

. . . Fire Protection by Computer Design

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

Job Name : PARK DANFORTH - 1ST AUDITORIUM
Building : 2016 ADDITION, 1ST AUDITORIUM
Location : PORTLAND, ME
System : 1
Contract : 4737CME
Data File : PD1STA.wxf

Hydraulic Design Information Sheet

Name - PARK DANFORTH, 1ST FLOOR AUDITORIUM Date - 2-12-15
 Location - PORTLAND, ME
 Building - 2016 ADDITION, 1ST AUDITORIUM System No. - 1
 Contractor - PC CONSTRUCTION Contract No. - 4737CME
 Calculated By - BENOIT Drawing No. - 4
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 9-0
 Occupancy - AUDITORIUM

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 - 168	() 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 - 292.0 Press Required - 41.0 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
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

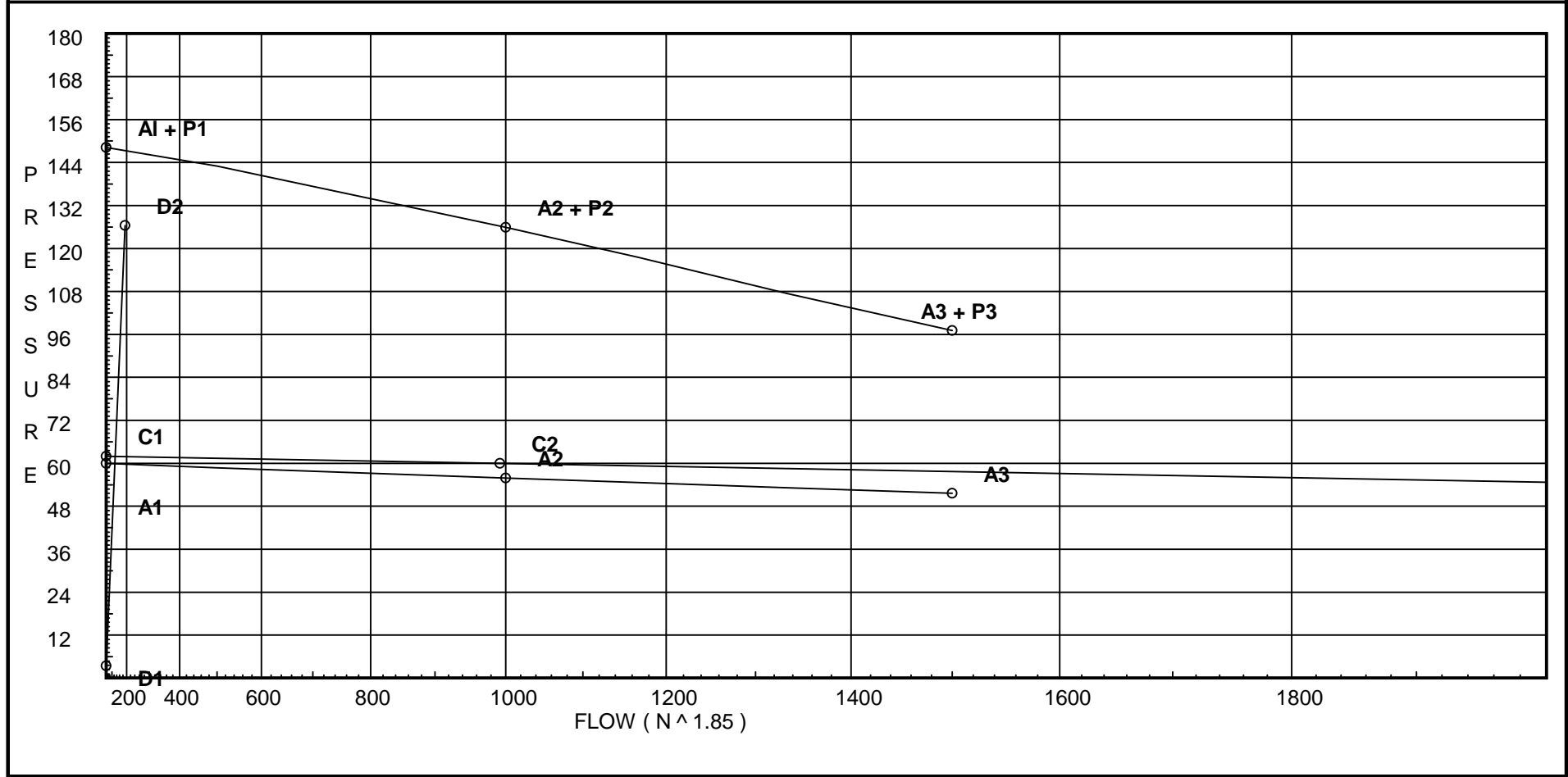
E Horizontal Barriers Provided:

Water Supply Curve C

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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 : 3.465 D2 - System Flow : 192.022 D2 - System Pressure : 126.429 Hose (Demand) : _____ D3 - System Demand : 192.022 Hose (Adj City) : 100 Safety Margin : 20.821
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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	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.
30	17.0	5.6	7.0	na	14.82	0.1	148	7.0
31	17.0	5.6	7.81	na	15.65	0.1	148	7.0
31T	17.0		7.9	na				
32	17.0	5.6	11.44	na	18.94	0.1	168	9.0
33	17.0	5.6	13.81	na	20.81	0.1	148	7.0
34	19.5	5.6	11.22	na	18.76	0.1	148	7.0
35	19.5	5.6	11.81	na	19.25	0.1	148	7.0
34T	19.5		12.72	na				
36	17.0	5.6	10.25	na	17.93	0.1	148	7.0
37	17.0	5.6	11.29	na	18.82	0.1	168	9.0
38	17.0	5.6	15.75	na	22.23	0.1	148	7.0
37T	17.0		12.16	na				
38T	17.0		17.18	na				
39	17.0	5.6	19.64	na	24.82	0.1	148	7.0
L	17.0		17.01	na				
M	17.0		17.31	na				
N	17.0		20.72	na				
O	17.0		21.38	na				
P	17.0		39.73	na				
Q	16.0		75.99	na				
CFC	14.0		120.56	na				
SD	17.0		119.33	na				
SF	9.0		123.15	na				
TOR	9.0		123.25	na				
BOR	2.0		126.35	na				
DISC	2.0		126.43	na				
SUCT	2.0		59.73	na				
BF1	2.0		59.73	na				
BF2	2.0		64.73	na				
FLG	1.0		65.18	na				
HOSE	5.0		63.49	na	100.0			
TEST	9.0		61.79	na				

The maximum velocity is 27.73 and it occurs in the pipe between nodes O and P

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	*****
30 to 31T	14.82 14.82	1.049 120.0 0.0747	T	5.0 0.0 0.0	7.000 5.000 12.000	7.000 0.0 0.896			K Factor = 5.60 Vel = 5.50	
	0.0 14.82					7.896			K Factor = 5.27	
31 to 31T	15.65 15.65	1.049 120.0 0.0820		0.0 0.0 0.0	1.000 0.0 1.000	7.814 0.0 0.082			K Factor = 5.60 Vel = 5.81	
31T to 32	14.82 30.47	1.049 120.0 0.2836		0.0 0.0 0.0	12.500 0.0 12.500	7.896 0.0 3.545			Vel = 11.31	
32 to 33	18.94 49.41	1.38 120.0 0.1824		0.0 0.0 0.0	13.000 0.0 13.000	11.441 0.0 2.371			K Factor = 5.60 Vel = 10.60	
33 to M	20.81 70.22	1.38 120.0 0.3495	T	6.0 0.0 0.0	4.000 6.000 10.000	13.812 0.0 3.495			K Factor = 5.60 Vel = 15.06	
	0.0 70.22					17.307			K Factor = 16.88	
34 to 34T	18.76 18.76	1.049 120.0 0.1156	T	5.0 0.0 0.0	8.000 5.000 13.000	11.221 0.0 1.503			K Factor = 5.60 Vel = 6.96	
	0.0 18.76					12.724			K Factor = 5.26	
35 to 34T	19.25 19.25	1.049 120.0 0.1213	T	5.0 0.0 0.0	2.500 5.000 7.500	11.814 0.0 0.910			K Factor = 5.60 Vel = 7.15	
34T to L	18.76 38.01	1.049 120.0 0.4267	T	5.0 0.0 0.0	2.500 5.000 7.500	12.724 1.083 3.200			Vel = 14.11	
	0.0 38.01					17.007			K Factor = 9.22	
36 to 37T	17.93 17.93	1.049 120.0 0.1063	2E	4.0 0.0 0.0	14.000 4.000 18.000	10.251 0.0 1.914			K Factor = 5.60 Vel = 6.66	
	0.0 17.93					12.165			K Factor = 5.14	
37 to 37T	18.82 18.82	1.049 120.0 0.1163	T	5.0 0.0 0.0	2.500 5.000 7.500	11.293 0.0 0.872			K Factor = 5.60 Vel = 6.99	
	0.0 18.82					12.165			K Factor = 5.40	
38 to 38T	22.23 22.23	1.049 120.0 0.1582	E T	2.0 5.0 0.0	2.000 7.000 9.000	15.754 0.0 1.424			K Factor = 5.60 Vel = 8.25	
	0.0 22.23					17.178			K Factor = 5.36	

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	*****
37T	36.75	1.049		0.0	12.500	12.165				
to		120.0		0.0	0.0	0.0				
38T	36.75	0.4010		0.0	12.500	5.013			Vel = 13.64	
38T	22.23	1.38	E	3.0	5.000	17.178				
to		120.0	T	6.0	9.000	0.0				
N	58.98	0.2530		0.0	14.000	3.542			Vel = 12.65	
	0.0									
	58.98					20.720			K Factor = 12.96	
39	24.82	1.049	T	5.0	4.000	19.638			K Factor = 5.60	
to		120.0		0.0	5.000	0.0				
O	24.82	0.1940		0.0	9.000	1.746			Vel = 9.21	
	0.0									
	24.82					21.384			K Factor = 5.37	
L	38.01	1.682		0.0	7.000	17.007				
to		120.0		0.0	0.0	0.0				
M	38.01	0.0429		0.0	7.000	0.300			Vel = 5.49	
M	70.22	1.682		0.0	11.500	17.307				
to		120.0		0.0	0.0	0.0				
N	108.23	0.2968		0.0	11.500	3.413			Vel = 15.63	
N	58.98	1.682		0.0	1.000	20.720				
to		120.0		0.0	0.0	0.0				
O	167.21	0.6640		0.0	1.000	0.664			Vel = 24.14	
O	24.81	1.682	J	9.9	11.500	21.384				
to		120.0		0.0	9.900	0.0				
P	192.02	0.8572		0.0	21.400	18.344			Vel = 27.73	
P	0.0	1.682	2I	9.9	22.000	39.728				
to		120.0	J	9.9	19.800	0.433				
Q	192.02	0.8572		0.0	41.800	35.830			Vel = 27.73	
Q	0.0	1.682	3I	14.849	12.000	75.991				
to		120.0	J	9.9	38.980	0.866				
CFC	192.02	0.8572	B	3.094	50.980	43.700			Vel = 27.73	
			S	11.137						
CFC	0.0	6.357	I	12.573	12.000	120.557				
to		120.0	J	31.433	44.006	-1.299				
SD	192.02	0.0013		0.0	56.006	0.074			Vel = 1.94	
SD	0.0	6.357	8I	100.587	135.000	119.332				
to		120.0	J	31.433	132.020	3.465				
SF	192.02	0.0013		0.0	267.020	0.353			Vel = 1.94	
SF	0.0	6.357	3I	37.72	40.000	123.150				
to		120.0		0.0	37.720	0.0				
TOR	192.02	0.0013		0.0	77.720	0.103			Vel = 1.94	
TOR	0.0	6.357	J	31.433	7.000	123.253				
to		120.0	B	12.573	44.006	3.032				
BOR	192.02	0.0013		0.0	51.006	0.067			Vel = 1.94	
BOR	0.0	6.357	B	12.573	6.000	126.352				
to		120.0	S	40.235	52.808	0.0				
DISC	192.02	0.0013		0.0	58.808	0.077			Vel = 1.94	
	0.0									

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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	*****
	192.02					126.429			K Factor = 17.08	
						126.429				
						20.821				
						147.250				
						147.250				
						-87.524				
						59.726				
SUCT	0.0	8.249	G	4.698	10.000	59.726				
to		120.0		0.0	4.698	0.0				
BF1	192.02	0.0004		0.0	14.698	0.006			Vel = 1.15	
BF1	0.0	8.249		0.0	1.000	59.732				
to		120.0		0.0	0.0	5.000			** Fixed Loss = 5	
BF2	192.02	0.0		0.0	1.000	0.0			Vel = 1.15	
BF2	0.0	8.249	2I	30.537	5.000	64.732				
to		120.0		0.0	30.537	0.433				
FLG	192.02	0.0004		0.0	35.537	0.013			Vel = 1.15	
FLG	0.0	8.27	T	55.354	90.000	65.178				
to		140.0	G	6.326	61.680	-1.732				
HOSE	192.02	0.0003		0.0	151.680	0.042			Vel = 1.15	
HOSE	100.00	12.34	E	42.195	280.000	63.488			Qa = 100	
to		140.0	T	93.767	145.339	-1.732				
TEST	292.02	0.0001	G	9.377	425.339	0.036			Vel = 0.78	
	0.0									
	292.02					61.792			K Factor = 37.15	