



**. . . Fire Protection by Computer Design**

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

Job Name : 17 CARLETON STREET  
Building :  
Location : 17 CARLETON STREET, PORTLAND, MAINE 04101  
System : 1 OF 1  
Contract : 16-149  
Data File : 1614917CARLETONSTREETA2.WXF

Hydraulic Design Information Sheet

Name - 17 CARLETON STREET Date - 3-30-2017  
 Location - 17 CARLETON STREET, PORTLAND, MAINE 04101  
 Building - System No. - 1 OF 1  
 Contractor - BENCHMARK Contract No. - 16-149  
 Calculated By - SCOTT E. GARLAND Drawing No. - 1-3 OF 3  
 Construction: (X) Combustible ( ) Non-Combustible Ceiling Height - VARIES  
 Occupancy - SERVICE AREA - ORDINARY HAZARD GP 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

M	Area of Sprinkler Operation	- ENTIRE	System Type	Sprinkler/Nozzle
	Density	- .20	(X) Wet	Make RELIABLE
D	Area Per Sprinkler	- 129.17	( ) Dry	Model G5-80
E	Elevation at Highest Outlet	- 110.833	( ) Deluge	Size 17/32" X 3/4"
S	Hose Allowance - Inside	-	( ) Preaction	K-Factor 8.0
I	Rack Sprinkler Allowance	-	( ) Other	Temp.Rat.155 DEG
G	Hose Allowance - Outside	- 250		

N Note DESIGN AREA #2 - LOWER LEVEL SERVICE AREA

Calculation Flow Required - 256.25 Press Required - 42.760 AT BASE OF RISER  
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 4-28-2015		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 50	@ Press -	
R	Residual Press - 47	Elev. -	Well
S	Flow - 1034		Proof Flow
U	Elevation - 98.0		

P Location - ON EMERY STREET AT PINE STREET, APPROX. 650' FROM THE BLDG

L Source of Information - PORTLAND WATER DISTRICT

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	Solid Piled %	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:

# Fittings Used Summary

SPRINKLER SYSTEMS INC.  
17 CARLETON STREET

Page 10  
Date 3-30-2017

## Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24	
Bvca	B Fly Vic 705						6	6	7		8	12	14	16	18	19						
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	
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28	
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	
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	
Zac	Ames 2000SS	Fitting generates a Fixed Loss Based on Flow																				

## 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**

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
TEST	50.0	47	1034.0	49.2	506.25	43.633

**NODE ANALYSIS**

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
TYP	0.0	8	8.27	23.0	
TYP1	0.0	8	10.43	25.83	
TYP2	0.0	8	8.27	23.0	
11	110.833	7.59	11.49	25.71	K=K @ DROP
12	110.833	7.59	11.58	25.83	K=K @ DRP1
13	110.833	7.59	11.89	26.16	K=K @ DROP
14	110.833	7.59	11.99	26.29	K=K @ DRP1
K	110.833		12.15		
15	105.0	8	8.37	23.15	
16	110.833	8	9.26	24.35	
17	110.833	7.59	11.81	26.06	K=K @ DRP2
18	110.833	7.59	11.9	26.17	K=K @ DRP2
19	110.833	7.59	11.94	26.22	K=K @ DRP2
20	110.833	7.59	12.04	26.32	K=K @ DRP2
P	110.833		12.37		
L	110.833		13.41		
M	110.833		13.48		
N	110.833		13.65		
Q	111.083		21.21		
S	110.25		22.81		
J	110.25		27.18		
T	98.833		32.72		
RT	98.833		33.68		
TOV	95.833		38.03		
RB	91.833		42.76		
X1	91.833		42.97	250.0	
X2	91.833		44.84		
X3	91.833		45.48		
TEST	98.0		43.63		

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 DROP	0 0	8.00	23.00 23.0	1 1.049	T 0.0 0.0	5.0 0.0 5.000	120 0.1685	8.266 0.0 0.927		Vel = 8.54	
DROP			0.0 23.00					9.193		K Factor = 7.59	
TYP1 to DRP1	0 0	8.00	25.83 25.83	1 1.049	T 0.0 0.0	5.0 0.0 5.000	120 0.2089	10.428 0.0 1.149		Vel = 9.59	
DRP1			0.0 25.83					11.577		K Factor = 7.59	
TYP2 to DRP2	0 0	8.00	23.00 23.0	1 1.049	T 0.0 0.0	5.0 0.0 5.000	120 0.1685	8.266 0.0 0.927		Vel = 8.54	
DRP2			0.0 23.00					9.193		K Factor = 7.59	
11 to 12	110.833 110.833	7.59	25.71 25.71	2 2.067		0.0 0.0 0.0	11.917 0.0076	11.486 0.0 0.091		K = K @ DROP Vel = 2.46	
12 to K	110.833 110.833	7.59	25.83 51.54	2 2.067	E 0.0 0.0	5.0 0.0 20.625	120 0.0276	11.577 0.0 0.569		K = K @ DRP1 Vel = 4.93	
K			0.0 51.54					12.146		K Factor = 14.79	
13 to 14	110.833 110.833	7.59	26.16 26.16	2 2.067		0.0 0.0 0.0	11.917 0.0079	11.892 0.0 0.094		K = K @ DROP Vel = 2.50	
14 to K	110.833 110.833	7.59	26.29 52.45	2 2.067		0.0 0.0 0.0	5.625 0.0284	120 0.160		K = K @ DRP1 Vel = 5.01	
K			0.0 52.45					12.146		K Factor = 15.05	
K to L	110.833 110.833		103.99 103.99	2 2.067	T 0.0 0.0	10.0 0.0 12.500	120 0.1010	12.146 0.0 1.263		Vel = 9.94	
L			0.0 103.99					13.409		K Factor = 28.40	
15 to 16	105 110.833	8.00	23.15 23.15	1 1.049	4E 0.0 0.0	8.0 0.0 8.000	120 0.1705	8.371 -2.526 3.417		Vel = 8.59	
16 to M	110.833 110.833	8.00	24.34 47.49	1 1.049	T 0.0 0.0	5.0 0.0 5.000	120 0.6446	9.262 0.0 4.217		Vel = 17.63	
M			0.0 47.49					13.479		K Factor = 12.94	
17 to 18	110.833 110.833	7.59	26.06 26.06	2 2.067		0.0 0.0 0.0	11.917 0.0078	11.805 0.0 0.093		K = K @ DRP2 Vel = 2.49	
18 to P	110.833 110.833	7.59	26.17 52.23	2 2.067	E 0.0 0.0	5.0 0.0 5.000	120 0.0283	11.898 0.0 0.475		K = K @ DRP2 Vel = 4.99	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
17 CARLETON STREET

Page 13  
Date 3-30-2017

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	*****
P			0.0 52.23					12.373		K Factor = 14.85	
19 to 20	110.833 110.833	7.59	26.22	2	0.0 0.0 0.0	11.917 0.0 11.917	120	11.942 0.0 0.094		K = K @ DRP2 Vel = 2.51	
20 to P	110.833 110.833	7.59	26.31	2	T 10.0 0.0	1.792 10.000 11.792	120	12.036 0.0 0.337		K = K @ DRP2 Vel = 5.02	
P			0.0 52.53					12.373		K Factor = 14.93	
P to N	110.833 110.833		104.76	2	T 10.0 0.0	2.500 10.000 12.500	120	12.373 0.0 1.280		Vel = 10.02	
N			0.0 104.76					13.653		K Factor = 28.35	
L to M	110.833 110.833		103.99	3	0.0 0.0 0.0	6.375 0.0 6.375	120	13.409 0.0 0.070		Vel = 4.00	
M to N	110.833 110.833		47.49	3	0.0 0.0 0.0	7.917 0.0 7.917	120	13.479 0.0 0.174		Vel = 5.82	
N to Q	110.833 111.083		104.77	3	5E T 47.038 20.159 0.0	64.375 67.197 131.572	120	13.653 -0.108 7.664		Vel = 9.85	
Q to S	111.083 110.250		0.0	4	2E 26.334 0.0 0.0	51.917 26.334 78.251	120	21.209 0.361 1.238		Vel = 5.77	
S to J	110.250 110.250		0.0	4	Bvca E S T Fsp 10.534 13.167 28.968 26.334 0.0	7.583 79.003 86.586	120	22.808 3.000 1.371		* Fixed Loss = 3 Vel = 5.77	
J to T	110.250 98.833		0.0	4	T 26.334 0.0 0.0	11.417 26.334 37.751	120	27.179 4.945 0.597		Vel = 5.77	
T to RT	98.833 98.833		0.0	4	Bvca 2E 10.534 26.334 0.0	23.792 36.868 60.660	120	32.721 0.0 0.960		Vel = 5.77	
RT to TOV	98.833 95.833		0.0	4	Fsp 0.0 0.0 0.0	3.000 0.0 3.000	120	33.681 4.299 0.048		* Fixed Loss = 3 Vel = 5.77	
TOV to RB	95.833 91.833		0.0	4	Zac 0.0 0.0 0.0	4.000 0.0 4.000	120	38.028 4.668 0.064		* Fixed Loss = 2.936 Vel = 5.77	
RB to X1	91.833 91.833		0.0	6	E G T 20.084 4.304 43.037	40.000 67.425 107.425	140	42.760 0.0 0.212		Vel = 2.76	
X1 to X2	91.833 91.833	H250	250.00	6	T 43.037 0.0 0.0	225.000 43.037 268.037	140	42.972 0.0 1.866		Vel = 5.45	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
17 CARLETON STREET

Page 14  
Date 3-30-2017

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	*****
X2 to X3	91.833 91.833		0.0 506.25	8 8.27	2F	28.468 0.0 28.468	360.000 388.468	140	44.838 0.0		
X3 to TEST	91.833 98		0.0 506.25	6 6.16	F T	10.042 43.037 0.0	65.000 53.079 118.079	140	45.482 -2.671 0.822	Vel = 3.02	
TEST			0.0 506.25						43.633	K Factor = 76.64	

# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
17 CARLETON STREET

Page 15  
Date 3-30-2017

City Water Supply:  
C1 - Static Pressure : 50  
C2 - Residual Pressure: 47  
C2 - Residual Flow : 1034

Demand:  
D1 - Elevation : 5.558  
D2 - System Flow : 256.248  
D2 - System Pressure : 43.633  
Hose ( Demand ) : 250  
D3 - System Demand : 506.248  
Safety Margin : 5.567

