

. . . Fire Protection by Computer Design

HAMPSHIRE FIRE PROTECTION
8 N. WENTWORTH AVE.
LONDONDERRY, NH 03053
603-432-8221

Job Name : PARK DANFORTH - 5TH FLOOR
Building : 2016 ADDITION, 5TH FLOOR
Location : PORTLAND, ME
System : 5
Contract : 4737CME
Data File : PD5TH.wxf

Hydraulic Design Information Sheet

Name - PARK DANFORTH, 5TH FLOOR Date - 2-12-15
 Location - PORTLAND, ME
 Building - 2016 ADDITION, 5TH FLOOR System No. - 5
 Contractor - PC CONSTRUCTION Contract No. - 4737CME
 Calculated By - BENOIT Drawing No. - 9
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 8-0
 Occupancy - ELDERY APARTMENTS

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. () 1 () 2 () 3 () Ex.Haz.
 Y () NFPA 231 () NFPA 231C () Figure Curve

S Other

T Specific Ruling Made By Date

M	Area of Sprinkler Operation	- 1500	System Type	Sprinkler/Nozzle
	Density	- .1	(X) Wet	Make RELIABLE
D	Area Per Sprinkler	- 148	() Dry	Model FLFR
E	Elevation at Highest Outlet	- 61	() Deluge	Size 1/2
S	Hose Allowance - Inside	- 0	() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	() Other	Temp.Rat.
G	Hose Allowance - Outside	- 100		

N Note

Calculation Flow Required - 320.7 Press Required - 49.0 AT TEST
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 10-25-14		Cap. -
T	Time of Test - 10 AM	Rated Cap.- 1000	Elev.-
E	Static Press - 62	@ Press - 70	
R	Residual Press - 60	Elev. - 0	Well
	Flow - 992		Proof Flow
S	Elevation - 0		

U Location - SEE SITE PLAN

P Source of Information - PORTLAND WATER DEPT., MEANS DIVISION

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
M	() Single Row	() Conven. Pallet	() Auto. Storage () Encap.
S	() Double Row	() Slave Pallet	() Solid Shelf () Non
T	() Mult. Row		() Open Shelf

R K Flue Spacing Clearance:Storage to Ceiling
 A Longitudinal Transverse

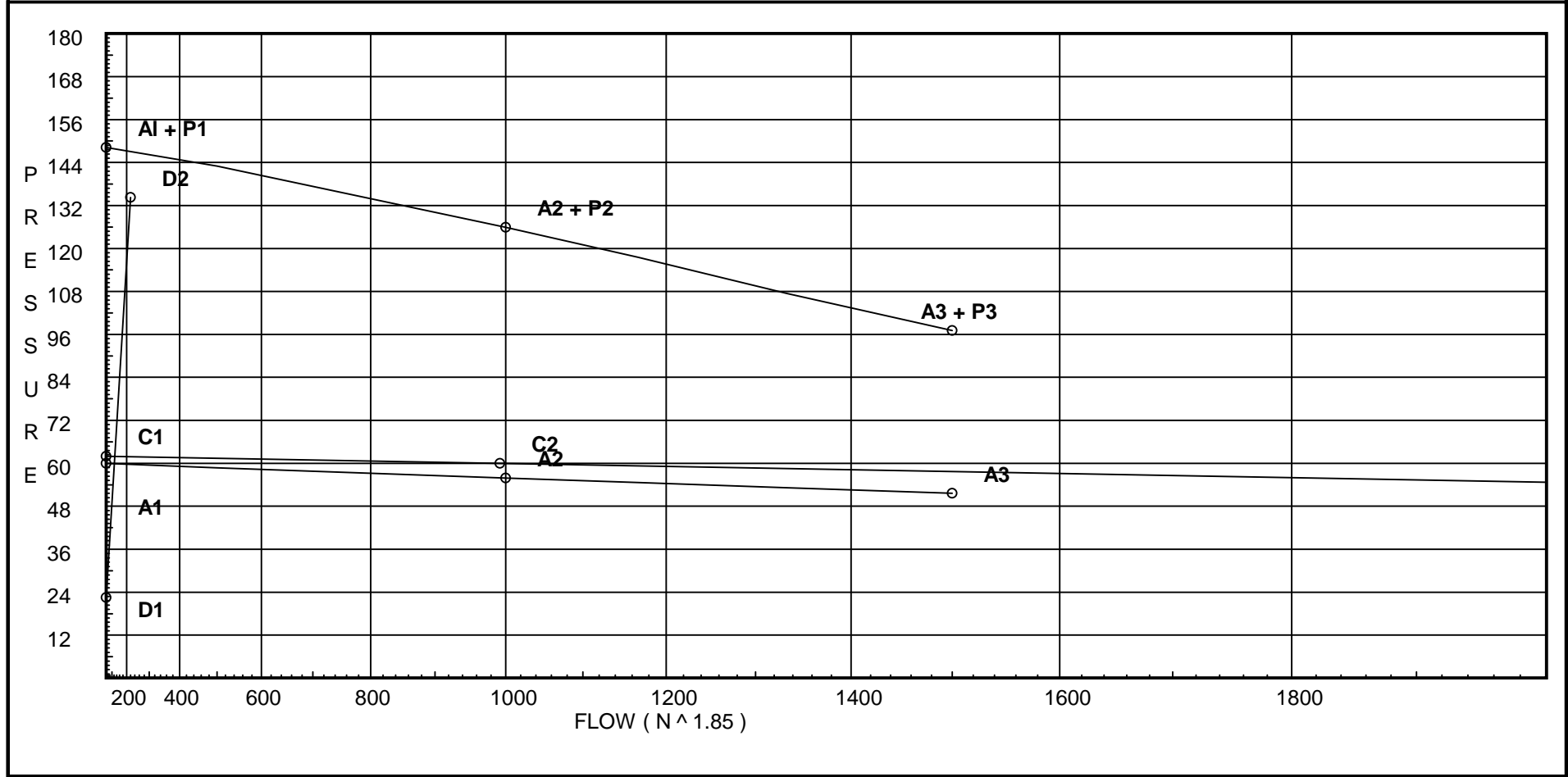
G Horizontal Barriers Provided:

Water Supply Curve C

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City Water Supply: C1 - Static Pressure : 62 C2 - Residual Pressure: 60 C2 - Residual Flow : 992 City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow A1 - Adjusted Static: 59.998 A2 - Adj Resid : 55.899 @ 1000 A3 - Adj Resid : 51.615 @ 1500	Pump Data: P1 - Pump Churn Pressure : 88.2 P2 - Pump Rated Pressure : 70 P2 - Pump Rated Flow : 1000 P3 - Pump Pressure @ Max Flow : 45.5 P3 - Pump Max Flow : 1500 City Residual Flow @ 0 = 6348.24 City Residual Flow @ 20 = 5143.10 City Water @ 150% of Pump = 57.70	Demand: D1 - Elevation : 22.521 D2 - System Flow : 220.694 D2 - System Pressure : 134.273 Hose (Demand) : _____ D3 - System Demand : 220.694 Hose (Adj City) : 100 Safety Margin : 12.715
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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	2.25	2	2.5	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
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
I	90' Grvd-Vic Elbow #10	0	0	2	3	4	3.5	6	5	8	7	8.5	10	13	17	20	23	25	33	36	40
J	90'Tee-Branch Grv Vic #20	0	0	4.5	6	8	8.5	10.8	13	17	16	21	25	33	41	50	65	78	88	98	120
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

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.
1	61.0	5.6	7.79	na	15.63	0.1	148	7.0
2	61.0	5.6	8.94	na	16.75	0.1	148	7.0
3	61.0	5.6	12.12	na	19.49	0.1	148	7.0
4	61.0	5.6	11.38	na	18.89	0.1	148	7.0
4T	61.0		12.6	na				
4U	61.0		12.84	na				
4V	61.0		15.24	na				
5	61.0	5.6	16.47	na	22.72	0.1	148	7.0
6	61.0	5.6	19.84	na	24.94	0.1	148	7.0
7	61.0	5.6	19.55	na	24.76	0.1	148	7.0
8	61.0	5.6	9.0	na	16.8	0.1	168	9.0
9	61.0	5.6	9.79	na	17.52	0.1	168	9.0
10	61.0	5.6	11.33	na	18.85	0.1	148	7.0
9T	61.0		10.56	na				
10T	61.0		12.15	na				
11	61.0	5.6	18.9	na	24.34	0.1	148	7.0
A	61.0		20.46	na				
B	61.0		20.5	na				
C	61.0		21.11	na				
D	61.0		21.48	na				
E	61.0		22.89	na				
F	61.0		58.65	na				
G	61.0		91.5	na				
5FC	61.0		106.3	na				
S3	57.0		108.07	na				
SB	17.0		126.49	na				
SE	9.0		130.49	na				
SF	9.0		130.92	na				
TOR	9.0		131.05	na				
BOR	2.0		134.17	na				
DISC	2.0		134.27	na				
SUCT	2.0		59.66	na				
BF1	2.0		59.67	na				
BF2	2.0		64.67	na				
FLG	1.0		65.12	na				
HOSE	5.0		63.44	na	100.0			
TEST	9.0		61.75	na				

The maximum velocity is 28.78 and it occurs in the pipe between nodes 11 and E

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	*****
1	15.63	1.049	2E	4.0	10.000	7.788				
to		120.0		0.0	4.000	0.0				
2	15.63	0.0825		0.0	14.000	1.155			K Factor = 5.60	
2	16.75	1.049		0.0	10.000	8.943			Vel = 5.80	
to		120.0		0.0	0.0	0.0				
3	32.38	0.3172		0.0	10.000	3.172			K Factor = 5.60	
3	19.49	1.049	T	5.0	6.000	12.115			Vel = 12.02	
to		120.0		0.0	5.000	0.0				
A	51.87	0.7585		0.0	11.000	8.344			K Factor = 5.60	
	0.0								Vel = 19.26	
	51.87					20.459				
4	18.89	1.049	T	5.0	5.500	11.375			K Factor = 11.47	
to		120.0		0.0	5.000	0.0				
4T	18.89	0.1170		0.0	10.500	1.229			K Factor = 5.60	
4T	0.0	1.049		0.0	2.000	12.604			Vel = 7.01	
to		120.0		0.0	0.0	0.0				
4U	18.89	0.1170		0.0	2.000	0.234			Vel = 7.01	
4U	0.0	1.049	E	2.0	13.500	12.838				
to		120.0	T	5.0	7.000	0.0				
4V	18.89	0.1171		0.0	20.500	2.400			K Factor = 5.60	
4V	0.0	1.049		0.0	10.500	15.238			Vel = 7.01	
to		120.0		0.0	0.0	0.0				
5	18.89	0.1170		0.0	10.500	1.229			Vel = 7.01	
5	22.72	1.049	T	5.0	3.000	16.467			K Factor = 5.60	
to		120.0		0.0	5.000	0.0				
B	41.61	0.5048		0.0	8.000	4.038			Vel = 15.45	
	0.0									
	41.61					20.505			K Factor = 9.19	
6	24.94	1.049	T	5.0	1.500	19.838			K Factor = 5.60	
to		120.0		0.0	5.000	0.0				
C	24.94	0.1958		0.0	6.500	1.273			Vel = 9.26	
	0.0									
	24.94					21.111			K Factor = 5.43	
7	24.76	1.049	T	5.0	5.000	19.545			K Factor = 5.60	
to		120.0		0.0	5.000	0.0				
D	24.76	0.1931		0.0	10.000	1.931			Vel = 9.19	
	0.0									
	24.76					21.476			K Factor = 5.34	
8	16.80	1.049	E	2.0	14.500	9.000			K Factor = 5.60	
to		120.0		0.0	2.000	0.0				
9T	16.8	0.0942		0.0	16.500	1.555			Vel = 6.24	
	0.0									
	16.80					10.555			K Factor = 5.17	
9	17.52	1.049	T	5.0	2.500	9.791			K Factor = 5.60	
to		120.0		0.0	5.000	0.0				
9T	17.52	0.1019		0.0	7.500	0.764			Vel = 6.50	
	0.0									
	17.52					10.555			K Factor = 5.39	

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 10T	18.85 18.85	1.049 120.0 0.1167	T	5.0 0.0 0.0	2.000 5.000 7.000	11.329 0.0 0.817			K Factor = 5.60 Vel = 7.00	
	0.0 18.85						12.146		K Factor = 5.41	
9T to 10T	34.32 34.32	1.049 120.0 0.3536		0.0 0.0 0.0	4.500 0.0 4.500	10.555 0.0 1.591			Vel = 12.74	
10T to 11	18.85 53.17	1.049 120.0 0.7942		0.0 0.0 0.0	8.500 0.0 8.500	12.146 0.0 6.751			Vel = 19.74	
11 to E	24.35 77.52	1.049 120.0 1.5956		0.0 0.0 0.0	2.500 0.0 2.500	18.897 0.0 3.989			K Factor = 5.60 Vel = 28.78	
	0.0 77.52						22.886		K Factor = 16.20	
A to B	51.87 51.87	2.157 120.0 0.0230		0.0 0.0 0.0	2.000 0.0 2.000	20.459 0.0 0.046			Vel = 4.55	
B to C	41.61 93.48	2.157 120.0 0.0673		0.0 0.0 0.0	9.000 0.0 9.000	20.505 0.0 0.606			Vel = 8.21	
C to D	24.94 118.42	2.157 120.0 0.1043		0.0 0.0 0.0	3.500 0.0 3.500	21.111 0.0 0.365			Vel = 10.40	
D to E	24.76 143.18	2.157 120.0 0.1484		0.0 0.0 0.0	9.500 0.0 9.500	21.476 0.0 1.410			Vel = 12.57	
E to F	77.51 220.69	2.157 120.0 0.3302	I	4.307 0.0 0.0	104.000 4.307 108.307	22.886 0.0 35.766			Vel = 19.38	
F to G	0.0 220.69	2.157 120.0 0.3302	J	10.461 0.0 0.0	89.000 10.461 99.461	58.652 0.0 32.844			Vel = 19.38	
G to 5FC	0.0 220.69	2.157 120.0 0.3302	3I B S	12.922 7.384 13.537	11.000 33.843 44.843	91.496 0.0 14.809			Vel = 19.38	
5FC to S3	0.0 220.69	4.26 120.0 0.0120		0.0 0.0 0.0	3.000 0.0 3.000	106.305 1.732 0.036			Vel = 4.97	
S3 to SB	0.0 220.69	4.26 120.0 0.0120	I J B	9.217 21.067 15.8	45.000 46.084 91.084	108.073 17.324 1.094			Vel = 4.97	
SB to SE	0.0 220.69	4.26 120.0 0.0120	I J	9.217 21.067	14.000 30.284	126.491 3.465			Vel = 4.97	
SE to SF	0.0 220.69	4.26 120.0 0.0120	J	21.067 0.0 0.0	15.000 21.067 36.067	130.487 0.0 0.433			Vel = 4.97	

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	*****
SF to TOR	0.0 220.69	6.357 120.0 0.0017	3l	37.72 0.0 0.0	40.000 37.720 77.720	130.920 0.0 0.133		Vel = 2.23		
TOR to BOR	0.0 220.69	6.357 120.0 0.0017	J B	31.433 12.573 0.0	7.000 44.006 51.006	131.053 3.032 0.087		Vel = 2.23		
BOR to DISC	0.0 220.69	6.357 120.0 0.0017	B S	12.573 40.235 0.0	6.000 52.808 58.808	134.172 0.0 0.101		Vel = 2.23		
	0.0 220.69					134.273		K Factor = 19.05		
System Demand Pressure						134.273				
Safety Margin						12.715				
Continuation Pressure						146.988				
Pressure @ Pump Outlet						146.988				
Pressure From Pump Curve						-87.326				
Pressure @ Pump Inlet						59.662				
SUCT to BF1	0.0 220.69	8.249 120.0 0.0005	G	4.698 0.0 0.0	10.000 4.698 14.698	59.662 0.0 0.007		Vel = 1.32		
BF1 to BF2	0.0 220.69	8.249 120.0 0.0010		0.0 0.0 0.0	1.000 0.0 1.000	59.669 5.000 0.001		** Fixed Loss = 5 Vel = 1.32		
BF2 to FLG	0.0 220.69	8.249 120.0 0.0005	2l	30.537 0.0 0.0	5.000 30.537 35.537	64.670 0.433 0.017		Vel = 1.32		
FLG to HOSE	0.0 220.69	8.27 140.0 0.0003	T G	55.354 6.326 0.0	90.000 61.680 151.680	65.120 -1.732 0.053		Vel = 1.32		
HOSE to TEST	100.00 320.69	12.34 140.0 0.0001	E T G	42.195 93.767 9.377	280.000 145.339 425.339	63.441 -1.732 0.043		Qa = 100 Vel = 0.86		
	0.0 320.69					61.752		K Factor = 40.81		