Inspections Division
Date: 03/22/16

. . . 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

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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

SYSTEM DESIGN

(X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.
( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve
Other
Specific Ruling Made By Date

Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
Density	- .1	(X) Wet	Make RELIABLE
Area Per Sprinkler	- 148	( ) Dry	Model F1FR
Elevation at Highest Outlet	- 61	( ) Deluge	Size 1/2
Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.
Hose Allowance - Outside	- 100		

Note 40% QR HEAD USE REDUCTION

Calculation Summary Flow Required - 254 Press Required - -26 AT TEST
C-Factor Used: 120 Overhead 140 Underground

WATER SUPPLY

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

Location - SEE SITE PLAN

Source of Information - PORTLAND WATER DEPT., MEANS DIVISION

COMMODITY STORAGE

Commodity Class Location
Storage Ht. Area Aisle W.
Storage Method: Solid Piled % Palletized % Rack

( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.
( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non
( ) Mult. Row ( ) Open Shelf

Flue Spacing Clearance:Storage to Ceiling
Longitudinal Transverse

Horizontal Barriers Provided:

Water Supply Curve C

HAMPSHIRE FIRE PROTECTION
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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 : 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

Fittings Used Summary

HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - 1ST OFFICES

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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

HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - 1ST OFFICES

Date 1-29-

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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

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	20.55	1.049	2E	4.0	11.000	13.463		K Factor = 5.60
to		120.0		0.0	4.000	0.0		
21T	20.55	0.1368		0.0	15.000	2.052		Vel = 7.63
	0.0							
	20.55					15.515		K Factor = 5.22
21	21.12	1.049	E	2.0	2.000	14.220		K Factor = 5.60
to		120.0	T	5.0	7.000	0.0		
21T	21.12	0.1439		0.0	9.000	1.295		Vel = 7.84
21T	20.54	1.049		0.0	12.000	15.515		
to		120.0		0.0	0.0	0.0		
21U	41.66	0.5059		0.0	12.000	6.071		Vel = 15.47
21U	0.0	1.38	T	6.0	22.000	21.586		
to		120.0		0.0	6.000	0.0		
H	41.66	0.1330		0.0	28.000	3.725		Vel = 8.94
	0.0							
	41.66					25.311		K Factor = 8.28
22	14.82	1.049	2E	4.0	9.000	7.000		K Factor = 5.60
to		120.0	T	5.0	9.000	0.0		
22T	14.82	0.0747		0.0	18.000	1.345		Vel = 5.50
	0.0							
	14.82					8.345		K Factor = 5.13
23	14.82	1.049	2E	4.0	9.000	7.000		K Factor = 5.60
to		120.0	T	5.0	9.000	0.0		
22T	14.82	0.0747		0.0	18.000	1.345		Vel = 5.50
	0.0							
	14.82					8.345		K Factor = 5.13
24	17.90	1.049	E	2.0	2.000	10.218		K Factor = 5.60
to		120.0	T	5.0	7.000	0.0		
24T	17.9	0.1060		0.0	9.000	0.954		Vel = 6.64
	0.0							
	17.90					11.172		K Factor = 5.36
25	19.73	1.049	E	2.0	2.000	12.408		K Factor = 5.60
to		120.0	T	5.0	7.000	0.0		
25T	19.73	0.1268		0.0	9.000	1.141		Vel = 7.32
	0.0							
	19.73					13.549		K Factor = 5.36
22T	29.63	1.049		0.0	10.500	8.345		
to		120.0		0.0	0.0	0.0		
24T	29.63	0.2692		0.0	10.500	2.827		Vel = 11.00
24T	17.90	1.38		0.0	14.000	11.172		
to		120.0		0.0	0.0	0.0		
25T	47.53	0.1698		0.0	14.000	2.377		Vel = 10.20
25T	19.73	1.38	T	6.0	31.000	13.549		
to		120.0		0.0	6.000	0.0		
I	67.26	0.3227		0.0	37.000	11.940		Vel = 14.43
	0.0							
	67.26					25.489		K Factor = 13.32

Final Calculations - Hazen-Williams

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	21.97	1.049	4E	8.0	15.000	15.397		K Factor = 5.60
to		120.0		0.0	8.000	0.0		
27T	21.97	0.1549		0.0	23.000	3.563		Vel = 8.16
	0.0							
	21.97					18.960		K Factor = 5.05
27	23.36	1.049	E	2.0	2.000	17.399		K Factor = 5.60
to		120.0	T	5.0	7.000	0.0		
27T	23.36	0.1734		0.0	9.000	1.561		Vel = 8.67
27T	21.97	1.049		0.0	9.000	18.960		
to		120.0		0.0	0.0	0.0		
27U	45.33	0.5913		0.0	9.000	5.322		Vel = 16.83
27U	0.0	1.38	T	6.0	23.000	24.282		
to		120.0		0.0	6.000	0.0		
J	45.33	0.1555		0.0	29.000	4.510		Vel = 9.72
	0.0							
	45.33					28.792		K Factor = 8.45
H	41.66	1.682		0.0	3.500	25.311		
to		120.0		0.0	0.0	0.0		
I	41.66	0.0509		0.0	3.500	0.178		Vel = 6.02
I	67.26	1.682		0.0	11.000	25.489		
to		120.0		0.0	0.0	0.0		
J	108.92	0.3003		0.0	11.000	3.303		Vel = 15.73
J	45.34	1.682		0.0	5.500	28.792		
to		120.0		0.0	0.0	0.0		
K	154.26	0.5716		0.0	5.500	3.144		Vel = 22.27
K	0.0	2.157	7I	30.151	45.000	31.936		
to		120.0	2J	20.921	71.993	0.260		
1FC	154.26	0.1702	B	7.384	116.993	19.917		Vel = 13.54
			S	13.537				
1FC	0.0	4.26		0.0	3.000	52.113		
to		120.0		0.0	0.0	0.433		
SB	154.26	0.0060		0.0	3.000	0.018		Vel = 3.47
SB	0.0	4.26	I	9.217	14.000	52.564		
to		120.0	J	21.067	30.284	3.465		
SE	154.26	0.0062		0.0	44.284	0.274		Vel = 3.47
SE	0.0	4.26	J	21.067	15.000	56.303		
to		120.0		0.0	21.067	0.0		
SF	154.26	0.0062		0.0	36.067	0.223		Vel = 3.47
SF	0.0	6.357	3I	37.72	40.000	56.526		
to		120.0		0.0	37.720	0.0		
TOR	154.26	0.0009		0.0	77.720	0.069		Vel = 1.56
TOR	0.0	6.357	J	31.433	7.000	56.595		
to		120.0	B	12.573	44.006	3.032		
BOR	154.26	0.0009		0.0	51.006	0.045		Vel = 1.56
BOR	0.0	6.357	B	12.573	6.000	59.672		
to		120.0	S	40.235	52.808	0.0		
DISC	154.26	0.0009		0.0	58.808	0.052		Vel = 1.56
	0.0							

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 ******
	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