 Above Ceiling
Occupancy classification: Light Hazard
Density: .1 - Gpm/SqFt
Area of application: 1000 - SqFt
Coverage per sprinkler: 196 - SqFt
Type of sprinklers calculated: quick response concealed space upright
No. of sprinklers calculated: 7
In-rack demand: n/a - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 250 - GPM @ 73 - 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)

High Tech Fire Protection
409 CUMBERLAND AVE APARTMENT COMPLEX 3rd FLOOR UNIT 315 & 313 above cov. 3A

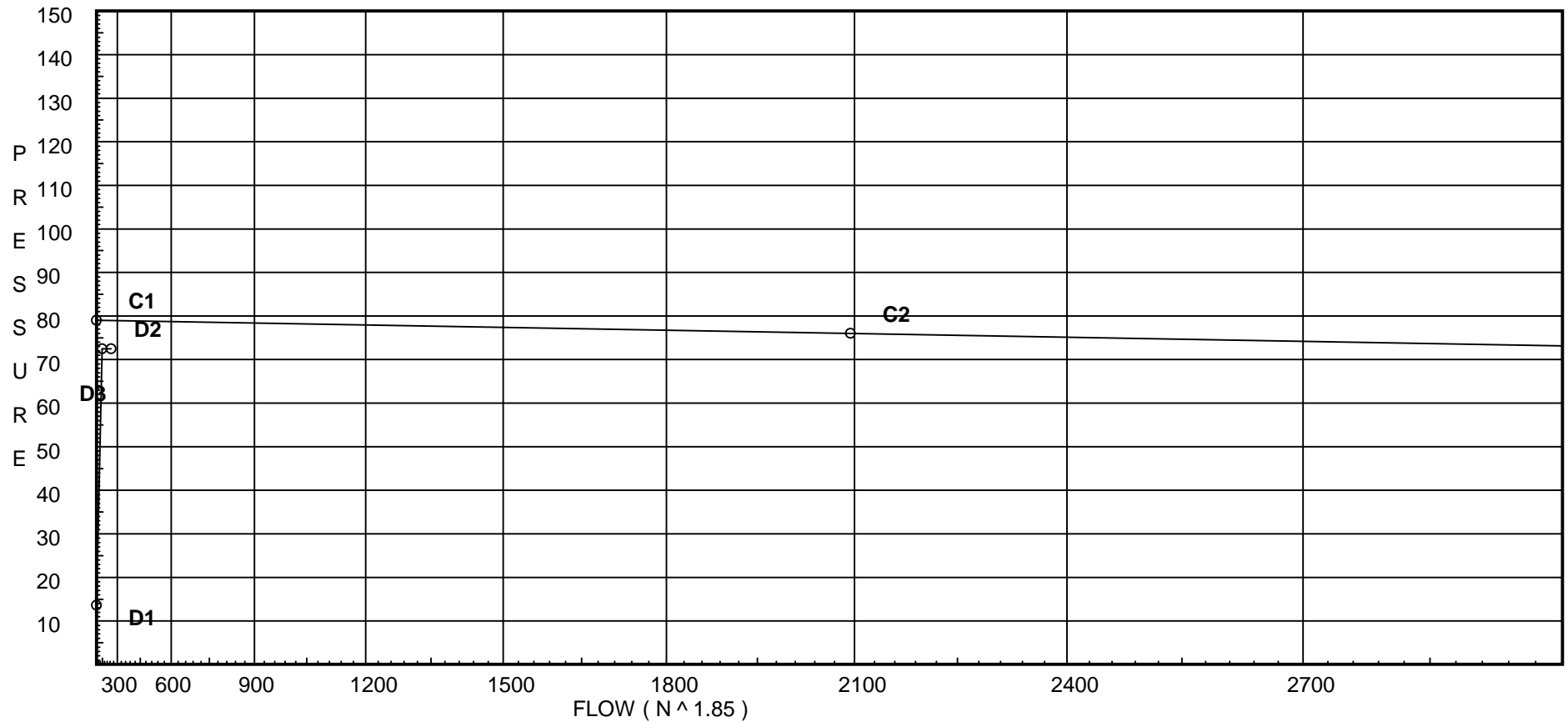
Page 2
Date 1-23-14

City Water Supply:

C1 - Static Pressure : 79
C2 - Residual Pressure: 76
C2 - Residual Flow : 2094

Demand:

D1 - Elevation : 13.643
D2 - System Flow : 149.532
D2 - System Pressure : 72.445
Hose (Demand) : 100
D3 - System Demand : 249.532
Safety Margin : 6.496



Fittings Used Summary

High Tech Fire Protection
 409 CUMBERLAND AVE APARTMENT COMPLEX 3rd FLOOR UNIT 315 & 313 above cov. 3A

Page 3
 Date 1-23-14

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	
N *	CPVC 90'EII Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0	
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0	
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' EII 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

High Tech Fire Protection
 409 CUMBERLAND AVE APARTMENT COMPLEX 3rd FLOOR UNIT 315 & 313 above cov. 3A

Page 4
 Date 1-23-14

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	1.0	5.6	12.25	na	19.6	0.1	196	7.0
DP2	1.0	5.6	12.25	na	19.6	0.1	196	7.0
320	46.5	K = K @ EQ01	13.6	na	19.6			
321	46.5	K = K @ EQ02	14.47	na	20.62			
322	46.5		14.53	na				
323	46.5	K = K @ EQ02	15.32	na	21.22			
330	46.5	K = K @ EQ02	14.44	na	20.6			
331	46.5		15.45	na				
340	46.5	K = K @ EQ01	16.79	na	21.78			
341	46.5	K = K @ EQ02	17.84	na	22.89			
342	46.5		17.92	na				
350	46.5	K = K @ EQ02	17.74	na	22.83			
351	46.5		18.97	na				
332	46.0		21.8	na				
352	46.0		23.46	na				
353	46.0		41.38	na				
SA3	46.0		51.06	na				
SA0	8.9		67.5	na				
TOR	8.9		67.96	na				
BOR	3.0		73.63	na				
BASE	0.0		78.72	na				
HS1	10.0		74.45	na				
HS2	12.0		73.68	na				
HS3	12.0		73.68	na	100.0			
TEST	15.0		72.45	na				

The maximum velocity is 17.24 and it occurs in the pipe between nodes 331 and 332

Final Calculations - Hazen-Williams

High Tech Fire Protection
 409 CUMBERLAND AVE APARTMENT COMPLEX 3rd FLOOR UNIT 315 & 313 above cov. 3A

Page 5
 Date 1-23-14

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
DP1 to EQ01	19.60 19.6	1.101 150.0 0.0656	1N 1O	7.0 5.0 0.0	2.000 12.000 14.000	12.250 0.433 0.918			K Factor = 5.60 Vel = 6.60	
	0.0 19.60						13.601		K Factor = 5.31	
DP2 to EQ02	19.60 19.6	1.101 150.0 0.0655	1O	5.0 0.0 0.0	1.000 5.000 6.000	12.250 0.433 0.393			K Factor = 5.60 Vel = 6.60	
	0.0 19.60						13.076		K Factor = 5.42	
320 to 322	19.60 19.6	1.101 150.0 0.0656	1O	5.0 0.0 0.0	9.200 5.000 14.200	13.601 0.0 0.931			K Factor @ node EQ01 Vel = 6.60	
	0.0 19.60						14.532		K Factor = 5.14	
321 to 322	20.62 20.62	1.101 150.0 0.0722		0.0 0.0 0.0	0.900 0.0 0.900	14.467 0.0 0.065			K Factor @ node EQ02 Vel = 6.95	
322 to 323	19.60 40.22	1.394 150.0 0.0784		0.0 0.0 0.0	10.100 0.0 10.100	14.532 0.0 0.792			Vel = 8.45	
323 to 331	21.21 61.43	1.394 150.0 0.1720		0.0 0.0 0.0	0.750 0.0 0.750	15.324 0.0 0.129			K Factor @ node EQ02 Vel = 12.91	
	0.0 61.43						15.453		K Factor = 15.63	
330 to 331	20.60 20.6	1.101 150.0 0.0718	1O	5.0 0.0 0.0	9.100 5.000 14.100	14.440 0.0 1.013			K Factor @ node EQ02 Vel = 6.94	
331 to 332	61.43 82.03	1.394 150.0 0.2935	1O 1N	6.0 8.0 0.0	6.900 14.000 20.900	15.453 0.217 6.135			Vel = 17.24	
	0.0 82.03						21.805		K Factor = 17.57	
340 to 342	21.78 21.78	1.101 150.0 0.0796	1O	5.0 0.0 0.0	9.200 5.000 14.200	16.789 0.0 1.131			K Factor @ node EQ01 Vel = 7.34	
	0.0 21.78						17.920		K Factor = 5.15	
341 to 342	22.89 22.89	1.101 150.0 0.0878		0.0 0.0 0.0	0.900 0.0 0.900	17.841 0.0 0.079			K Factor @ node EQ02 Vel = 7.71	
342 to 351	21.78 44.67	1.394 150.0 0.0954		0.0 0.0 0.0	11.000 0.0 11.000	17.920 0.0 1.049			Vel = 9.39	
	0.0 44.67						18.969		K Factor = 10.26	

Final Calculations - Hazen-Williams

High Tech Fire Protection
 409 CUMBERLAND AVE APARTMENT COMPLEX 3rd FLOOR UNIT 315 & 313 above cov. 3A

Page 6
 Date 1-23-14

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
350 to 351	22.83	1.101 150.0	1O	5.0 0.0	9.100 5.000	17.743 0.0			K Factor @ node EQ02	
351 to 352	22.83	0.0870		0.0	14.100	1.226			Vel = 7.69	
351 to 352	44.67	1.394 150.0	1O 1N	6.0 8.0	6.900 14.000	18.969 0.217				
	67.5	0.2046		0.0	20.900	4.277			Vel = 14.19	
	0.0 67.50					23.463			K Factor = 13.94	
332 to 352	82.03	2.003 150.0		0.0 0.0	33.000 0.0	21.805 0.0				
	82.03	0.0502		0.0	33.000	1.658			Vel = 8.35	
352 to 353	67.50	2.003 150.0	1N 1T	11.0 12.965	93.500 23.965	23.463 0.0				
	149.53	0.1526		0.0	117.465	17.920			Vel = 15.22	
353 to SA3	0.0	2.157 120.0	1B 1Fsp	7.384 0.0	4.000 37.535	41.383 3.000			* Fixed loss = 3	
	149.53	0.1607	1S 1T 1V	13.537 12.307 4.307	41.535	6.676			Vel = 13.13	
SA3 to SA0	0.0	4.26 120.0	3V	26.861 0.0	36.500 26.861	51.059 16.068				
	149.53	0.0058		0.0	63.361	0.370			Vel = 3.37	
SA0 to TOR	0.0	4.26 120.0	3V 1X	26.861 21.067	31.500 47.928	67.497 0.0				
	149.53	0.0058		0.0	79.428	0.464			Vel = 3.37	
TOR to BOR	0.0	4.26 120.0	1B 1Fsp	15.8 0.0	4.000 15.800	67.961 5.555			* Fixed loss = 3	
	149.53	0.0059		0.0	19.800	0.116			Vel = 3.37	
BOR to BASE	0.0	4.26 120.0	1Zia 1E	0.0 13.167	2.000 39.501	73.632 4.842			* Fixed loss = 3.543	
	149.53	0.0059	1T	26.334	41.501	0.243			Vel = 3.37	
BASE to HS1	0.0	6.16 140.0	1G 1T	4.304 43.037	25.000 67.425	78.717 -4.331				
	149.53	0.0007	1E	20.084	92.425	0.067			Vel = 1.61	
HS1 to HS2	0.0	6.16 140.0	1T	43.037 0.0	80.000 43.037	74.453 -0.866				
	149.53	0.0007		0.0	123.037	0.090			Vel = 1.61	
HS2 to HS3	0.0	12.46 100.0	1T	52.745 0.0	20.000 52.745	73.677 0.0				
	149.53	0.0		0.0	72.745	0.003			Vel = 0.39	
HS3 to TEST	100.00	6.16 140.0	1G 1E	4.304 20.084	10.000 24.388	73.680 -1.299			Qa = 100	
	249.53	0.0019		0.0	34.388	0.064			Vel = 2.69	
	0.0 249.53					72.445			K Factor = 29.32	