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 - PARKING GARAGE
Building	:	2016 ADDITION, PARKING GARAGE
Location	:	PORTLAND, ME
System	:	1
Contract	:	4737CME
Data File	:	PDPG.wxf

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Hydraulic Design Information Sheet

Name - PARK DANFORTH, PARKING GARAGE Date - 2-12-16
Location - PORTLAND, ME
Building - 2016 ADDITION, PARKING GARAGE System No. - 1
Contractor - PC CONSTRUCTION Contract No. - 4737CME
Calculated By - BENOIT Drawing No. - 2
Construction: ( ) Combustible (X) Non-Combustible Ceiling Height - 9-0
Occupancy - PARKING GARAGE

SYSTEM DESIGN

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

Area of Sprinkler Operation	- 1950	System Type	Sprinkler/Nozzle
Density	- .15	(X) Wet	Make RELIABLE
Area Per Sprinkler	- 105	( ) Dry	Model F1FR
Elevation at Highest Outlet	- 9	( ) Deluge	Size 1/2
Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 5.6
Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155
Hose Allowance - Outside	- 250		

Note 30% DRY INCREASE IN REMOTE AREA

Calculation Summary: Flow Required - 863.6 Press Required - 40.3 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

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PARK DANFORTH - PARKING GARAGE

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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: 59.848
- A2 - Adj Resid : 55.14 @ 1000
- A3 - Adj Resid : 50.59 @ 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 : -0.650
- D2 - System Flow : 613.614
- D2 - System Pressure : 119.215
- Hose (Demand) : _____
- D3 - System Demand : 613.614
- Hose (Adj City) : 250
- Safety Margin : 20.192

Fittings Used Summary

HAMPSHIRE FIRE PROTECTION
PARK DANFORTH - PARKING GARAGE

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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
D	Dry Rel D						9.8	9.8			28		47								
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 - PARKING GARAGE

Date 2-12-1

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
40	7.5	5.6	7.03	na	14.85	0.15	99	7.0
41	7.5	5.6	7.87	na	15.71	0.15	99	7.0
42	7.5	5.6	9.08	na	16.88	0.15	105	8.0
42T	7.5		9.22	na				
43	7.5	5.6	11.23	na	18.77	0.15	105	8.0
44	7.5	5.6	13.1	na	20.27	0.15	105	8.0
45	7.5	5.6	16.15	na	22.51	0.15	105	8.0
46	7.5	5.6	19.0	na	24.41	0.15	105	8.0
47	7.5	5.6	21.37	na	25.89	0.15	105	8.0
48	9.0	5.6	18.63	na	24.17	0.15	99	7.0
49	9.0	5.6	21.47	na	25.95	0.15	99	7.0
50	9.0	5.6	22.92	na	26.81	0.15	99	7.0
ST	9.0		24.83	na				
51	9.0	5.6	19.37	na	24.65	0.15	105	8.0
52	9.0	5.6	22.33	na	26.46	0.15	105	8.0
53	9.0	5.6	23.83	na	27.34	0.15	105	8.0
TT	9.0		25.8	na				
54	9.0	5.6	21.57	na	26.01	0.15	105	8.0
55	9.0	5.6	24.83	na	27.91	0.15	105	8.0
56	9.0	5.6	26.5	na	28.83	0.15	105	8.0
UT	9.0		28.67	na				
57	9.0	5.6	25.15	na	28.08	0.15	105	8.0
58	9.0	5.6	28.9	na	30.11	0.15	105	8.0
59	9.0	5.6	30.82	na	31.09	0.15	105	8.0
VT	9.0		33.32	na				
60	9.0	5.6	51.12	na	40.04	0.15	105	8.0
61	9.0	5.6	58.36	na	42.78	0.15	105	8.0
62	9.0	5.6	62.07	na	44.12	0.15	105	8.0
XT	9.0		66.85	na				
R	7.5		23.82	na				
S	9.0		27.89	na				
T	9.0		28.98	na				
U	9.0		32.17	na				
V	9.0		37.36	na				
W	9.0		46.09	na				
X	9.0		74.59	na				
Y	9.0		78.19	na				
Z	9.0		97.74	na				
DTR	9.0		108.86	na				
BOR	2.0		118.55	na				
DISC	2.0		119.22	na				
SUCT	2.0		57.69	na				
BF1	2.0		57.74	na				
BF2	2.0		62.74	na				
FLG	1.0		63.29	na				
HOSE	5.0		61.91	na	250.0			
TEST	9.0		60.45	na				

The maximum velocity is 28.63 and it occurs in the pipe between nodes V and W

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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 ******
40	14.85	1.049		0.0	8.000	7.032		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
41	14.85	0.1051		0.0	8.000	0.841		Vel = 5.51
41	15.71	1.38	T	4.282	8.500	7.873		K Factor = 5.60
to		100.0		0.0	4.282	0.0		
42T	30.56	0.1051		0.0	12.782	1.343		Vel = 6.56
	0.0							
	30.56					9.216		K Factor = 10.07
42	16.88	1.049		0.0	1.000	9.083		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
42T	16.88	0.1330		0.0	1.000	0.133		Vel = 6.27
42T	30.56	1.38		0.0	8.500	9.216		
to		100.0		0.0	0.0	0.0		
43	47.44	0.2371		0.0	8.500	2.015		Vel = 10.18
43	18.77	1.61		0.0	9.000	11.231		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
44	66.21	0.2072		0.0	9.000	1.865		Vel = 10.43
44	20.26	1.61		0.0	9.000	13.096		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
45	86.47	0.3398		0.0	9.000	3.058		Vel = 13.63
45	22.51	1.61	T	5.71	9.000	16.154		K Factor = 5.60
to		100.0		0.0	5.710	0.0		
R	108.98	0.5211		0.0	14.710	7.666		Vel = 17.17
	0.0							
	108.98					23.820		K Factor = 22.33
46	24.41	1.049		0.0	9.000	18.997		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
47	24.41	0.2636		0.0	9.000	2.372		Vel = 9.06
47	25.89	1.38	T	4.282	5.000	21.369		K Factor = 5.60
to		100.0		0.0	4.282	0.0		
R	50.3	0.2641		0.0	9.282	2.451		Vel = 10.79
	0.0							
	50.30					23.820		K Factor = 10.31
48	24.17	1.049		0.0	11.000	18.627		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
49	24.17	0.2588		0.0	11.000	2.847		Vel = 8.97
49	25.95	1.38	T	4.282	8.500	21.474		K Factor = 5.60
to		100.0		0.0	4.282	0.0		
ST	50.12	0.2624		0.0	12.782	3.354		Vel = 10.75
	0.0							
	50.12					24.828		K Factor = 10.06
50	26.81	1.049	T	3.568	2.500	22.925		K Factor = 5.60
to		100.0		0.0	3.568	0.0		
ST	26.81	0.3136		0.0	6.068	1.903		Vel = 9.95
ST	50.12	1.38	T	4.282	1.000	24.828		
to		100.0		0.0	4.282	0.0		
S	76.93	0.5797		0.0	5.282	3.062		Vel = 16.50
	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 ******
	76.93					27.890		K Factor = 14.57
51	24.65	1.049		0.0	11.000	19.374		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
52	24.65	0.2685		0.0	11.000	2.953		Vel = 9.15
52	26.46	1.38	T	4.282	8.500	22.327		K Factor = 5.60
to		100.0		0.0	4.282	0.0		
TT	51.11	0.2720		0.0	12.782	3.477		Vel = 10.96
	0.0							
	51.11					25.804		K Factor = 10.06
53	27.34	1.049	T	3.568	2.500	23.832		K Factor = 5.60
to		100.0		0.0	3.568	0.0		
TT	27.34	0.3250		0.0	6.068	1.972		Vel = 10.15
TT	51.11	1.38	T	4.282	1.000	25.804		
to		100.0		0.0	4.282	0.0		
T	78.45	0.6011		0.0	5.282	3.175		Vel = 16.83
	0.0							
	78.45					28.979		K Factor = 14.57
54	26.01	1.049		0.0	11.000	21.572		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
55	26.01	0.2965		0.0	11.000	3.261		Vel = 9.66
55	27.91	1.38	T	4.282	8.500	24.833		K Factor = 5.60
to		100.0		0.0	4.282	0.0		
UT	53.92	0.3003		0.0	12.782	3.839		Vel = 11.57
	0.0							
	53.92					28.672		K Factor = 10.07
56	28.83	1.049	T	3.568	2.500	26.496		K Factor = 5.60
to		100.0		0.0	3.568	0.0		
UT	28.83	0.3586		0.0	6.068	2.176		Vel = 10.70
UT	53.91	1.38	T	4.282	1.000	28.672		
to		100.0		0.0	4.282	0.0		
U	82.74	0.6632		0.0	5.282	3.503		Vel = 17.75
	0.0							
	82.74					32.175		K Factor = 14.59
57	28.08	1.049		0.0	11.000	25.146		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
58	28.08	0.3416		0.0	11.000	3.758		Vel = 10.42
58	30.11	1.38	T	4.282	8.500	28.904		K Factor = 5.60
to		100.0		0.0	4.282	0.0		
VT	58.19	0.3458		0.0	12.782	4.420		Vel = 12.48
	0.0							
	58.19					33.324		K Factor = 10.08
59	31.09	1.049	T	3.568	2.500	30.822		K Factor = 5.60
to		100.0		0.0	3.568	0.0		
VT	31.09	0.4123		0.0	6.068	2.502		Vel = 11.54
VT	58.19	1.38	T	4.282	1.000	33.324		
to		100.0		0.0	4.282	0.0		
V	89.28	0.7635		0.0	5.282	4.033		Vel = 19.15

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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							
	89.28					37.357		K Factor = 14.61
60	40.04	1.049		0.0	11.000	51.118		K Factor = 5.60
to		100.0		0.0	0.0	0.0		
61	40.04	0.6585		0.0	11.000	7.243		Vel = 14.86
61	42.78	1.38	T	4.282	8.500	58.361		K Factor = 5.60
to		100.0		0.0	4.282	0.0		
XT	82.82	0.6645		0.0	12.782	8.493		Vel = 17.77
	0.0							
	82.82					66.854		K Factor = 10.13
62	44.12	1.049	T	3.568	2.500	62.072		K Factor = 5.60
to		100.0		0.0	3.568	0.0		
XT	44.12	0.7881		0.0	6.068	4.782		Vel = 16.38
XT	82.82	1.38	T	4.282	1.000	66.854		
to		100.0		0.0	4.282	0.0		
X	126.94	1.4642		0.0	5.282	7.734		Vel = 27.23
	0.0							
	126.94					74.588		K Factor = 14.70
R	159.28	2.157	2I	6.148	12.500	23.820		
to		100.0		0.0	6.148	-0.650		
S	159.28	0.2531		0.0	18.648	4.720		Vel = 13.98
S	76.93	2.635		0.0	5.500	27.890		
to		100.0		0.0	0.0	0.0		
T	236.21	0.1980		0.0	5.500	1.089		Vel = 13.90
T	78.44	2.635		0.0	9.500	28.979		
to		100.0		0.0	0.0	0.0		
U	314.65	0.3364		0.0	9.500	3.196		Vel = 18.51
U	82.75	2.635		0.0	10.000	32.175		
to		100.0		0.0	0.0	0.0		
V	397.4	0.5182		0.0	10.000	5.182		Vel = 23.38
V	89.28	2.635	J	10.582	1.000	37.357		
to		100.0		0.0	10.582	0.0		
W	486.68	0.7539		0.0	11.582	8.732		Vel = 28.63
W	0.0	2.635	J	10.582	32.000	46.089		
to		100.0		0.0	10.582	0.0		
Y	486.68	0.7539		0.0	42.582	32.104		Vel = 28.63
	0.0							
	486.68					78.193		K Factor = 55.04
X	126.94	2.635	I	5.879	41.000	74.588		
to		100.0	J	10.582	16.461	0.0		
Y	126.94	0.0627		0.0	57.461	3.605		Vel = 7.47
Y	486.67	4.26	2I	13.156	147.000	78.193		
to		100.0	J	15.036	28.192	0.0		
Z	613.61	0.1116		0.0	175.192	19.545		Vel = 13.81
Z	0.0	4.26	3I	19.734	80.000	97.738		
to		100.0		0.0	19.735	0.0		
DTR	613.61	0.1116		0.0	99.735	11.127		Vel = 13.81
DTR	0.0	4.26	J	15.036	7.000	108.865		
to		100.0	D	26.313	52.624	3.032		
BOR	613.61	0.1115	B	11.277	59.624	6.651		Vel = 13.81

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BOR	0.0	6.357	B	12.573	6.000	118.548		
to		120.0	S	40.235	52.808	0.0		
DISC	613.61	0.0113		0.0	58.808	0.667		Vel = 6.20
	0.0							
	613.61					119.215		K Factor = 56.20
System Demand Pressure						119.215		
Safety Margin						20.192		
Continuation Pressure						139.406		
Pressure @ Pump Outlet						139.406		
Pressure From Pump Curve						-81.715		
Pressure @ Pump Inlet						57.692		
SUCT	0.0	8.249	G	4.698	10.000	57.692		
to		120.0		0.0	4.698	0.0		
BF1	613.61	0.0031		0.0	14.698	0.046		Vel = 3.68
BF1	0.0	8.249		0.0	1.000	57.738		
to		120.0		0.0	0.0	5.000		* * Fixed Loss = 5
BF2	613.61	0.0040		0.0	1.000	0.004		Vel = 3.68
BF2	0.0	8.249	2I	30.537	5.000	62.742		
to		120.0		0.0	30.537	0.433		
FLG	613.61	0.0032		0.0	35.537	0.113		Vel = 3.68
FLG	0.0	8.27	T	55.354	90.000	63.288		
to		140.0	G	6.326	61.680	-1.732		
HOSE	613.61	0.0024		0.0	151.680	0.359		Vel = 3.66
HOSE	250.00	12.34	E	42.195	280.000	61.915		Qa = 250
to		140.0	T	93.767	145.339	-1.732		
TEST	863.61	0.0006	G	9.377	425.339	0.269		Vel = 2.32
	0.0							
	863.61					60.452		K Factor = 111.07