

. . . Fire Protection by Computer Design

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

Job Name : PARK DANFORTH - 1ST OFFICES
Building : 2016 ADDITION, 1ST OFFICES
Location : PORTLAND, ME
System : 1
Contract : 4737CME
Data File : PD1STOFF.wxf

Hydraulic Design Information Sheet

Name - PARK DANFORTH, 1ST FLOOR OFFICES Date - 2-12-15
 Location - PORTLAND, ME
 Building - 2016 ADDITION, 1ST OFFICES System No. - 1
 Contractor - PC CONSTRUCTION Contract No. - 4737CME
 Calculated By - BENOIT Drawing No. - 9
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 8-0
 Occupancy - OFFICES

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 - 900	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 40% QR HEAD USE REDUCTION

Calculation Flow Required - 254 Press Required - -26 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
S	Flow - 992		Proof Flow
U	Elevation - 0		

P Location - SEE SITE PLAN

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

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
	() 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

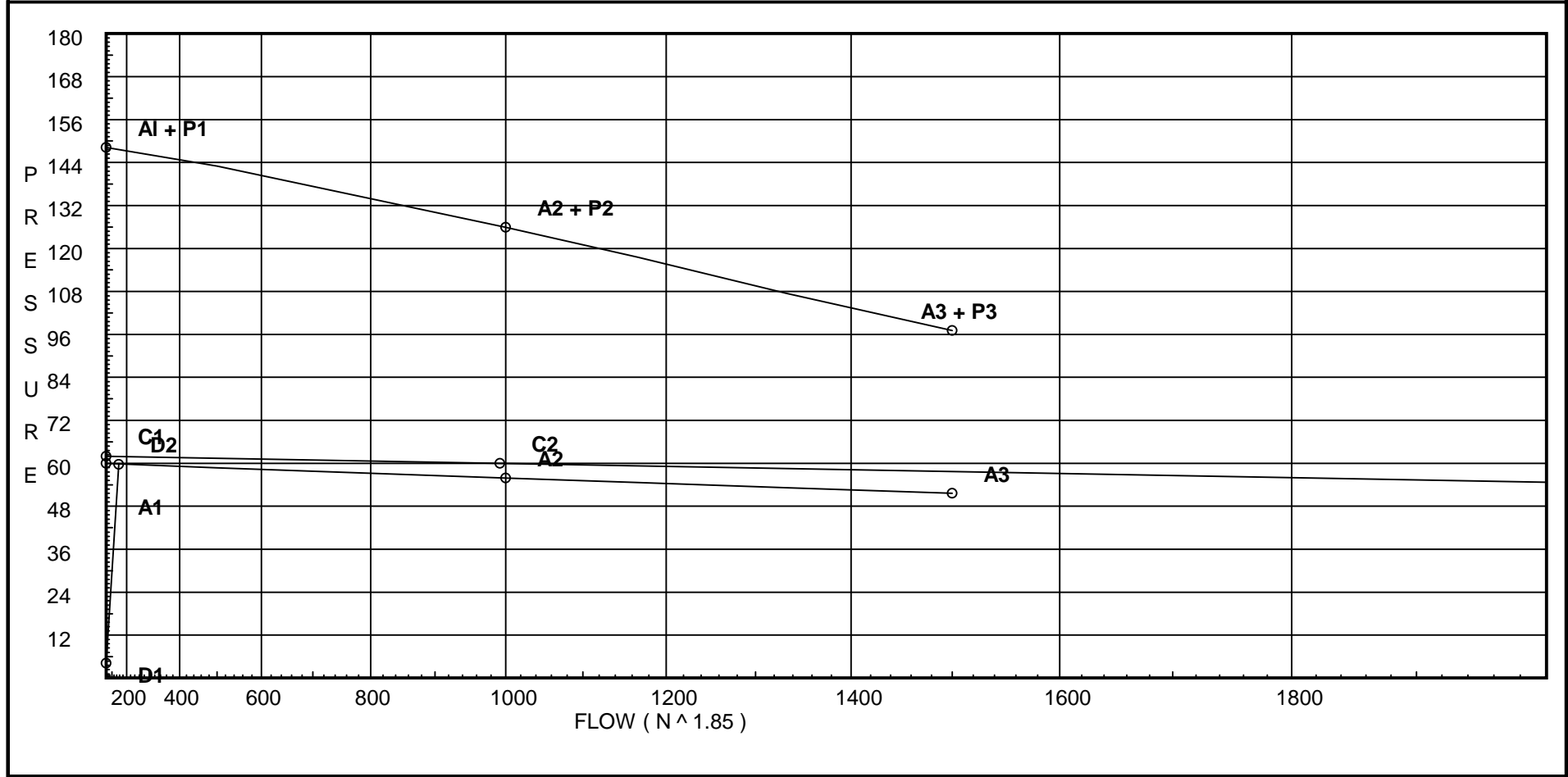
E Horizontal Barriers Provided:

Water Supply Curve C

HAMPSHIRE FIRE PROTECTION
 PARK DANFORTH - 1ST OFFICES

Page 2
 Date 1-29-16

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 : 4.158 D2 - System Flow : 154.257 D2 - System Pressure : 59.724 Hose (Demand) : _____ D3 - System Demand : 154.257 Hose (Adj City) : 100 Safety Margin : 87.828
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Fittings Used Summary

HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - 1ST OFFICES

Page 3
Date 1-29-16

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	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

HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - 1ST OFFICES

Page 4
Date 1-29-16

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
20	18.6	5.6	13.46	na	20.55	0.1	148	7.0
21	18.6	5.6	14.22	na	21.12	0.1	148	7.0
21T	18.6		15.52	na				
21U	18.6		21.59	na				
22	18.6	5.6	7.0	na	14.82	0.1	148	7.0
23	18.6	5.6	7.0	na	14.82	0.1	148	7.0
24	18.6	5.6	10.22	na	17.9	0.1	148	7.0
25	18.6	5.6	12.41	na	19.73	0.1	148	7.0
22T	18.6		8.35	na				
24T	18.6		11.17	na				
25T	18.6		13.55	na				
26	18.6	5.6	15.4	na	21.97	0.1	148	7.0
27	18.6	5.6	17.4	na	23.36	0.1	148	7.0
27T	18.6		18.96	na				
27U	18.6		24.28	na				
H	18.6		25.31	na				
I	18.6		25.49	na				
J	18.6		28.79	na				
K	18.6		31.94	na				
1FC	18.0		52.11	na				
SB	17.0		52.56	na				
SE	9.0		56.3	na				
SF	9.0		56.53	na				
TOR	9.0		56.6	na				
BOR	2.0		59.67	na				
DISC	2.0		59.72	na				
SUCT	2.0		59.8	na				
BF1	2.0		59.81	na				
BF2	2.0		64.81	na				
FLG	1.0		65.25	na				
HOSE	5.0		63.54	na	100.0			
TEST	9.0		61.84	na				

The maximum velocity is 22.27 and it occurs in the pipe between nodes J and K

Final Calculations - Hazen-Williams

HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - 1ST OFFICES

Page 5
Date 1-29-16

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
20 to 21T	20.55 20.55	1.049 120.0 0.1368	2E	4.0 0.0 0.0	11.000 4.000 15.000	13.463 0.0 2.052			K Factor = 5.60 Vel = 7.63	
	0.0 20.55					15.515			K Factor = 5.22	
21 to 21T	21.12 21.12	1.049 120.0 0.1439	E T	2.0 5.0 0.0	2.000 7.000 9.000	14.220 0.0 1.295			K Factor = 5.60 Vel = 7.84	
21T to 21U	20.54 41.66	1.049 120.0 0.5059		0.0 0.0 0.0	12.000 0.0 12.000	15.515 0.0 6.071			Vel = 15.47	
21U to H	0.0 41.66	1.38 120.0 0.1330	T	6.0 0.0 0.0	22.000 6.000 28.000	21.586 0.0 3.725			Vel = 8.94	
	0.0 41.66					25.311			K Factor = 8.28	
22 to 22T	14.82 14.82	1.049 120.0 0.0747	2E T	4.0 5.0 0.0	9.000 9.000 18.000	7.000 0.0 1.345			K Factor = 5.60 Vel = 5.50	
	0.0 14.82					8.345			K Factor = 5.13	
23 to 22T	14.82 14.82	1.049 120.0 0.0747	2E T	4.0 5.0 0.0	9.000 9.000 18.000	7.000 0.0 1.345			K Factor = 5.60 Vel = 5.50	
	0.0 14.82					8.345			K Factor = 5.13	
24 to 24T	17.90 17.9	1.049 120.0 0.1060	E T	2.0 5.0 0.0	2.000 7.000 9.000	10.218 0.0 0.954			K Factor = 5.60 Vel = 6.64	
	0.0 17.90					11.172			K Factor = 5.36	
25 to 25T	19.73 19.73	1.049 120.0 0.1268	E T	2.0 5.0 0.0	2.000 7.000 9.000	12.408 0.0 1.141			K Factor = 5.60 Vel = 7.32	
	0.0 19.73					13.549			K Factor = 5.36	
22T to 24T	29.63 29.63	1.049 120.0 0.2692		0.0 0.0 0.0	10.500 0.0 10.500	8.345 0.0 2.827			Vel = 11.00	
24T to 25T	17.90 47.53	1.38 120.0 0.1698		0.0 0.0 0.0	14.000 0.0 14.000	11.172 0.0 2.377			Vel = 10.20	
25T to I	19.73 67.26	1.38 120.0 0.3227	T	6.0 0.0 0.0	31.000 6.000 37.000	13.549 0.0 11.940			Vel = 14.43	
	0.0 67.26					25.489			K Factor = 13.32	

Final Calculations - Hazen-Williams

HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - 1ST OFFICES

Page 6
Date 1-29-16

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
26 to 27T	21.97 21.97	1.049 120.0 0.1549	4E	8.0 0.0 0.0	15.000 8.000 23.000	15.397 0.0 3.563			K Factor = 5.60 Vel = 8.16	
	0.0 21.97						18.960		K Factor = 5.05	
27 to 27T	23.36 23.36	1.049 120.0 0.1734	E T	2.0 5.0 0.0	2.000 7.000 9.000	17.399 0.0 1.561			K Factor = 5.60 Vel = 8.67	
27T to 27U	21.97 45.33	1.049 120.0 0.5913		0.0 0.0 0.0	9.000 0.0 9.000	18.960 0.0 5.322			Vel = 16.83	
27U to J	0.0 45.33	1.38 120.0 0.1555	T	6.0 0.0 0.0	23.000 6.000 29.000	24.282 0.0 4.510			Vel = 9.72	
	0.0 45.33						28.792		K Factor = 8.45	
H to I	41.66 41.66	1.682 120.0 0.0509		0.0 0.0 0.0	3.500 0.0 3.500	25.311 0.0 0.178			Vel = 6.02	
I to J	67.26 108.92	1.682 120.0 0.3003		0.0 0.0 0.0	11.000 0.0 11.000	25.489 0.0 3.303			Vel = 15.73	
J to K	45.34 154.26	1.682 120.0 0.5716		0.0 0.0 0.0	5.500 0.0 5.500	28.792 0.0 3.144			Vel = 22.27	
K to 1FC	0.0 154.26	2.157 120.0 0.1702	7I 2J B S	30.151 20.921 7.384 13.537	45.000 71.993 116.993	31.936 0.260 19.917			Vel = 13.54	
1FC to SB	0.0 154.26	4.26 120.0 0.0060		0.0 0.0 0.0	3.000 0.0 3.000	52.113 0.433 0.018			Vel = 3.47	
SB to SE	0.0 154.26	4.26 120.0 0.0062	I J	9.217 21.067 0.0	14.000 30.284 44.284	52.564 3.465 0.274			Vel = 3.47	
SE to SF	0.0 154.26	4.26 120.0 0.0062	J	21.067 0.0 0.0	15.000 21.067 36.067	56.303 0.0 0.223			Vel = 3.47	
SF to TOR	0.0 154.26	6.357 120.0 0.0009	3I	37.72 0.0 0.0	40.000 37.720 77.720	56.526 0.0 0.069			Vel = 1.56	
TOR to BOR	0.0 154.26	6.357 120.0 0.0009	J B	31.433 12.573 0.0	7.000 44.006 51.006	56.595 3.032 0.045			Vel = 1.56	
BOR to DISC	0.0 154.26	6.357 120.0 0.0009	B S	12.573 40.235 0.0	6.000 52.808 58.808	59.672 0.0 0.052			Vel = 1.56	
	0.0									

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HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - 1ST OFFICES

Page 7
Date 1-29-16

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	154.26				59.724		K Factor = 19.96		
System Demand Pressure					59.724				
Safety Margin					87.828				
Continuation Pressure					147.552				
Pressure @ Pump Outlet					147.552				
Pressure From Pump Curve					-87.750				
Pressure @ Pump Inlet					59.802				
SUCT	0.0	8.249	G	4.698	10.000	59.802			
to		120.0		0.0	4.698	0.0			
BF1	154.26	0.0003		0.0	14.698	0.004	Vel = 0.93		
BF1	0.0	8.249		0.0	1.000	59.806			
to		120.0		0.0	0.0	5.000	** Fixed Loss = 5		
BF2	154.26	0.0		0.0	1.000	0.0	Vel = 0.93		
BF2	0.0	8.249	2I	30.537	5.000	64.806			
to		120.0		0.0	30.537	0.433			
FLG	154.26	0.0003		0.0	35.537	0.009	Vel = 0.93		
FLG	0.0	8.27	T	55.354	90.000	65.248			
to		140.0	G	6.326	61.680	-1.732			
HOSE	154.26	0.0002		0.0	151.680	0.028	Vel = 0.92		
HOSE	100.00	12.34	E	42.195	280.000	63.544	Qa = 100		
to		140.0	T	93.767	145.339	-1.732			
TEST	254.26	0.0001	G	9.377	425.339	0.027	Vel = 0.68		
	0.0								
	254.26				61.839		K Factor = 32.33		