

... 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 : Hilton Garden Inn Addition Portland Jetport Attic North end addition
Drawing : FP-02
Location : 145 Jetport Boulevard Portland
Remote Area : 4A
Contract : 053013-1
Data File : attic north end addition.WXF

HYDRAULIC CALCULATIONS
for

Project name: Hilton Garden Inn Addition North End of Attic
Location: 145 Jetport Boulevard Portland
Drawing no: FP-02
Date: 10/15/13

Design

Remote area number: 4A
Remote area location: NORTH END OF ATTIC
Occupancy classification: LIGHT HAZARD
Density: .1 - Gpm/SqFt
Area of application: 2535 - SqFt
Coverage per sprinkler: 120/ 360 - SqFt
Type of sprinklers calculated: BRASS UPRIGHTS & ATTIC HEADS
No. of sprinklers calculated: 18
In-rack demand: N/A - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 528 - GPM @ 75 - Psi
Type of system: DRY
Volume of dry or preaction system: 130 - Gal

Water supply information

Date: 10/31/2013
Location: Test hydrant in front of addition entrance
Source: Portland Water District

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
Hilton Garden Inn Addition Portland Jetport Attic North end addition

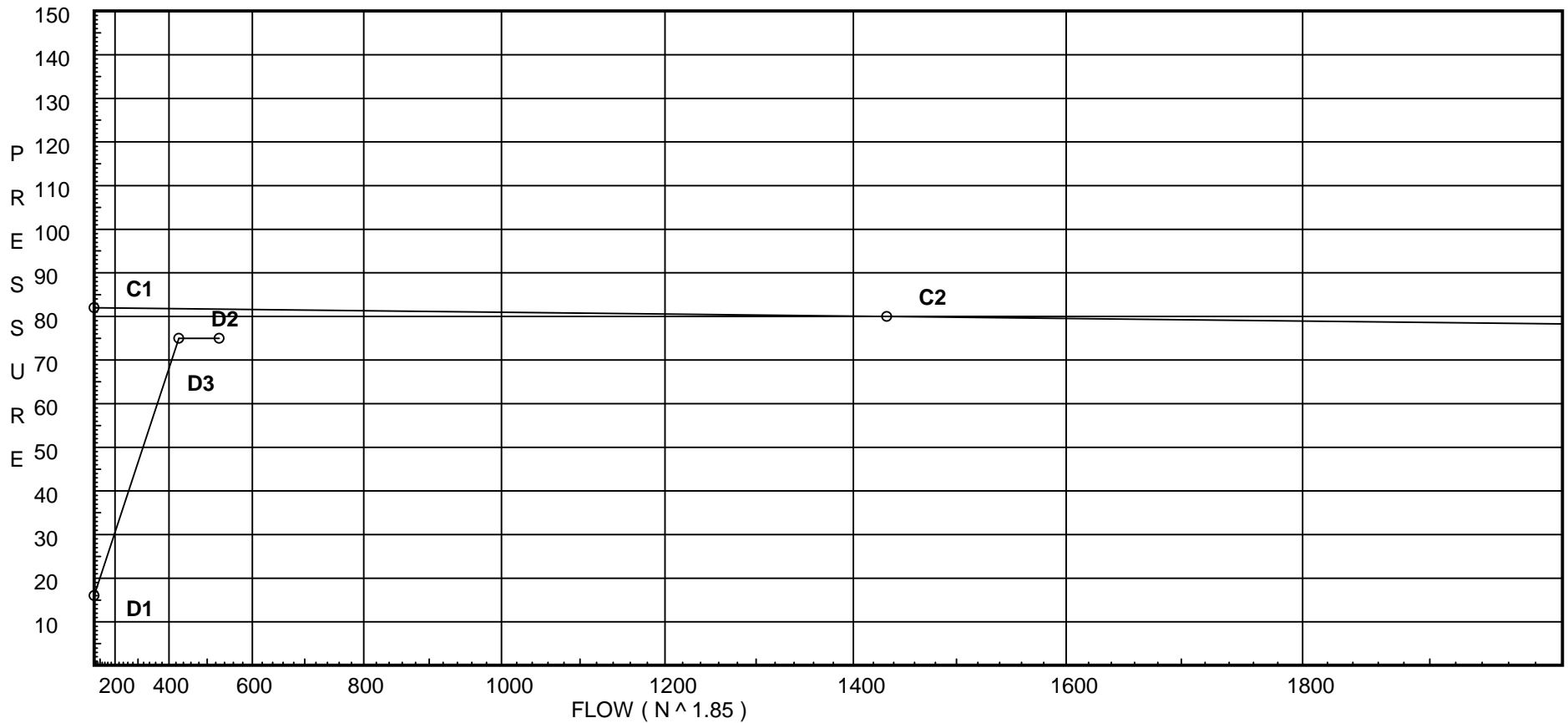
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City Water Supply:

C1 - Static Pressure : 82
C2 - Residual Pressure: 80
C2 - Residual Flow : 1433

Demand:

D1 - Elevation : 16.025
D2 - System Flow : 428.071
D2 - System Pressure : 75.004
Hose (Demand) : 100
D3 - System Demand : 528.071
Safety Margin : 6.681



Fittings Used Summary

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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
Bvcb	B Fly Vic 705W	0	0	0	0	0	0	5	5	0	12	12	8	11	12	14	0	0	0	0	0
Dvc	Dry Vic 768 NXT					3	9	8	17		21		22	50							
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
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	0	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

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.
400	33.0	5.6	7.75	na	15.59	0.1	120	7.0
401	33.0	5.6	8.78	na	16.6	0.1	120	7.0
402	33.0	5.6	13.67	na	20.7	0.1	120	7.0
403	33.0		14.75	na				
410	36.0	5.6	12.21	na	19.57	0.1	120	7.0
411	36.0	5.6	12.53	na	19.83	0.1	120	7.0
412	36.0		13.89	na				
415	39.0	5.6	16.97	na	23.07	0.1	120	7.0
416	39.0		17.83	na				
420	33.0	5.6	15.64	na	22.15	0.1	120	7.0
421	33.0	5.6	16.86	na	22.99	0.1	120	7.0
422	33.0		18.41	na				
425	36.0	5.6	7.1	na	14.92	0.1	120	7.0
426	36.0	5.6	8.52	na	16.35	0.1	120	7.0
427	36.0	5.6	11.51	na	19.0	0.1	120	7.0
428	36.0		12.93	na				
430	39.0	5.6	11.84	na	19.27	0.1	120	7.0
431	39.0	5.6	12.81	na	20.04	0.1	120	7.0
432	39.0		13.64	na				
435	39.0	5.6	19.9	na	24.98	0.1	120	7.0
DA	32.0		20.21	na				
DB	32.0		21.1	na				
DC	32.0		23.61	na				
DD	32.0		22.6	na				
DE	32.0		23.26	na				
DF	32.0		24.04	na				
DG	32.0		26.41	na				
DH	32.0		26.65	na				
450	39.0	8	22.6	na	38.03	0.1	360	22.6
451	39.0	8	22.64	na	38.06	0.1	360	22.6
452	39.0	8	22.78	na	38.18	0.1	360	22.6
453	39.0	8	23.45	na	38.74	0.1	360	22.6
454	39.0		23.54	na				
455	39.0		23.93	na				
DI	31.0		28.04	na				
TOD	31.0		32.04	na				
BOD	24.0		37.19	na				
DJ	20.0		39.45	na				
AJ	20.0		41.21	na				
AK	10.0		46.32	na				
AL	10.0		52.36	na				
AM	10.0		52.75	na				
TOW	10.0		68.25	na				
BOW	3.0		72.83	na				
BASE	0.0		74.29	na				
HOSE	0.0		75.76	na	100.0			
TEST	2.0		75.0	na				

The maximum velocity is 19.63 and it occurs in the pipe between nodes 403 and DA

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	*****
400 to 401	15.59	1.049 100.0		9.000 0.0	7.748 0.0			K Factor = 5.60	
401 to 403	15.59	0.1150		9.000	1.035			Vel = 5.79	
401 to 403	16.59	1.049 100.0	1T	3.568 0.0	10.000 3.568	8.783 0.0		K Factor = 5.60	
	32.18	0.4396		0.0	13.568	5.965		Vel = 11.95	
	0.0 32.18					14.748		K Factor = 8.38	
402 to 403	20.70	1.049 100.0	1T	3.568 0.0	2.000 3.568	13.666 0.0		K Factor = 5.60	
	20.7	0.1943		0.0	5.568	1.082		Vel = 7.68	
403 to DA	32.19	1.049 100.0	1T	3.568 0.0	1.000 3.568	14.748 0.433			
	52.89	1.1018		0.0	4.568	5.033		Vel = 19.63	
	0.0 52.89					20.214		K Factor = 11.76	
410 to 412	19.57	1.049 100.0	1T	3.568 0.0	6.000 3.568	12.214 0.0		K Factor = 5.60	
	19.57	0.1752		0.0	9.568	1.676		Vel = 7.26	
	0.0 19.57					13.890		K Factor = 5.25	
411 to 412	19.82	1.049 100.0	1T	3.568 0.0	4.000 3.568	12.533 0.0		K Factor = 5.60	
	19.82	0.1793		0.0	7.568	1.357		Vel = 7.36	
412 to DB	19.58	1.049 100.0	1T	3.568 0.0	5.000 3.568	13.890 1.732			
	39.4	0.6392		0.0	8.568	5.477		Vel = 14.63	
	0.0 39.40					21.099		K Factor = 8.58	
415 to 416	23.07	1.049 100.0	1E	1.427 0.0	2.200 1.427	16.967 0.0		K Factor = 5.60	
	23.07	0.2374		0.0	3.627	0.861		Vel = 8.56	
416 to DC	0.0	1.049 100.0	1T	3.568 0.0	8.000 3.568	17.828 3.032			
	23.07	0.2375		0.0	11.568	2.747		Vel = 8.56	
	0.0 23.07					23.607		K Factor = 4.75	
420 to 422	22.15	1.049 100.0	1T	3.568 0.0	9.000 3.568	15.640 0.0		K Factor = 5.60	
	22.15	0.2202		0.0	12.568	2.768		Vel = 8.22	
	0.0 22.15					18.408		K Factor = 5.16	
421 to 422	22.99	1.049 100.0	1T	3.568 0.0	3.000 3.568	16.858 0.0		K Factor = 5.60	
	22.99	0.2360		0.0	6.568	1.550		Vel = 8.53	
422 to DD	22.15	1.049 100.0	1T	3.568 0.0	1.000 3.568	18.408 0.433			
	45.14	0.8220		0.0	4.568	3.755		Vel = 16.76	

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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 45.14									
						22.596			K Factor = 9.50	
425 to 426	14.92	1.049 100.0	1E	1.427 0.0	12.000 1.427	7.100 0.0			K Factor = 5.60	
	14.92	0.1061		0.0	13.427	1.424			Vel = 5.54	
426 to 428	16.35	1.049 100.0	1T	3.568 0.0	7.000 3.568	8.524 0.0			K Factor = 5.60	
	31.27	0.4168		0.0	10.568	4.405			Vel = 11.61	
	0.0 31.27									
						12.929			K Factor = 8.70	
427 to 428	19.00	1.049 100.0	1T	3.568 0.0	5.000 3.568	11.508 0.0			K Factor = 5.60	
	19.0	0.1658		0.0	8.568	1.421			Vel = 7.05	
428 to DE	31.27	1.049 100.0	1T	3.568 0.0	5.000 3.568	12.929 1.732				
	50.27	1.0032		0.0	8.568	8.595			Vel = 18.66	
	0.0 50.27									
						23.256			K Factor = 10.42	
430 to 432	19.27	1.049 100.0	1T	3.568 0.0	7.000 3.568	11.845 0.0			K Factor = 5.60	
	19.27	0.1702		0.0	10.568	1.799			Vel = 7.15	
	0.0 19.27									
						13.644			K Factor = 5.22	
431 to 432	20.04	1.049 100.0	1T	3.568 0.0	1.000 3.568	12.808 0.0			K Factor = 5.60	
	20.04	0.1830		0.0	4.568	0.836			Vel = 7.44	
432 to DF	19.27	1.049 100.0	1T	3.568 0.0	8.000 3.568	13.644 3.032				
	39.31	0.6366		0.0	11.568	7.364			Vel = 14.59	
	0.0 39.31									
						24.040			K Factor = 8.02	
435 to DH	24.98	1.049 100.0	1E 1T	1.427 3.568	8.500 4.995	19.902 3.032			K Factor = 5.60	
	24.98	0.2752		0.0	13.495	3.714			Vel = 9.27	
	0.0 24.98									
						26.648			K Factor = 4.84	
DA to DB	52.89	1.682 100.0		0.0 0.0	8.000 0.0	20.214 0.0				
	52.89	0.1106		0.0	8.000	0.885			Vel = 7.64	
DB to DC	39.39	1.682 100.0		0.0 0.0	8.100 0.0	21.099 0.0				
	92.28	0.3096		0.0	8.100	2.508			Vel = 13.32	
DC to DG	23.07	1.682 100.0		0.0 0.0	6.000 0.0	23.607 0.0				
	115.35	0.4678		0.0	6.000	2.807			Vel = 16.66	
	0.0 115.35									
						26.414			K Factor = 22.44	

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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	*****
DD	45.14	1.682		0.0	8.000	22.596				
to		100.0		0.0	0.0	0.0				
DE	45.14	0.0825		0.0	8.000	0.660		Vel =	6.52	
DE	50.27	2.157		0.0	8.000	23.256				
to		100.0		0.0	0.0	0.0				
DF	95.41	0.0980		0.0	8.000	0.784		Vel =	8.38	
DF	39.31	2.157	1T	8.783	4.000	24.040				
to		100.0		0.0	8.783	0.0				
DG	134.72	0.1857		0.0	12.783	2.374		Vel =	11.83	
DG	115.35	3.26		0.0	3.000	26.414				
to		100.0		0.0	0.0	0.0				
DH	250.07	0.0780		0.0	3.000	0.234		Vel =	9.61	
DH	24.98	4.26	1V	6.39	31.500	26.648				
to		100.0		0.0	6.390	0.433				
DI	275.05	0.0253		0.0	37.890	0.958		Vel =	6.19	
	0.0									
	275.05					28.039		K Factor =	51.94	
450	38.03	2.635		0.0	5.400	22.600		K Factor =	8.00	
to		100.0		0.0	0.0	0.0				
451	38.03	0.0067		0.0	5.400	0.036		Vel =	2.24	
451	38.06	2.635		0.0	6.000	22.636		K Factor =	8.00	
to		100.0		0.0	0.0	0.0				
452	76.09	0.0243		0.0	6.000	0.146		Vel =	4.48	
452	38.19	2.635	1X	10.582	4.000	22.782		K Factor =	8.00	
to		100.0		0.0	10.582	0.0				
454	114.28	0.0517		0.0	14.582	0.754		Vel =	6.72	
	0.0									
	114.28					23.536		K Factor =	23.56	
453	38.74	2.635	1X	10.582	2.000	23.448		K Factor =	8.00	
to		100.0		0.0	10.582	0.0				
454	38.74	0.0070		0.0	12.582	0.088		Vel =	2.28	
454	114.28	3.26	1V	4.796	7.750	23.536				
to		100.0		0.0	4.795	0.0				
455	153.02	0.0314		0.0	12.545	0.394		Vel =	5.88	
455	0.0	3.26	1X	12.469	8.000	23.930				
to		100.0		0.0	12.469	3.465				
DI	153.02	0.0315		0.0	20.469	0.644		Vel =	5.88	
	0.0									
	153.02					28.039		K Factor =	28.90	
DI	428.07	4.26	2V	12.78	57.000	28.039				
to		100.0		0.0	12.780	0.0				
TOD	428.07	0.0573		0.0	69.780	3.999		Vel =	9.64	
TOD	0.0	4.26	1Dvc	19.734	6.000	32.038				
to		100.0	1B	11.277	31.011	3.032				
BOD	428.07	0.0573		0.0	37.011	2.120		Vel =	9.64	
BOD	0.0	4.26	1V	8.954	4.000	37.190				
to		120.0		0.0	8.954	1.732				
DJ	428.07	0.0410		0.0	12.954	0.531		Vel =	9.64	

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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	*****
DJ	0.0	4.26	1V	8.954	13.000	39.453				
to		120.0	1X	21.067	30.021	0.0				
AJ	428.07	0.0409		0.0	43.021	1.759		Vel =	9.64	
AJ	0.0	4.26	1V	8.954	10.000	41.212				
to		120.0		0.0	8.954	4.331				
AK	428.07	0.0409		0.0	18.954	0.775		Vel =	9.64	
AK	0.0	4.26	5V	44.768	103.000	46.318				
to		120.0		0.0	44.768	0.0				
AL	428.07	0.0409		0.0	147.768	6.044		Vel =	9.64	
AL	0.0	4.26	1V	8.954	0.500	52.362				
to		120.0		0.0	8.954	0.0				
AM	428.07	0.0409		0.0	9.454	0.387		Vel =	9.64	
AM	0.0	4.26	11V	98.49	270.000	52.749				
to		120.0	2F	10.534	109.024	0.0				
TOW	428.07	0.0409		0.0	379.024	15.502		Vel =	9.64	
TOW	0.0	6.357	1Bvcb	10.059	6.000	68.251				
to		120.0	1Fsp	0.0	88.014	4.032		* Fixed loss =	1	
BOW	428.07	0.0058	1T	37.72	94.014	0.548		Vel =	4.33	
			1S	40.235						
BOW	0.0	6.357	1G	3.772	6.000	72.831				
to		120.0	1E	17.603	21.375	1.299				
BASE	428.07	0.0058		0.0	27.375	0.159		Vel =	4.33	
BASE	0.0	6.16	1G	4.304	200.000	74.289				
to		140.0	2E	40.168	87.509	0.0				
HOSE	428.07	0.0051	1T	43.037	287.509	1.467		Vel =	4.61	
HOSE	100.00	12.34	1G	9.377	300.000	75.756		Qa =	100	
to		140.0	1E	42.195	145.339	-0.866				
TEST	528.07	0.0003	1T	93.767	445.339	0.114		Vel =	1.42	
	0.0									
	528.07					75.004		K Factor =	60.97	