



... Fire Protection by Computer Design

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

Job Name : B. H. Milliken Area 1
Building : EXISTING
Location : 235 PRESUMPCOT STREET PORTLAND, MAINE
System : 1 WET
Contract : 16-069
Data File : B H Milliken Area 1.WXF

Hydraulic Design Information Sheet

Name - B. H. MILLIKEN TENANT FIT-UP AREA 1 Date - 07/05/2016
 Location - 235 PRESUMPCOT STREET PORTLAND, MAINE
 Building - EXISTING System No. - 1 WET
 Contractor - SPRINKLER SYSTEMS INC. Contract No. - 16-069
 Calculated By - CDS Drawing No. -
 Construction: () Combustible (X) Non-Combustible Ceiling Height - VARIES
 Occupancy - OFFICES

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

E				
M	Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
	Density	- .10	(X) Wet	Make RELIABLE
D	Area Per Sprinkler	- 196	() Dry	Model F1FR56
E	Elevation at Highest Outlet	- 28.330	() Deluge	Size 1/2" X 1/2"
S	Hose Allowance - Inside	- 0	() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	() Other	Temp.Rat.155 DEG.
G	Hose Allowance - Outside	- 100		

N Note

Calculation Flow Required - 226.89 Press Required - 83.083 AT BASE
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:
 A Date of Test - 06/14/2016 Cap. -
 T Time of Test - AM Rated Cap.- Elev.-
 E Static Press - 92 @ Press -
 R Residual Press - 75 Elev. - Well
 Flow - 1453 Proof Flow
 S Elevation - 35.0'

U Location - ON SITE

P Source of Information - OWNER AND WATER DISTRICT

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

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

G Horizontal Barriers Provided:
 E

Fittings Used Summary

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 2
Date

Fitting Legend		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	
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	

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

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 3
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	9.0	na	16.8	0.1	168	7.0
125	35.75		65.36	na				
127	35.75		66.67	na				
129	35.75		67.35	na				
120	35.75		67.83	na				
118	35.75		68.17	na				
116	35.75		68.41	na				
114	35.75		68.57	na				
112	35.75		68.67	na				
110	35.75		68.75	na				
108	35.75		68.79	na				
106	35.75		68.81	na				
104	35.75		68.83	na				
102	35.75		68.83	na				
101	40.5		67.16	na				
103	40.5		67.16	na				
105	40.5		67.17	na				
107	40.5		67.2	na				
109	40.5		67.24	na				
111	40.5		67.31	na				
113	40.5		67.42	na				
115	40.5		67.58	na				
117	40.5		67.81	na				
119	40.5		68.15	na				
124	35.75		65.48	na				
17	28.75	5.6	19.32	na	24.62	0.1	196	7.0
16	28.75	5.6	19.24	na	24.56	0.1	168	7.0
14	28.75	5.6	14.45	na	21.29	0.1	196	7.0
12	28.75	5.6	14.47	na	21.3	0.1	168	7.0
10	28.33	5.6	14.06	na	21.0	0.15	120	7.0
8	28.75	5.6	12.76	na	20.0	0.15	120	7.0
7	28.75	5.6	13.2	na	20.35	0.1	196	7.0
5	28.75	5.6	12.4	na	19.72	0.1	196	7.0
4	28.75	5.6	12.82	na	20.05	0.1	196	7.0
1	28.33	5.6	9.0	na	16.8	0.1	168	7.0
2	28.33	K = K @ DROP	10.04	na	17.21			
3	28.33		14.55	na				
4T	28.33		14.61	na				
6	28.33		14.74	na				
7T	28.33		15.03	na				
9	28.33		15.15	na				
11	28.33		15.7	na				
12T	28.33		16.33	na				
15	28.33		17.12	na				
16T	28.33		21.61	na				
18	28.33		22.8	na				
19	28.33		52.75	na				
20	28.33		58.45	na				
21	35.75		59.92	na				
122	35.75		65.52	na				
121	40.5		68.03	na				
123	40.5		68.07	na				
126	40.5		68.2	na				
128	40.5		68.47	na				
130	40.5		69.15	na				
TOR	36.0		72.66	na				
TAV	26.0		80.12	na				
BASE	20.0		83.08	na				
HOSE	35.0		77.05	na	100.0			
TEST	35.0		77.08	na				

The maximum velocity is 19.92 and it occurs in the pipe between nodes 18 and 19

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 4
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to DROP	16.80 16.8	1.049 120.0 0.0943	T	5.0 0.0 0.0	1.000 5.000 6.000	9.000 0.0 0.566			K Factor = 5.60	
	0.0 16.80					9.566			K Factor = 5.43	
125 to 127	167.55 167.55	2.635 120.0 0.0748	T	16.474 0.0 0.0	1.000 16.474 17.474	65.358 0.0 1.307				Vel = 9.86
127 to 129	-25.97 141.58	2.635 120.0 0.0548		0.0 0.0 0.0	12.500 0.0 12.500	66.665 0.0 0.685				Vel = 8.33
129 to 120	-24.30 117.28	2.635 120.0 0.0387		0.0 0.0 0.0	12.500 0.0 12.500	67.350 0.0 0.484				Vel = 6.90
120 to 118	-20.75 96.53	2.635 120.0 0.0270		0.0 0.0 0.0	12.500 0.0 12.500	67.834 0.0 0.337				Vel = 5.68
118 to 116	-17.32 79.21	2.635 120.0 0.0187		0.0 0.0 0.0	12.500 0.0 12.500	68.171 0.0 0.234				Vel = 4.66
116 to 114	-14.55 64.66	2.635 120.0 0.0129		0.0 0.0 0.0	12.500 0.0 12.500	68.405 0.0 0.161				Vel = 3.80
114 to 112	-12.36 52.3	2.635 120.0 0.0086		0.0 0.0 0.0	12.500 0.0 12.500	68.566 0.0 0.108				Vel = 3.08
112 to 110	-10.67 41.63	2.635 120.0 0.0058		0.0 0.0 0.0	12.500 0.0 12.500	68.674 0.0 0.072				Vel = 2.45
110 to 108	-9.43 32.2	2.635 120.0 0.0035		0.0 0.0 0.0	12.500 0.0 12.500	68.746 0.0 0.044				Vel = 1.89
108 to 106	-8.57 23.63	2.635 120.0 0.0020		0.0 0.0 0.0	12.500 0.0 12.500	68.790 0.0 0.025				Vel = 1.39
106 to 104	-8.07 15.56	2.635 120.0 0.0009		0.0 0.0 0.0	12.500 0.0 12.500	68.815 0.0 0.011				Vel = 0.92
104 to 102	-7.81 7.75	2.635 120.0 0.0003		0.0 0.0 0.0	12.500 0.0 12.500	68.826 0.0 0.004				Vel = 0.46
102 to 101	0.0 7.75	1.442 120.0 0.0048	2T 2E	14.864 7.432 0.0	58.000 22.296 80.296	68.830 -2.057 0.383				Vel = 1.52
101 to 103	0.0 7.75	2.635 120.0 0.0002		0.0 0.0 0.0	12.500 0.0 12.500	67.156 0.0 0.003				Vel = 0.46

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 5
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
103	7.81	2.635		0.0	12.500	67.159				
to		120.0		0.0	0.0	0.0				
105	15.56	0.0010		0.0	12.500	0.012		Vel =	0.92	
105	8.07	2.635		0.0	12.500	67.171				
to		120.0		0.0	0.0	0.0				
107	23.63	0.0020		0.0	12.500	0.025		Vel =	1.39	
107	8.57	2.635		0.0	12.500	67.196				
to		120.0		0.0	0.0	0.0				
109	32.2	0.0035		0.0	12.500	0.044		Vel =	1.89	
109	9.43	2.635		0.0	12.500	67.240				
to		120.0		0.0	0.0	0.0				
111	41.63	0.0057		0.0	12.500	0.071		Vel =	2.45	
111	10.67	2.635		0.0	12.500	67.311				
to		120.0		0.0	0.0	0.0				
113	52.3	0.0087		0.0	12.500	0.109		Vel =	3.08	
113	12.36	2.635		0.0	12.500	67.420				
to		120.0		0.0	0.0	0.0				
115	64.66	0.0128		0.0	12.500	0.160		Vel =	3.80	
115	14.55	2.635		0.0	12.500	67.580				
to		120.0		0.0	0.0	0.0				
117	79.21	0.0187		0.0	12.500	0.234		Vel =	4.66	
117	17.32	2.635		0.0	12.500	67.814				
to		120.0		0.0	0.0	0.0				
119	96.53	0.0270		0.0	12.500	0.338		Vel =	5.68	
119	20.75	2.635	T	16.474	9.250	68.152				
to		120.0		0.0	16.474	0.0				
130	117.28	0.0387		0.0	25.724	0.995		Vel =	6.90	
	0.0									
	117.28					69.147		K Factor =	14.10	
104	7.82	1.442	2T	14.864	58.000	68.826				
to		120.0	2E	7.432	22.296	-2.057				
103	7.82	0.0049		0.0	80.296	0.390		Vel =	1.54	
	0.0									
	7.82					67.159		K Factor =	0.95	
106	8.06	1.442	2T	14.864	58.000	68.815				
to		120.0	2E	7.432	22.296	-2.057				
105	8.06	0.0051		0.0	80.296	0.413		Vel =	1.58	
	0.0									
	8.06					67.171		K Factor =	0.98	
108	8.58	1.442	2T	14.864	58.000	68.790				
to		120.0	2E	7.432	22.296	-2.057				
107	8.58	0.0058		0.0	80.296	0.463		Vel =	1.69	
	0.0									
	8.58					67.196		K Factor =	1.05	
110	9.43	1.442	2T	14.864	58.000	68.746				
to		120.0	2E	7.432	22.296	-2.057				
109	9.43	0.0069		0.0	80.296	0.551		Vel =	1.85	

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 6
Date

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 9.43					67.240		K Factor = 1.15	
112 to 111	10.67	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	68.674 -2.057		Vel = 2.10	
	0.0 10.67					67.311		K Factor = 1.30	
114 to 113	12.36	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	68.566 -2.057		Vel = 2.43	
	0.0 12.36					67.420		K Factor = 1.51	
116 to 115	14.55	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	68.405 -2.057		Vel = 2.86	
	0.0 14.55					67.580		K Factor = 1.77	
118 to 117	17.32	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	68.171 -2.057		Vel = 3.40	
	0.0 17.32					67.814		K Factor = 2.10	
120 to 119	20.75	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	67.834 -2.057		Vel = 4.08	
	0.0 20.75					68.152		K Factor = 2.51	
129 to 128	24.30	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	67.350 -2.057		Vel = 4.77	
	0.0 24.30					68.473		K Factor = 2.94	
127 to 126	25.97	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	66.665 -2.057		Vel = 5.10	
	0.0 25.97					68.205		K Factor = 3.14	
124 to 123	29.81	1.442 120.0	2T 2E	14.864 7.432	58.000 22.296	65.484 -2.057		Vel = 5.86	
	0.0 29.81					68.068		K Factor = 3.61	
17 to 18	24.62	1.049 120.0	2E T	4.0 5.0	8.250 9.000	19.323 0.182		K Factor = 5.60	
	24.62	0.1911		0.0	17.250	3.297		Vel = 9.14	

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 7
Date

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 24.62						22.802	K Factor = 5.16	
16 to 16T	24.56 24.56	1.049 120.0 0.1903	2E T	4.0 5.0 0.0	2.500 9.000 11.500	19.237 0.182 2.188		K Factor = 5.60 Vel = 9.12	
	0.0 24.56						21.607	K Factor = 5.28	
14 to 15	21.29 21.29	1.049 120.0 0.1461	2E T	4.0 5.0 0.0	8.000 9.000 17.000	14.450 0.182 2.483		K Factor = 5.60 Vel = 7.90	
	0.0 21.29						17.115	K Factor = 5.15	
12 to 12T	21.30 21.3	1.049 120.0 0.1462	2E T	4.0 5.0 0.0	2.500 9.000 11.500	14.466 0.182 1.681		K Factor = 5.60 Vel = 7.91	
	0.0 21.30						16.329	K Factor = 5.27	
10 to 11	21.00 21.0	1.049 120.0 0.1423	E T	2.0 5.0 0.0	4.500 7.000 11.500	14.059 0.0 1.637		K Factor = 5.60 Vel = 7.80	
	0.0 21.00						15.696	K Factor = 5.30	
8 to 9	20.00 20.0	1.049 120.0 0.1301	2E T	4.0 5.0 0.0	8.000 9.000 17.000	12.756 0.182 2.212		K Factor = 5.60 Vel = 7.42	
	0.0 20.00						15.150	K Factor = 5.14	
7 to 7T	20.35 20.35	1.049 120.0 0.1344	2E T	4.0 5.0 0.0	3.250 9.000 12.250	13.203 0.182 1.646		K Factor = 5.60 Vel = 7.55	
	0.0 20.35						15.031	K Factor = 5.25	
5 to 6	19.72 19.72	1.049 120.0 0.1268	2E T	4.0 5.0 0.0	8.000 9.000 17.000	12.400 0.182 2.155		K Factor = 5.60 Vel = 7.32	
	0.0 19.72						14.737	K Factor = 5.14	
4 to 4T	20.05 20.05	1.049 120.0 0.1308	2E T	4.0 5.0 0.0	3.250 9.000 12.250	12.824 0.182 1.602		K Factor = 5.60 Vel = 7.44	
	0.0 20.05						14.608	K Factor = 5.25	
1 to 2	16.80 16.8	1.049 120.0 0.0943	2E	4.0 0.0 0.0	7.000 4.000 11.000	9.000 0.0 1.037		K Factor = 5.60 Vel = 6.24	

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 8
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
2 to 3	17.21 34.01	1.049 120.0 0.3475	T	5.0 0.0 0.0	8.000 5.000 13.000	10.037 0.0 4.517			K Factor @ node DROP Vel = 12.63	
3 to 4T	0.0 34.01	2.157 120.0 0.0103		0.0 0.0 0.0	5.250 0.0 5.250	14.554 0.0 0.054			Vel = 2.99	
4T to 6	20.05 54.06	2.157 120.0 0.0246		0.0 0.0 0.0	5.250 0.0 5.250	14.608 0.0 0.129			Vel = 4.75	
6 to 7T	19.72 73.78	2.157 120.0 0.0436		0.0 0.0 0.0	6.750 0.0 6.750	14.737 0.0 0.294			Vel = 6.48	
7T to 9	20.35 94.13	2.157 120.0 0.0680		0.0 0.0 0.0	1.750 0.0 1.750	15.031 0.0 0.119			Vel = 8.26	
9 to 11	20.00 114.13	2.157 120.0 0.0975		0.0 0.0 0.0	5.600 0.0 5.600	15.150 0.0 0.546			Vel = 10.02	
11 to 12T	21.00 135.13	2.157 120.0 0.1333		0.0 0.0 0.0	4.750 0.0 4.750	15.696 0.0 0.633			Vel = 11.86	
12T to 15	21.30 156.43	2.157 120.0 0.1747		0.0 0.0 0.0	4.500 0.0 4.500	16.329 0.0 0.786			Vel = 13.73	
15 to 16T	21.29 177.72	2.157 120.0 0.2212	2E	12.307 0.0 0.0	8.000 12.307 20.307	17.115 0.0 4.492			Vel = 15.60	
16T to 18	24.56 202.28	2.157 120.0 0.2812		0.0 0.0 0.0	4.250 0.0 4.250	21.607 0.0 1.195			Vel = 17.76	
18 to 19	24.61 226.89	2.157 120.0 0.3476	E	6.153 0.0 0.0	80.000 6.153 86.153	22.802 0.0 29.946			Vel = 19.92	
19 to 20	0.0 226.89	2.157 120.0 0.3476	E	6.153 0.0 0.0	10.250 6.153 16.403	52.748 0.0 5.701			Vel = 19.92	
20 to 21	0.0 226.89	2.157 120.0 0.3476	E	6.153 0.0 0.0	7.330 6.153 13.483	58.449 -3.214 4.687			Vel = 19.92	
21 to 125	0.0 226.89	2.157 120.0 0.3476	T	12.307 0.0 0.0	3.330 12.307 15.637	59.922 0.0 5.436			Vel = 19.92	
125 to 124	-167.54 59.35	2.635 120.0 0.0110		0.0 0.0 0.0	11.500 0.0 11.500	65.358 0.0 0.126			Vel = 3.49	

Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 9
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
124	-29.81	2.635		12.500	65.484				
to		120.0		0.0	0.0				
122	29.54	0.0030		12.500	0.038		Vel = 1.74		
122	0.0	1.442	2T	14.864	58.000	65.522			
to		120.0	2E	7.432	22.296	-2.057			
121	29.54	0.0569		0.0	80.296	4.565	Vel = 5.80		
121	0.0	2.635		0.0	12.500	68.030			
to		120.0		0.0	0.0	0.0			
123	29.54	0.0030		0.0	12.500	0.038	Vel = 1.74		
123	29.81	2.635		0.0	12.500	68.068			
to		120.0		0.0	0.0	0.0			
126	59.35	0.0110		0.0	12.500	0.137	Vel = 3.49		
126	25.97	2.635		0.0	12.500	68.205			
to		120.0		0.0	0.0	0.0			
128	85.32	0.0214		0.0	12.500	0.268	Vel = 5.02		
128	24.29	2.635	T	16.474	3.250	68.473			
to		120.0		0.0	16.474	0.0			
130	109.61	0.0342		0.0	19.724	0.674	Vel = 6.45		
130	117.28	4.26	2E	26.334	97.500	69.147			
to		120.0		0.0	26.334	1.949			
TOR	226.89	0.0126		0.0	123.834	1.565	Vel = 5.11		
TOR	0.0	4.26	Fsp	0.0	10.000	72.661			
to		120.0		0.0	0.0	7.331	** Fixed Loss = 3		
TAV	226.89	0.0126		0.0	10.000	0.126	Vel = 5.11		
TAV	0.0	4.026	A	17.0	3.000	80.118			
to		120.0	G	2.0	19.000	2.599			
BASE	226.89	0.0166		0.0	22.000	0.366	Vel = 5.72		
BASE	0.0	6.16	E	20.084	225.000	83.083			
to		140.0	G	4.304	67.425	-6.496			
HOSE	226.89	0.0016	T	43.037	292.425	0.460	Vel = 2.44		
HOSE	100.00	12.34		0.0	300.000	77.047	Qa = 100		
to		140.0		0.0	0.0	0.0			
TEST	326.89	0.0001		0.0	300.000	0.032	Vel = 0.88		
	0.0								
	326.89					77.079	K Factor = 37.23		

Water Supply Curve C

SPRINKLER SYSTEMS INC.
B. H. Milliken Area 1

Page 10
Date

City Water Supply:
C1 - Static Pressure : 92
C2 - Residual Pressure: 75
C2 - Residual Flow : 1453

Demand:
D1 - Elevation : -2.889
D2 - System Flow : 226.893
D2 - System Pressure : 77.079
Hose (Demand) : 100
D3 - System Demand : 326.893
Safety Margin : 13.845

