



. . . Fire Protection by Computer Design

SPRINKLER SYSTEMS INC.
P. O. BOX 1285
2-4 AVON STREET
LEWISTON, ME 04243
207-782-0104

Job Name : NDA 164 MIDDLE STREET
Building :
Location : 164 MIDDLE STREET, PORTLAND, MAINE 04101
System : 1 OF 1
Contract : 16-154
Data File : 16154NDA164MIDDLESTA1FINAL.WXF

Hydraulic Design Information Sheet

Name - NDA 164 MIDDLE STREET Date - 3-23-2017
 Location - 164 MIDDLE STREET, PORTLAND, MAINE 04101
 Building - System No. - 1 OF 1
 Contractor - DUCAS CONSTRUCTION Contract No. - 16-154
 Calculated By - SCOTT E. GARLAND Drawing No. - 1 OF 1
 Construction: (X) Combustible () Non-Combustible Ceiling Height - VARIES
 Occupancy - FUTURE MERCANTILE - ORDINARY HAZARD GROUP 2

S (X) NFPA 13 () Lt. Haz. Ord.Haz.Gp. () 1 (X) 2 () 3 () Ex.Haz.
 Y () NFPA 231 () NFPA 231C () Figure Curve

S Other

T Specific Ruling Made By Date

Specific Ruling	Made By	Date
Area of Sprinkler Operation - 1950	System Type	Sprinkler/Nozzle
Density - .20	(X) Wet	Make RELIABLE
Area Per Sprinkler - 127.5	() Dry	Model FIFR56
Elevation at Highest Outlet - 71.250	() Deluge	Size 1/2" X 1/2"
Hose Allowance - Inside -	() Preaction	K-Factor 5.6
Rack Sprinkler Allowance -	() Other	Temp.Rat.200 DEG
Hose Allowance - Outside - 250		

N Note DESIGN AREA #1 - FIRST FLOOR SPEC AREA

Calculation Flow Required - 529.171 Press Required - 75.979 AT BASE OF RISER
 Summary C-Factor Used: 120 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
Date of Test - 6-28-2016	Rated Cap.-	Cap. -
Time of Test -	@ Press -	Elev.-
Static Press - 93	Elev. -	Well
Residual Press - 86		Proof Flow
Flow - 1500		
Elevation - 46.0		

U Location - ON EXCHANGE STREET AT MIDDLE STREET, APPROX. 250' FROM THE BLDG

P Source of Information - PORTLAND WATER DISTRICT

Commodity	Class	Location
Storage Ht.	Area	Aisle W.
Storage Method: Solid Piled	% Palletized	% Rack
() Single Row	() Conven. Pallet	() Auto. Storage
() Double Row	() Slave Pallet	() Encap.
() Mult. Row	() Open Shelf	() Non

R K Flue Spacing Clearance:Storage to Ceiling
 A Longitudinal Transverse

G Horizontal Barriers Provided:

Fittings Used Summary

SPRINKLER SYSTEMS INC.
NDA 164 MIDDLE STREET

Page 3
Date 3-23-2017

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24	
A	Alarm Rel E1 & E3							7.7	21.5		17		27	29								
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	
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																				
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	
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	

Unit 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.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	93.0	86	1500.0	90.916	779.17	75.844

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
TYP	0.0	5.6	20.74	25.5	
3	71.25	5.6	17.5	23.43	
4	71.25	5.6	19.24	24.56	
5	71.25	5.6	17.66	23.53	
6	71.25	5.6	19.42	24.68	
7	71.25	5.6	17.84	23.66	
8	71.25	5.6	19.62	24.8	
9	71.25	5.6	18.38	24.01	
10	71.25	5.6	20.21	25.17	
11	70.25	5.46	22.45	25.86	K=K @ SPRG
12	70.25	5.46	25.12	27.36	K=K @ SPRG
13	70.25	5.46	26.89	28.31	K=K @ SPRG
GB	70.25		28.62		
14	70.25	5.46	23.86	26.66	K=K @ SPRG
15	70.25	5.46	26.68	28.2	K=K @ SPRG
16	70.25	5.46	28.56	29.17	K=K @ SPRG
HB	70.25		30.39		
17	70.25	5.46	35.0	32.3	K=K @ SPRG
B	70.75		28.16		
C	70.75		28.42		
D	70.75		28.7		
F	70.75		29.53		
E	70.75		29.91		
G	70.75		30.25		
H	70.75		32.13		
J	70.75		35.4		
K	70.75		39.01		
18	66.5	5.46	21.82	25.5	K=K @ SPRG
19	66.5	5.46	23.86	26.67	K=K @ SPRG
20	66.5	5.46	25.34	27.48	K=K @ SPRG
21	66.5	5.46	26.8	28.26	K=K @ SPRG
22	66.5	5.46	29.36	29.58	K=K @ SPRG
M	66.5		34.81		
L	70.75		41.89		
N	70.75		45.56		
P	70.75		48.47		
Q	70.75		51.12		
S	49.5		65.13		
RT	49.5		66.6		
RB	41.5		75.98		
X1	41.5		76.64	250.0	
X2	41.5		77.72		

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
TEST	46.0		75.84		

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv. Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
TYP to SPRG	0 0	5.60	25.50 25.5	1 1.049	T 0.0	5.0 0.0 5.333	120 0.2040	20.735 0.0 1.088			Vel = 9.47
SPRG			0.0 25.50					21.823			K Factor = 5.46
3 to 4	71.250 71.250	5.60	23.42	1 1.049		0.0 0.0 10.000	120 0.1743	17.498 0.0 1.743			Vel = 8.69
4 to B	71.250 70.750	5.60	24.57 47.99	1 1.049	E T 0.0	2.0 5.0 13.250	120 0.6571	19.241 0.217 8.706			Vel = 17.82
B			0.0 47.99					28.164			K Factor = 9.04
5 to 6	71.250 71.250	5.60	23.53	1 1.049		0.0 0.0 10.000	120 0.1758	17.662 0.0 1.758			Vel = 8.73
6 to C	71.250 70.750	5.60	24.68 48.21	1 1.049	E T 0.0	2.0 5.0 13.250	120 0.6626	19.420 0.217 8.780			Vel = 17.90
C			0.0 48.21					28.417			K Factor = 9.04
7 to 8	71.250 71.250	5.60	23.66	1 1.049		0.0 0.0 10.000	120 0.1775	17.843 0.0 1.775			Vel = 8.78
8 to D	71.250 70.750	5.60	24.80 48.46	1 1.049	E T 0.0	2.0 5.0 13.250	120 0.6690	19.618 0.217 8.864			Vel = 17.99
D			0.0 48.46					28.699			K Factor = 9.05
9 to 10	71.250 71.250	5.60	24.01	1 1.049		0.0 0.0 10.000	120 0.1825	18.382 0.0 1.825			Vel = 8.91
10 to F	71.250 70.750	5.60	25.17 49.18	1 1.049	E T 0.0	2.0 5.0 13.250	120 0.6875	20.207 0.217 9.110			Vel = 18.26
F			0.0 49.18					29.534			K Factor = 9.05
11 to 12	70.250 70.250	5.46	25.86	1 1.049		0.0 0.0 12.750	120 0.2094	22.446 0.0 2.670			K = K @ SPRG Vel = 9.60
12 to GB	70.250 70.250	5.46	27.36 53.22	1.25 1.380	T	6.0 0.0 16.750	120 0.2093	25.116 0.0 3.505			K = K @ SPRG Vel = 11.42
GB			0.0 53.22					28.621			K Factor = 9.95
13 to GB	70.250 70.250	5.46	28.31	1 1.049	T	5.0 0.0 7.000	120 0.2474	26.889 0.0 1.732			K = K @ SPRG Vel = 10.51

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
NDA 164 MIDDLE STREET

Page 7
Date 3-23-2017

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv. Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
GB			0.0 28.31					28.621		K Factor = 5.29	
GB to G	70.250 70.750		81.52	1.5	T 8.0	0.500 0.0 8.000	120	28.621 -0.217			
G			81.52	1.610		8.500	0.2174	1.848		Vel = 12.85	
G			0.0 81.52					30.252		K Factor = 14.82	
14 to 15	70.250 70.250	5.46	26.66	1		0.0 0.0 12.750	120	23.859 0.0		K = K @ SPRG	
15 to HB	70.250 70.250	5.46	26.66	1.049		0.0 0.0 12.750	0.2215	2.824		Vel = 9.90	
15 to HB	70.250 70.250	5.46	28.20	1.25	T 6.0	10.750 6.000	120	26.683 0.0		K = K @ SPRG	
HB			54.86	1.380		0.0 16.750	0.2213	3.707		Vel = 11.77	
HB			0.0 54.86					30.390		K Factor = 9.95	
16 to HB	70.250 70.250	5.46	29.17	1	T 5.0	2.000 0.0 5.000	120	28.559 0.0		K = K @ SPRG	
HB			29.17	1.049		0.0 7.000	0.2616	1.831		Vel = 10.83	
HB			0.0 29.17					30.390		K Factor = 5.29	
HB to H	70.250 70.750		84.03	1.5	T 8.0	0.500 0.0 8.000	120	30.390 -0.217			
H			84.03	1.610		0.0 8.500	0.2300	1.955		Vel = 13.24	
H			0.0 84.03					32.128		K Factor = 14.82	
17 to J	70.250 70.750	5.46	32.30	1.5	E T 4.0	3.750 8.0 12.000	120	35.003 -0.217		K = K @ SPRG	
J			32.3	1.610		0.0 15.750	0.0392	0.618		Vel = 5.09	
J			0.0 32.30					35.404		K Factor = 5.43	
B to C	70.750 70.750		47.99	2		0.0 0.0 10.500	120	28.164 0.0			
C to D	70.750 70.750		47.99	2.067		0.0 0.0 10.500	0.0241	0.253		Vel = 4.59	
C to D	70.750 70.750		48.21	2.5		0.0 0.0 10.500	120	28.417 0.0			
D to E	70.750 70.750		96.2	2.635		0.0 0.0 10.500	0.0269	0.282		Vel = 5.66	
D to E	70.750 70.750		48.46	2.5	T 16.474	4.750 0.0 16.474	120	28.699 0.0			
E			144.66	2.635		0.0 21.224	0.0570	1.210		Vel = 8.51	
E			0.0 144.66					29.909		K Factor = 26.45	
F to E	70.750 70.750		49.18	2	T 10.0	4.833 0.0 10.000	120	29.534 0.0			
E			49.18	2.067		0.0 14.833	0.0253	0.375		Vel = 4.70	
E			0.0 49.18					29.909		K Factor = 8.99	
E to G	70.750 70.750		193.84	2.5		0.0 0.0 3.500	120	29.909 0.0			
G			193.84	2.635		0.0 3.500	0.0980	0.343		Vel = 11.40	

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
NDA 164 MIDDLE STREET

Page 8
Date 3-23-2017

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv. Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
G to H	70.750 70.750		81.53 275.37	2.5 2.635	0.0 0.0	10.000 0.0	120 0.1876	30.252 0.0		Vel = 16.20	
H to J	70.750 70.750		84.03 359.4	2.5 2.635	0.0 0.0	10.667 0.0	120 0.3071	32.128 0.0		Vel = 21.14	
J to K	70.750 70.750		32.29 391.69	2.5 2.635	0.0 0.0	10.000 0.0	120 0.3601	35.404 0.0		Vel = 23.04	
K to L	70.750 70.750		0.0 391.69	2.5 2.635	0.0 0.0	8.000 0.0	120 0.3601	39.005 0.0		Vel = 23.04	
L			0.0 391.69					41.886		K Factor = 60.52	
18 to 19	66.500 66.500	5.46	25.50 25.5	1 1.049	0.0 0.0	10.000 0.0	120 0.2040	21.823 0.0		K = K @ SPRG Vel = 9.47	
19 to 20	66.500 66.500	5.46	26.67 52.17	1.25 1.38	0.0 0.0	7.333 0.0	120 0.2016	23.863 0.0		K = K @ SPRG Vel = 11.19	
20 to 21	66.500 66.500	5.46	27.47 79.64	1.5 1.61	0.0 0.0	7.000 0.0	120 0.2083	25.341 0.0		K = K @ SPRG Vel = 12.55	
21 to 22	66.500 66.500	5.46	28.26 107.9	1.5 1.610	0.0 0.0	7.000 0.0	120 0.3651	26.799 0.0		K = K @ SPRG Vel = 17.00	
22 to M	66.500 66.500	5.46	29.58 137.48	2 2.157	T 0.0	12.307 12.307	27.375 39.682	120 0.1376	29.355 0.0	K = K @ SPRG Vel = 12.07	
M to L	66.500 70.750		0.0 137.48	2 2.157	2E T 0.0	12.307 12.307 0.0	40.167 24.614 64.781	120 0.1376	34.814 -1.841 8.913	Vel = 12.07	
L			0.0 137.48					41.886		K Factor = 21.24	
L to N	70.750 70.750		529.17 529.17	3 3.26	0.0 0.0	16.500 0.0	120 0.2228	41.886 0.0		Vel = 20.34	
N to P	70.750 70.750		0.0 529.17	4 4.26	0.0 0.0	48.000 0.0	120 0.0605	45.562 0.0		Vel = 11.91	
P to Q	70.750 70.750		0.0 529.17	4 4.26	T 0.0	26.334 0.0	17.500 26.334	120 0.0605	48.468 0.0	Vel = 11.91	
Q to S	70.750 49.500		0.0 529.17	4 4.26	2E T 0.0	26.334 26.334 0.0	26.750 52.668 79.418	120 0.0606	51.122 9.203 4.809	Vel = 11.91	
S to RT	49.500 49.500		0.0 529.17	4 4.26	E 0.0	13.167 0.0	11.000 13.167	120 0.0605	65.134 0.0	Vel = 11.91	

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
NDA 164 MIDDLE STREET

Page 9
Date 3-23-2017

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv. Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
RT to RB	49.500 41.500		0.0 529.17	4 4.26	A E G Fsp	22.384 13.167 2.633 0.0	10.000 38.184 48.184	120	66.597 6.465 2.917	* Fixed Loss = 3 Vel = 11.91	
RB to X1	41.500 41.500		0.0 529.17	6 6.16	G T	4.304 43.037 0.0	40.000 47.341 87.341	140	75.979 0.0 0.660	Vel = 5.70	
X1 to X2	41.500 41.500	H250	250.00 779.17	8 7.98	T	46.522 0.0 46.522	200.000 0.0 246.522	140	76.639 0.0 1.080	Vel = 5.00	
X2 to TEST	41.500 46		0.0 779.17	10 9.97		0.0 0.0 0.0	50.000 0.0 50.000	140	77.719 -1.949 0.074	Vel = 3.20	
TEST			0.0 779.17						75.844	K Factor = 89.47	

Water Supply Curve C

SPRINKLER SYSTEMS INC.
NDA 164 MIDDLE STREET

Page 10
Date 3-23-2017

City Water Supply:
C1 - Static Pressure : 93
C2 - Residual Pressure: 86
C2 - Residual Flow : 1500

Demand:
D1 - Elevation : 8.879
D2 - System Flow : 529.171
D2 - System Pressure : 75.844
Hose (Demand) : 250
D3 - System Demand : 779.171
Safety Margin : 15.072

