

. . . Fire Protection by Computer Design

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

Job Name : YORK STREET, PARKING GARAGE
Building : 2016
Location : YORK STREET, PORTLAND, ME
System : PG
Contract : 4833CME
Data File : YSPG.wxf

Hydraulic Design Information Sheet

Name - YORK STREET Date - 8-17-16
 Location - YORK STREET, PORTLAND, ME
 Building - 2016 System No. - PG
 Contractor - OPECHEE Contract No. - 4833CME
 Calculated By - BENOIT Drawing No. - 2
 Construction: () Combustible (2) Non-Combustible Ceiling Height - 10'
 Occupancy - PARKING GARAGE

S (X) NFPA 13 () Lt. Haz. Ord.Haz.Gp. (X) 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 - 1950	System Type	Sprinkler/Nozzle
	Density - .15	() Wet	Make RELIABLE
D	Area Per Sprinkler - 127	(X) Dry	Model F1-FR
E	Elevation at Highest Outlet - 15	() Deluge	Size 1/2
S	Hose Allowance - Inside - 0	() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance - 0	() Other	Temp.Rat.200
G	Hose Allowance - Outside - 250		

N Note 30% DRY SYSTEM INCREASE APPLIED

Calculation Flow Required - 625.0 Press Required - 83.6 AT TEST
 Summary C-Factor Used: 100 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 7-13-16		Cap. -
T	Time of Test - 6:00 AM	Rated Cap.-	Elev.-
E	Static Press - 100	@ Press -	
R	Residual Press - 98	Elev. -	Well
S	Flow - 1047		Proof Flow
U	Elevation - 0		

P Location - SEE SITE PLAN

L Source of Information - PORTLAND WATER MEANS DEPT.

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:

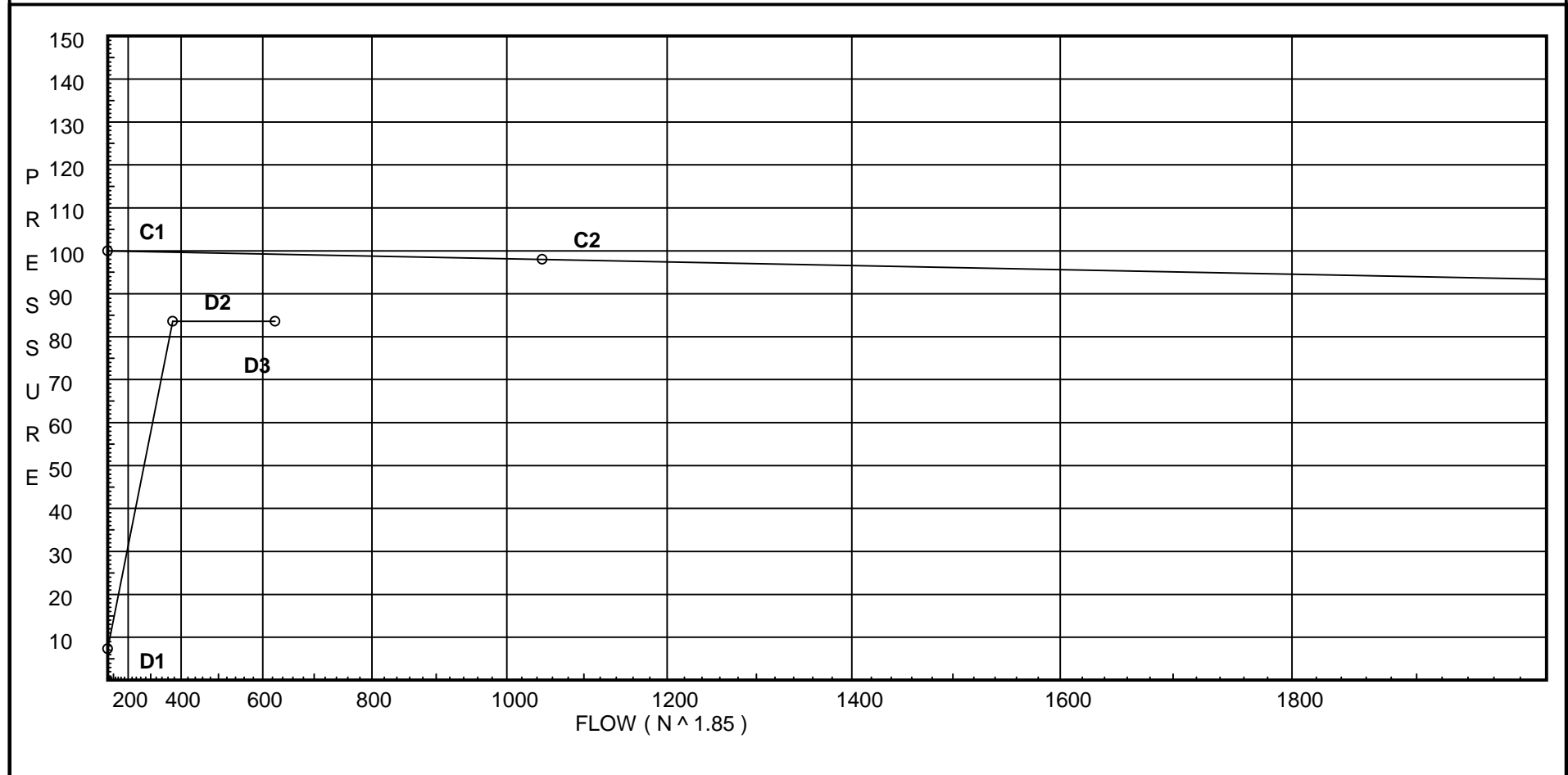
Water Supply Curve C

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City Water Supply:
C1 - Static Pressure : 100
C2 - Residual Pressure: 98
C2 - Residual Flow : 1047

Demand:
D1 - Elevation : 7.363
D2 - System Flow : 375.021
D2 - System Pressure : 83.581
Hose (Demand) : 250
D3 - System Demand : 625.021
Safety Margin : 15.649



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
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
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.
27	15.0	5.6	11.6	na	19.07	0.15	127	11.6
28	15.0	5.6	13.35	na	20.46	0.15	127	11.6
29	15.0	5.6	15.13	na	21.78	0.15	127	11.6
30	15.0	5.6	19.13	na	24.49	0.15	127	11.6
31	15.0	5.6	22.65	na	26.65	0.15	127	11.6
32	14.5	5.6	11.74	na	19.19	0.15	127	11.6
33	14.5	5.6	13.52	na	20.59	0.15	127	11.6
34	14.5	5.6	15.32	na	21.92	0.15	127	11.6
35	14.5	5.6	19.36	na	24.64	0.15	127	11.6
36	14.5	5.6	22.92	na	26.81	0.15	127	11.6
37	14.0	5.6	12.08	na	19.46	0.15	127	11.6
38	14.0	5.6	13.9	na	20.88	0.15	127	11.6
39	14.0	5.6	15.74	na	22.22	0.15	127	11.6
40	14.0	5.6	19.9	na	24.98	0.15	127	11.6
41	14.0	5.6	23.54	na	27.17	0.15	127	11.6
42	13.5	5.6	38.39	na	34.7	0.15	127	11.6
J	15.0		36.69	na				
K	14.5		37.12	na				
L	14.0		38.11	na				
M	13.5		39.98	na				
N	9.0		64.46	na				
DBR	11.5		71.4	na				
BOR	2.0		75.58	na				
BF1	2.0		75.71	na				
BF2	2.0		80.74	na				
FLG	1.0		81.2	na				
HOSE	0.0		81.76	na	250.0			
TEST	-2.0		83.58	na				

The maximum velocity is 18.08 and it occurs in the pipe between nodes 41 and L

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	*****
27	19.07	1.049		0.0	10.500	11.600			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
28	19.07	0.1670		0.0	10.500	1.754			Vel = 7.08	
28	20.47	1.38		0.0	10.500	13.354			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
29	39.54	0.1691		0.0	10.500	1.776			Vel = 8.48	
29	21.78	1.38		0.0	10.500	15.130			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
30	61.32	0.3810		0.0	10.500	4.001			Vel = 13.15	
30	24.49	1.61		0.0	10.500	19.131			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
31	85.81	0.3350		0.0	10.500	3.517			Vel = 13.52	
31	26.65	1.61	2E	5.71	14.000	22.648			K Factor = 5.60	
to		100.0	T	5.71	11.420	0.0				
J	112.46	0.5524		0.0	25.420	14.042			Vel = 17.72	
	0.0									
	112.46					36.690			K Factor = 18.57	
32	19.19	1.049		0.0	10.500	11.745			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
33	19.19	0.1690		0.0	10.500	1.774			Vel = 7.12	
33	20.59	1.38		0.0	10.500	13.519			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
34	39.78	0.1711		0.0	10.500	1.797			Vel = 8.53	
34	21.92	1.38		0.0	10.500	15.316			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
35	61.7	0.3853		0.0	10.500	4.046			Vel = 13.23	
35	24.64	1.61		0.0	10.500	19.362			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
36	86.34	0.3388		0.0	10.500	3.557			Vel = 13.61	
36	26.81	1.61	2E	5.71	14.000	22.919			K Factor = 5.60	
to		100.0	T	5.71	11.420	0.0				
K	113.15	0.5587		0.0	25.420	14.201			Vel = 17.83	
	0.0									
	113.15					37.120			K Factor = 18.57	
37	19.46	1.049		0.0	10.500	12.079			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
38	19.46	0.1734		0.0	10.500	1.821			Vel = 7.22	
38	20.88	1.38		0.0	10.500	13.900			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
39	40.34	0.1756		0.0	10.500	1.844			Vel = 8.65	
39	22.22	1.38		0.0	10.500	15.744			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
40	62.56	0.3954		0.0	10.500	4.152			Vel = 13.42	
40	24.98	1.61		0.0	10.500	19.896			K Factor = 5.60	
to		100.0		0.0	0.0	0.0				
41	87.54	0.3475		0.0	10.500	3.649			Vel = 13.80	
41	27.17	1.61	2E	5.71	14.000	23.545			K Factor = 5.60	
to		100.0	T	5.71	11.420	0.0				
L	114.71	0.5730		0.0	25.420	14.566			Vel = 18.08	

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	*****
	0.0 114.71						38.111		K Factor = 18.58	
42 to M	34.70 34.7	1.61 100.0 0.0627	2E T	5.71 5.71 0.0	14.000 11.420 25.420	38.389 0.0 1.594			K Factor = 5.60 Vel = 5.47	
	0.0 34.70						39.983		K Factor = 5.49	
J to K	112.46 112.46	3.26 100.0 0.0177		0.0 0.0 0.0	12.000 0.0 12.000	36.690 0.217 0.213			Vel = 4.32	
K to L	113.15 225.61	3.26 100.0 0.0645		0.0 0.0 0.0	12.000 0.0 12.000	37.120 0.217 0.774			Vel = 8.67	
L to M	114.71 340.32	3.26 100.0 0.1379		0.0 0.0 0.0	12.000 0.0 12.000	38.111 0.217 1.655			Vel = 13.08	
M to N	34.70 375.02	3.26 100.0 0.1651	J	12.469 0.0 0.0	124.000 12.469 136.469	39.983 1.949 22.532			Vel = 14.41	
N to DBR	0.0 375.02	4.26 100.0 0.0449	2I J D B	13.156 15.036 26.313 11.277	113.000 65.781 178.781	64.464 -1.083 8.022			Vel = 8.44	
DBR to BOR	0.0 375.02	4.26 120.0 0.0320		0.0 0.0 0.0	2.000 0.0 2.000	71.403 4.114 0.064			Vel = 8.44	
BOR to BF1	0.0 375.02	4.26 120.0 0.0320		0.0 0.0 0.0	4.000 0.0 4.000	75.581 0.0 0.128			Vel = 8.44	
BF1 to BF2	0.0 375.02	4.26 120.0 0.0320		0.0 0.0 0.0	1.000 0.0 1.000	75.709 5.000 0.032			** Fixed Loss = 5 Vel = 8.44	
BF2 to FLG	0.0 375.02	8.27 140.0 0.0010	E	28.468 0.0 0.0	1.000 28.468 29.468	80.741 0.433 0.028			Vel = 2.24	
FLG to HOSE	0.0 375.02	8.27 140.0 0.0010	E 2G T	28.468 12.652 55.354	30.000 96.474 126.474	81.202 0.433 0.121			Vel = 2.24	
HOSE to TEST	250.00 625.02	8.27 140.0 0.0024	T G	55.354 6.326 0.0	330.000 61.680 391.680	81.756 0.866 0.959			Qa = 250 Vel = 3.73	
	0.0 625.02						83.581		K Factor = 68.37	