

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

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

Job Name : 23 Emerson Street Area 1  
Building : EXISTING RENOVATED  
Location : 23 EMERSON STREET PORTLAND, MAINE  
System : 1 WET  
Contract : 15-157  
Data File : 23 Emerson Street Area 1.WXF

Hydraulic Design Information Sheet

Name - 23 EMERSON STREET Date - 12-29-15  
 Location - 23 EMERSON STREET PORTLAND, MAINE  
 Building - EXISTING RENOVATED System No. - 1 WET  
 Contractor - SPRINKLER SYSTEMS INC. Contract No. - 15-157  
 Calculated By - CDS Drawing No. - 1-1 OF 1  
 Construction: (X) Combustible ( ) Non-Combustible Ceiling Height - VARIES  
 Occupancy - APARTMENTS

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

S Other NFPA 13R

T Specific Ruling Made By Date

M	Area of Sprinkler Operation - 4 HEADS	System Type	Sprinkler/Nozzle
	Density - .15	(X) Wet	Make RELIABLE
D	Area Per Sprinkler - 110	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet - 137	( ) 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.200 DEG.
G	Hose Allowance - Outside - 0		

N Note

Calculation Flow Required - 70.27 Press Required - 55.222 AT BASE  
 Summary C-Factor Used: 120 Overhead 150 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 11-25-15 Cap. -  
 T Time of Test - AM Rated Cap.- Elev.-  
 E Static Press - 68 @ Press -  
 R Residual Press - 65 Elev. - Well  
 Flow - 150 Proof Flow  
 S Elevation - 91.5'

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  
 E Horizontal Barriers Provided:

# Fittings Used Summary

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 1

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Date

## 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
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.  
23 Emerson Street Area 1

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
4	137.0	5.6	9.22	na	17.01	0.15	110	7.0
1	137.0	5.6	8.68	na	16.5	0.15	110	7.0
2	137.0		10.32	na				
3	137.0	5.6	10.35	na	18.02	0.15	110	7.0
5	137.0		10.38	na				
6	137.0	5.6	11.21	na	18.75	0.15	110	7.0
8	137.0		11.31	na				
9	137.0		12.77	na				
11	137.0		12.87	na				
12	137.0		14.34	na				
14	137.0		14.44	na				
17	137.0		15.24	na				
18	137.0		16.33	na				
19	129.75		19.87	na				
20	119.75		24.84	na				
21	119.75		25.6	na				
22	109.75		30.33	na				
23	98.5		36.57	na				
24	98.5		37.62	na				
TOR	98.5		37.93	na				
BKFL	92.5		43.76	na				
BASE	91.5		55.22	na				
1000	91.5		56.43	na				
2000	91.5		58.73	na				
TEST	91.5		58.76	na				

The maximum velocity is 10.51 and it occurs in the pipe between nodes BASE and 1000

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 1

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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	*****
4 to 5	17.01	1.049 120.0	T 5.0 0.0	7.000 5.000	9.222 0.0			K Factor = 5.60	
	17.01	0.0964	0.0	12.000	1.157			Vel = 6.31	
	0.0 17.01					10.379		K Factor = 5.28	
1 to 2	16.50	1.049 120.0	2E T 4.0 5.0	9.000 9.000	8.681 0.0			K Factor = 5.60	
	16.5	0.0912	0.0	18.000	1.641			Vel = 6.13	
2 to 3	0.0	1.682 120.0	0.0 0.0	3.250 0.0	10.322 0.0				
	16.5	0.0092	0.0	3.250	0.030			Vel = 2.38	
3 to 5	18.02	1.682 120.0	0.0 0.0	0.750 0.0	10.352 0.0			K Factor = 5.60	
	34.52	0.0360	0.0	0.750	0.027			Vel = 4.98	
5 to 6	17.00	1.682 120.0	0.0 0.0	11.000 0.0	10.379 0.0				
	51.52	0.0752	0.0	11.000	0.827			Vel = 7.44	
6 to 8	18.75	1.682 120.0	0.0 0.0	0.750 0.0	11.206 0.0			K Factor = 5.60	
	70.27	0.1333	0.0	0.750	0.100			Vel = 10.15	
8 to 9	0.0	1.682 120.0	0.0 0.0	11.000 0.0	11.306 0.0				
	70.27	0.1335	0.0	11.000	1.468			Vel = 10.15	
9 to 11	0.0	1.682 120.0	0.0 0.0	0.750 0.0	12.774 0.0				
	70.27	0.1333	0.0	0.750	0.100			Vel = 10.15	
11 to 12	0.0	1.682 120.0	0.0 0.0	11.000 0.0	12.874 0.0				
	70.27	0.1335	0.0	11.000	1.469			Vel = 10.15	
12 to 14	0.0	1.682 120.0	0.0 0.0	0.750 0.0	14.343 0.0				
	70.27	0.1333	0.0	0.750	0.100			Vel = 10.15	
14 to 17	0.0	1.682 120.0	E 4.95 0.0	1.000 4.950	14.443 0.0				
	70.27	0.1334	0.0	5.950	0.794			Vel = 10.15	
17 to 18	0.0	2.157 120.0	3E 18.46 0.0	9.000 18.460	15.237 0.0				
	70.27	0.0397	0.0	27.460	1.091			Vel = 6.17	
18 to 19	0.0	2.157 120.0	0.0 0.0	10.000 0.0	16.328 3.140				
	70.27	0.0398	0.0	10.000	0.398			Vel = 6.17	
19 to 20	0.0	2.157 120.0	E 6.153 0.0	10.000 6.153	19.866 4.331				
	70.27	0.0397	0.0	16.153	0.642			Vel = 6.17	
20 to 21	0.0	2.157 120.0	E 6.153 0.0	13.000 6.153	24.839 0.0				
	70.27	0.0397	0.0	19.153	0.761			Vel = 6.17	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 1

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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	*****
21	0.0	2.157		10.000	25.600				
to		120.0		0.0	4.331				
22	70.27	0.0398		10.000	0.398		Vel = 6.17		
22	0.0	2.157	E 6.153	16.000	30.329				
to		120.0	T 12.307	18.460	4.872				
23	70.27	0.0398		34.460	1.370		Vel = 6.17		
23	0.0	2.157	E 6.153	8.000	36.571				
to		120.0	T 12.307	18.460	0.0				
24	70.27	0.0398		26.460	1.052		Vel = 6.17		
24	0.0	2.157	E 6.153	1.500	37.623				
to		120.0		0.0	6.153	0.0			
TOR	70.27	0.0397		0.0	7.653	0.304	Vel = 6.17		
TOR	0.0	2.157	Fsp 0.0	6.000	37.927				
to		120.0		0.0	5.599		** Fixed Loss = 3		
BKFL	70.27	0.0397		6.000	0.238		Vel = 6.17		
BKFL	0.0	2.067		0.500	43.764				
to		120.0		0.0	11.433		** Fixed Loss = 11		
BASE	70.27	0.0500		0.500	0.025		Vel = 6.72		
BASE	0.0	1.653	E 2.544	10.000	55.222				
to		150.0		0.0	2.544	0.0			
1000	70.27	0.0961		12.544	1.206		Vel = 10.51		
1000	0.0	1.959	T 11.635	42.000	56.428				
to		150.0	G 1.164	12.799	0.0				
2000	70.27	0.0420		54.799	2.303		Vel = 7.48		
2000	0.0	6.16		150.000	58.731				
to		140.0		0.0	0.0				
TEST	70.27	0.0002		150.000	0.027		Vel = 0.76		
	0.0								
	70.27				58.758		K Factor = 9.17		

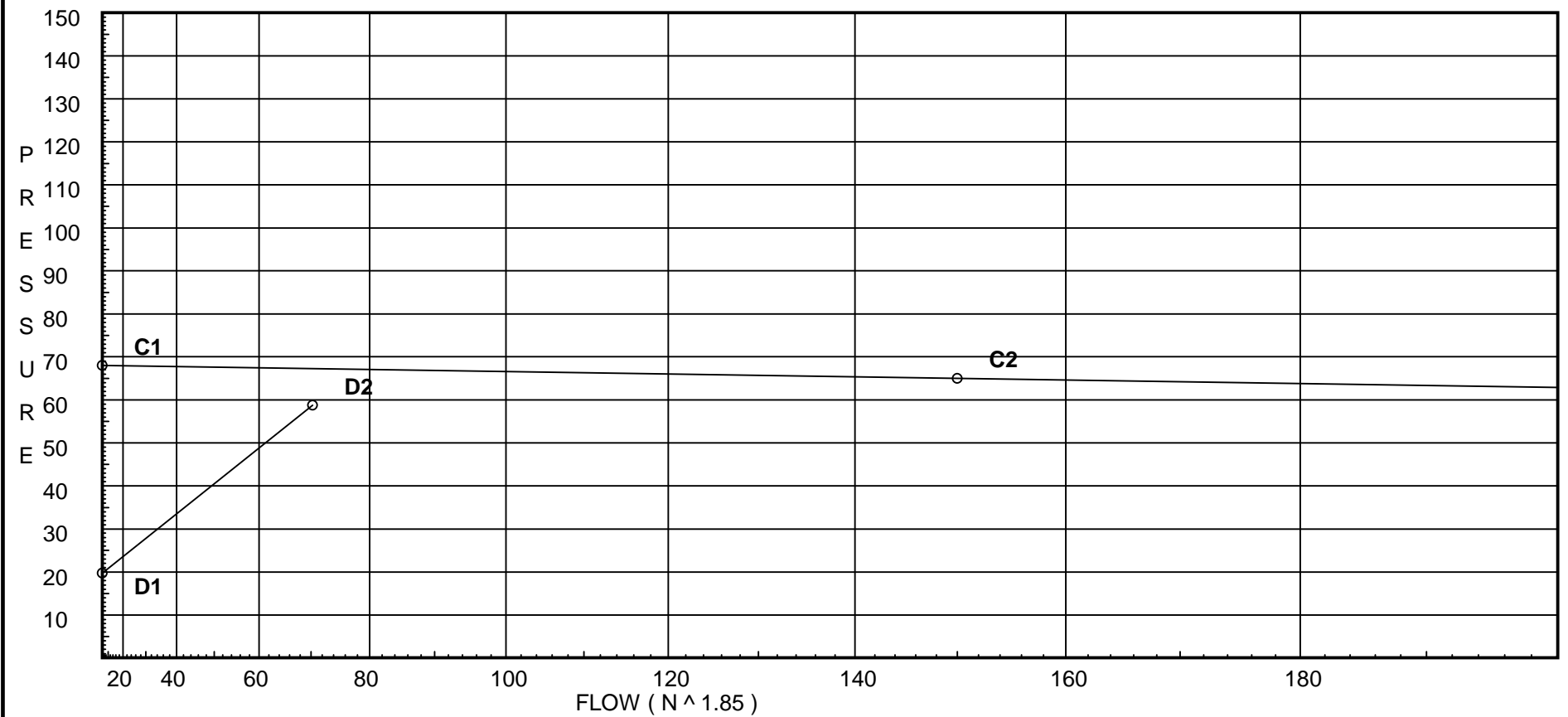
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 1

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Date

City Water Supply:  
C1 - Static Pressure : 68  
C2 - Residual Pressure: 65  
C2 - Residual Flow : 150

Demand:  
D1 - Elevation : 19.706  
D2 - System Flow : 70.27  
D2 - System Pressure : 58.758  
Hose ( Demand ) : \_\_\_\_\_  
D3 - System Demand : 70.27  
Safety Margin : 8.504



Hydraulic Design Information Sheet

Name - 23 EMERSON STREET AREA 2 Date - 12-29-15  
 Location - 23 EMERSON STREET PORTLAND, MAINE  
 Building - EXISTING RENOVATED System No. - 1 WET  
 Contractor - SPRINKLER SYSTEMS INC. Contract No. - 15-157  
 Calculated By - CDS Drawing No. - 1-1 OF 1  
 Construction: (X) Combustible ( ) Non-Combustible Ceiling Height - VARIES  
 Occupancy - APARTMENTS

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

S Other NFPA 13R  
 T Specific Ruling

Made By Date

M	Area of Sprinkler Operation	- 3 HEADS	System Type	Sprinkler/Nozzle
	Density	- .05	(X) Wet	Make RELIABLE
D	Area Per Sprinkler	- 324	( ) Dry	Model F1RES49
E	Elevation at Highest Outlet	- 129.750	( ) Deluge	Size 7/16" X 1/2"
S	Hose Allowance - Inside	- 0	( ) Preaction	K-Factor 4.9
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155 DEG.
G	Hose Allowance - Outside	- 0		

N Note

Calculation Flow Required - 50.15 Press Required - 50.643 AT BASE  
 Summary C-Factor Used: 120 Overhead 150 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 11-25-15		Cap. -
T	Time of Test - AM	Rated Cap.-	Elev.-
E	Static Press - 68	@ Press -	
R	Residual Press - 65	Elev. -	Well
	Flow - 150		Proof Flow
S	Elevation - 91.5'		

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	( ) 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:



# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 2

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Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	4.9	12.0	na	16.97	0.05	324	12.0
39	129.75	4.4	13.3	na	16.05	0.05	256	13.3
40	129.75		14.34	na				
41	119.75		19.54	na				
42	109.75		24.73	na				
35	129.75	K = K @ DROP	12.74	na	17.08			
36	129.75		13.42	na				
37	119.75		18.72	na				
38	109.75		24.03	na				
31	129.75	K = K @ DROP	12.65	na	17.02			
32	129.75		13.33	na				
33	119.75		18.63	na				
34	109.75		23.92	na				
53	98.5		30.92	na				
54	98.5		31.04	na				
55	98.5		31.55	na				
56	98.5		33.14	na				
24	98.5		33.31	na				
TOR	98.5		33.47	na				
BKFL	92.5		39.2	na				
BASE	91.5		50.64	na				
1000	91.5		51.29	na				
2000	91.5		52.52	na				
TEST	91.5		52.54	na				

The maximum velocity is 7.5 and it occurs in the pipe between nodes BASE and 1000

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 2

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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	16.97	1.049 120.0	T 5.0	1.000	12.000			K Factor = 4.90	
	16.97	0.0960	0.0	6.000	0.576			Vel = 6.30	
	0.0 16.97					12.576		K Factor = 4.79	
39 to 40	16.05	1.049 120.0	E 2.0 T 5.0	5.000	13.300			K Factor = 4.40	
	16.05	0.0866	0.0	12.000	1.039			Vel = 5.96	
40 to 41	0.0	1.049 120.0	0.0	10.000	14.339				
	16.05	0.0866	0.0	10.000	0.866			Vel = 5.96	
41 to 42	0.0	1.049 120.0	0.0	10.000	19.536				
	16.05	0.0866	0.0	10.000	0.866			Vel = 5.96	
42 to 55	0.0	1.049 120.0	E 2.0 T 5.0	15.500	24.733				
	16.05	0.0866	0.0	22.500	1.948			Vel = 5.96	
	0.0 16.05					31.553		K Factor = 2.86	
35 to 36	17.08	1.049 120.0	T 5.0	2.000	12.738			K Factor @ node DROP	
	17.08	0.0973	0.0	7.000	0.681			Vel = 6.34	
36 to 37	0.0	1.049 120.0	0.0	10.000	13.419				
	17.08	0.0972	0.0	10.000	0.972			Vel = 6.34	
37 to 38	0.0	1.049 120.0	0.0	10.000	18.722				
	17.08	0.0972	0.0	10.000	0.972			Vel = 6.34	
38 to 54	0.0	1.049 120.0	E 2.0 T 5.0	15.000	24.025				
	17.08	0.0972	0.0	22.000	2.139			Vel = 6.34	
	0.0 17.08					31.036		K Factor = 3.07	
31 to 32	17.02	1.049 120.0	T 5.0	2.000	12.652			K Factor @ node DROP	
	17.02	0.0966	0.0	7.000	0.676			Vel = 6.32	
32 to 33	0.0	1.049 120.0	0.0	10.000	13.328				
	17.02	0.0966	0.0	10.000	0.966			Vel = 6.32	
33 to 34	0.0	1.049 120.0	0.0	10.000	18.625				
	17.02	0.0966	0.0	10.000	0.966			Vel = 6.32	
34 to 53	0.0	1.049 120.0	E 2.0 T 5.0	15.000	23.922				
	17.02	0.0966	0.0	22.000	2.126			Vel = 6.32	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 2

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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	*****
53	0.0	1.682		0.0	12.000	30.920				
to		120.0		0.0	0.0	0.0				
54	17.02	0.0097		0.0	12.000	0.116		Vel =	2.46	
54	17.09	1.682		0.0	14.750	31.036				
to		120.0		0.0	0.0	0.0				
55	34.11	0.0351		0.0	14.750	0.517		Vel =	4.93	
55	16.04	1.682	T	9.9	12.250	31.553				
to		120.0		0.0	9.900	0.0				
56	50.15	0.0715		0.0	22.150	1.584		Vel =	7.24	
56	0.0	2.157		0.0	8.000	33.137				
to		120.0		0.0	0.0	0.0				
24	50.15	0.0214		0.0	8.000	0.171		Vel =	4.40	
24	0.0	2.157	E	6.153	1.500	33.308				
to		120.0		0.0	6.153	0.0				
TOR	50.15	0.0213		0.0	7.653	0.163		Vel =	4.40	
TOR	0.0	2.157	Fsp	0.0	6.000	33.471				
to		120.0		0.0	0.0	5.599		** Fixed Loss =	3	
BKFL	50.15	0.0212		0.0	6.000	0.127		Vel =	4.40	
BKFL	0.0	2.067		0.0	0.500	39.197				
to		120.0		0.0	0.0	11.433		** Fixed Loss =	11	
BASE	50.15	0.0260		0.0	0.500	0.013		Vel =	4.79	
BASE	0.0	1.653	E	2.544	10.000	50.643				
to		150.0		0.0	2.544	0.0				
1000	50.15	0.0516		0.0	12.544	0.647		Vel =	7.50	
1000	0.0	1.959	T	11.635	42.000	51.290				
to		150.0	G	1.164	12.799	0.0				
2000	50.15	0.0225		0.0	54.799	1.234		Vel =	5.34	
2000	0.0	6.16		0.0	150.000	52.524				
to		140.0		0.0	0.0	0.0				
TEST	50.15	0.0001		0.0	150.000	0.015		Vel =	0.54	
	0.0									
	50.15					52.539		K Factor =	6.92	

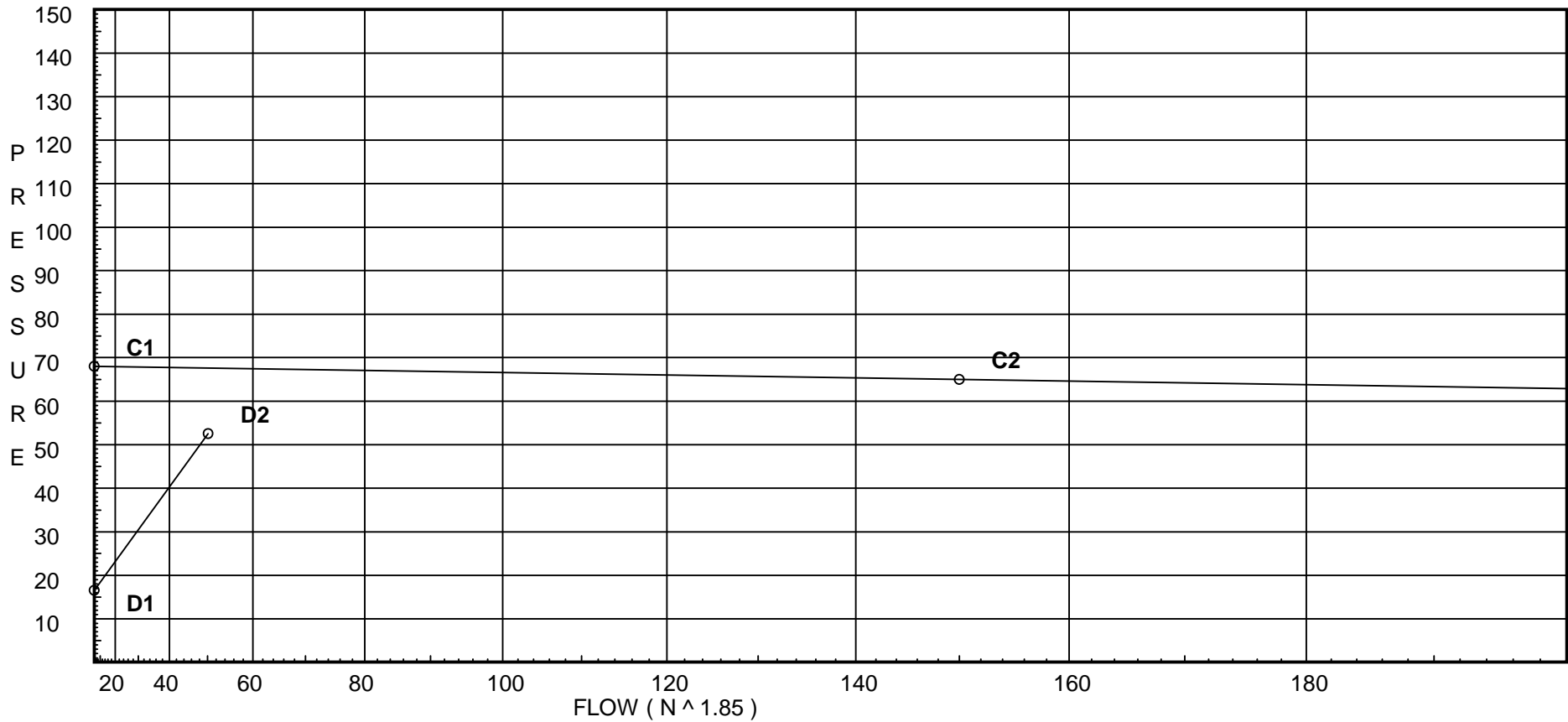
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 2

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Date

City Water Supply:  
C1 - Static Pressure : 68  
C2 - Residual Pressure: 65  
C2 - Residual Flow : 150

Demand:  
D1 - Elevation : 16.566  
D2 - System Flow : 50.154  
D2 - System Pressure : 52.539  
Hose ( Demand ) : \_\_\_\_\_  
D3 - System Demand : 50.154  
Safety Margin : 15.066



Hydraulic Design Information Sheet

Name - 23 EMERSON STREET AREA 3 Date - 12-29-15  
 Location - 23 EMERSON STREET PORTLAND, MAINE  
 Building - EXISTING RENOVATED System No. - 1 WET  
 Contractor - SPRINKLER SYSTEMS INC. Contract No. - 15-157  
 Calculated By - CDS Drawing No. - 1-1 OF 1  
 Construction: (X) Combustible ( ) Non-Combustible Ceiling Height - VARIES  
 Occupancy - APARTMENTS

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

S Other NFPA 13R  
 T Specific Ruling

Made By Date

M	Area of Sprinkler Operation - 3 HEADS	System Type	Sprinkler/Nozzle
	Density - .10	(X) Wet	Make RELIABLE
D	Area Per Sprinkler - 168	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet - 118.750	( ) 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.200 DEG.
G	Hose Allowance - Outside - 0		

N Note

Calculation Flow Required - 51.06 Press Required - 47.018 AT BASE  
 Summary C-Factor Used: 120 Overhead 150 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 11-25-15		Cap. -
T	Time of Test - AM	Rated Cap.-	Elev.-
E	Static Press - 68	@ Press -	
R	Residual Press - 65	Elev. -	Well
	Flow - 150		Proof Flow
S	Elevation - 91.5		

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	( ) Double Row	( ) Slave Pallet	( ) Solid Shelf ( ) Non
T	( ) Mult. Row		( ) Open Shelf

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

G  
 E Horizontal Barriers Provided:

# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 3

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Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
A1	118.75	5.6	9.0	na	16.8	0.1	168	7.0
A2	118.75	5.6	9.15	na	16.94	0.1	168	7.0
A3	118.75	5.6	9.58	na	17.33	0.1	168	7.0
A4	118.75		10.95	na				
A5	108.75		16.02	na				
AFTI	98.5		25.47	na				
57	98.5		25.58	na				
58	98.5		26.28	na				
59	98.5		26.32	na				
23	98.5		29.09	na				
24	98.5		29.67	na				
TOR	98.5		29.84	na				
BKFL	92.5		35.57	na				
BASE	91.5		47.02	na				
1000	91.5		47.69	na				
2000	91.5		48.96	na				
TEST	91.5		48.98	na				

The maximum velocity is 7.63 and it occurs in the pipe between nodes BASE and 1000

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 3

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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	*****
A1	16.80	1.682	E	4.95	10.500	9.000			K Factor = 5.60	
to		120.0		0.0	4.950	0.0				
A2	16.8	0.0094		0.0	15.450	0.146			Vel = 2.43	
A2	16.94	1.682		0.0	12.500	9.146			K Factor = 5.60	
to		120.0		0.0	0.0	0.0				
A3	33.74	0.0343		0.0	12.500	0.429			Vel = 4.87	
A3	17.32	1.682	E	4.95	3.750	9.575			K Factor = 5.60	
to		120.0	T	9.9	14.850	0.0				
A4	51.06	0.0740		0.0	18.600	1.376			Vel = 7.37	
A4	0.0	1.682		0.0	10.000	10.951				
to		120.0		0.0	0.0	4.331				
A5	51.06	0.0739		0.0	10.000	0.739			Vel = 7.37	
A5	0.0	1.682	Ball	3.094	25.000	16.021				
to		120.0	4E	19.799	42.692	4.439				
AFTI	51.06	0.0740	2T	19.799	67.692	5.006			Vel = 7.37	
AFTI	0.0	1.682		0.0	1.500	25.466				
to		120.0		0.0	0.0	0.0				
57	51.06	0.0740		0.0	1.500	0.111			Vel = 7.37	
57	0.0	1.682		0.0	9.500	25.577				
to		120.0		0.0	0.0	0.0				
58	51.06	0.0739		0.0	9.500	0.702			Vel = 7.37	
58	0.0	1.682		0.0	0.500	26.279				
to		120.0		0.0	0.0	0.0				
59	51.06	0.0740		0.0	0.500	0.037			Vel = 7.37	
59	0.0	1.682		0.0	37.500	26.316				
to		120.0		0.0	0.0	0.0				
23	51.06	0.0739		0.0	37.500	2.773			Vel = 7.37	
23	0.0	2.157	E	6.153	8.000	29.089				
to		120.0	T	12.307	18.460	0.0				
24	51.06	0.0220		0.0	26.460	0.583			Vel = 4.48	
24	0.0	2.157	E	6.153	1.500	29.672				
to		120.0		0.0	6.153	0.0				
TOR	51.06	0.0220		0.0	7.653	0.168			Vel = 4.48	
TOR	0.0	2.157	Fsp	0.0	6.000	29.840				
to		120.0		0.0	0.0	5.599			** Fixed Loss = 3	
BKFL	51.06	0.0220		0.0	6.000	0.132			Vel = 4.48	
BKFL	0.0	2.067		0.0	0.500	35.571				
to		120.0		0.0	0.0	11.433			** Fixed Loss = 11	
BASE	51.06	0.0280		0.0	0.500	0.014			Vel = 4.88	
BASE	0.0	1.653	E	2.544	10.000	47.018				
to		150.0		0.0	2.544	0.0				
1000	51.06	0.0533		0.0	12.544	0.668			Vel = 7.63	
1000	0.0	1.959	T	11.635	42.000	47.686				
to		150.0	G	1.164	12.799	0.0				
2000	51.06	0.0233		0.0	54.799	1.276			Vel = 5.44	

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 3

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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	*****
2000	0.0	6.16	0.0	150.000	48.962				
to		140.0	0.0	0.0	0.0				
TEST	51.06	0.0001	0.0	150.000	0.015		Vel = 0.55		
	0.0								
	51.06				48.977		K Factor = 7.30		



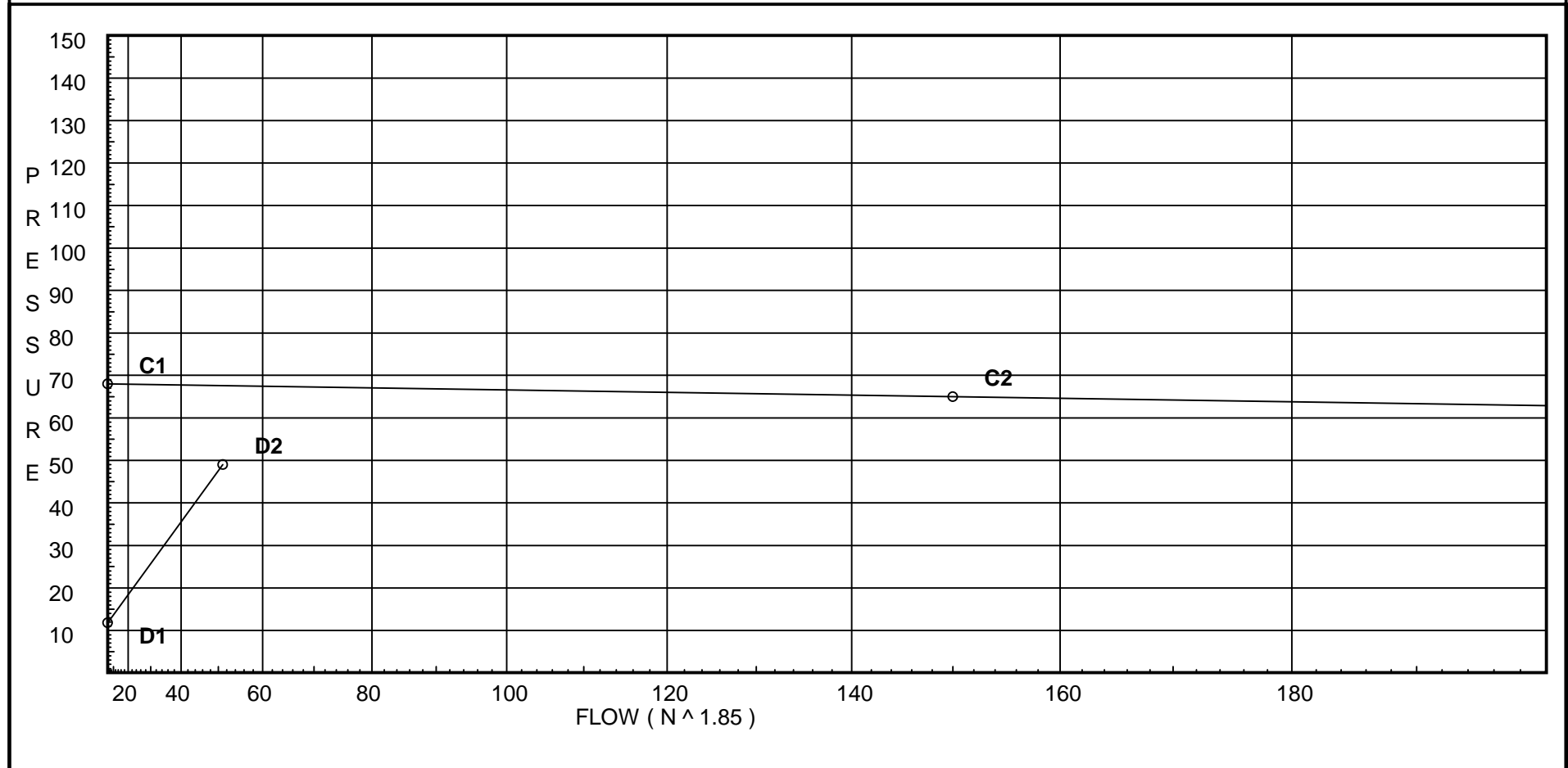
# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 3

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Date

City Water Supply:  
C1 - Static Pressure : 68  
C2 - Residual Pressure: 65  
C2 - Residual Flow : 150

Demand:  
D1 - Elevation : 11.802  
D2 - System Flow : 51.064  
D2 - System Pressure : 48.977  
Hose ( Demand ) : \_\_\_\_\_  
D3 - System Demand : 51.064  
Safety Margin : 18.614



Hydraulic Design Information Sheet

Name - 23 EMERSON STREET AREA 4 Date - 12-29-15  
 Location - 23 EMERSON STREET PORTLAND, MAINE  
 Building - EXISTING RENOVATED System No. - 1 WET  
 Contractor - SPRINKLER SYSTEMS INC. Contract No. - 15-157  
 Calculated By - CDS Drawing No. - 1-1 OF 1  
 Construction: (X) Combustible ( ) Non-Combustible Ceiling Height - VARIES  
 Occupancy - APARTMENTS

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

S Other NFPA 13R  
 T Specific Ruling

Made By Date

M	Area of Sprinkler Operation - 4 HEADS	System Type	Sprinkler/Nozzle
	Density - .15	(X) Wet	Make RELIABLE
D	Area Per Sprinkler - 130	( ) Dry	Model F1FR56
E	Elevation at Highest Outlet - 98.500	( ) 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.200 DEG.
G	Hose Allowance - Outside - 0		

N Note

Calculation Flow Required - 78.76 Press Required - 32.435 AT BASE  
 Summary C-Factor Used: 120 Overhead 150 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 11-25-15		Cap. -
T	Time of Test - AM	Rated Cap.-	Elev.-
E	Static Press - 68	@ Press -	
R	Residual Press - 65	Elev. -	Well
	Flow - 150		Proof Flow
S	Elevation - 91.5		

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	( ) Double Row	( ) Slave Pallet	( ) Solid Shelf ( ) Non
T	( ) Mult. Row		( ) Open Shelf

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

E Horizontal Barriers Provided:

# Pressure / Flow Summary - STANDARD

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 4

Page 18  
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
51	98.5	5.6	12.13	na	19.5	0.15	130	7.0
52	98.5	5.6	12.25	na	19.6	0.15	130	7.0
53	98.5		12.39	na				
54	98.5		12.93	na				
55	98.5		13.6	na				
56	98.5		14.6	na				
57	98.5	5.6	12.47	na	19.78	0.15	130	7.0
58	98.5		12.59	na				
59	98.5	5.6	12.6	na	19.88	0.15	130	7.0
23	98.5		14.34	na				
24	98.5		14.7	na				
TOR	98.5		15.08	na				
BKFL	92.5		20.97	na				
BASE	91.5		32.43	na				
1000	91.5		33.92	na				
2000	91.5		36.77	na				
TEST	91.5		36.8	na				

The maximum velocity is 11.77 and it occurs in the pipe between nodes BASE and 1000

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 4

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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	*****
51	19.50	1.682		0.0	10.250	12.125				
to		120.0		0.0	0.0	0.0				
52	19.5	0.0125		0.0	10.250	0.128				K Factor = 5.60
52	19.60	1.682		0.0	3.000	12.253				
to		120.0		0.0	0.0	0.0				
53	39.1	0.0450		0.0	3.000	0.135				Vel = 2.82
53	0.0	1.682		0.0	12.000	12.388				
to		120.0		0.0	0.0	0.0				
54	39.1	0.0452		0.0	12.000	0.542				K Factor = 5.60
54	0.0	1.682		0.0	14.750	12.930				
to		120.0		0.0	0.0	0.0				
55	39.1	0.0452		0.0	14.750	0.666				Vel = 5.65
55	0.0	1.682	T	9.9	12.250	13.596				
to		120.0		0.0	9.900	0.0				
56	39.1	0.0451		0.0	22.150	0.999				Vel = 5.65
56	0.0	2.157		0.0	8.000	14.595				
to		120.0		0.0	0.0	0.0				
24	39.1	0.0135		0.0	8.000	0.108				Vel = 3.43
	0.0									
	39.10					14.703				K Factor = 10.20
57	19.78	1.682		0.0	9.500	12.473				
to		120.0		0.0	0.0	0.0				
58	19.78	0.0127		0.0	9.500	0.121				K Factor = 5.60
58	0.0	1.682		0.0	0.500	12.594				
to		120.0		0.0	0.0	0.0				
59	19.78	0.0140		0.0	0.500	0.007				Vel = 2.86
59	19.88	1.682		0.0	37.500	12.601				
to		120.0		0.0	0.0	0.0				
23	39.66	0.0463		0.0	37.500	1.737				K Factor = 5.60
23	0.0	2.157	E	6.153	8.000	14.338				
to		120.0	T	12.307	18.460	0.0				
24	39.66	0.0138		0.0	26.460	0.365				Vel = 3.48
24	39.10	2.157	E	6.153	1.500	14.703				
to		120.0		0.0	6.153	0.0				
TOR	78.76	0.0490		0.0	7.653	0.375				Vel = 6.92
TOR	0.0	2.157	Fsp	0.0	6.000	15.078				
to		120.0		0.0	0.0	5.599				** Fixed Loss = 3
BKFL	78.76	0.0492		0.0	6.000	0.295				Vel = 6.92
BKFL	0.0	2.067		0.0	0.500	20.972				
to		120.0		0.0	0.0	11.433				** Fixed Loss = 11
BASE	78.76	0.0600		0.0	0.500	0.030				Vel = 7.53
BASE	0.0	1.653	E	2.544	10.000	32.435				
to		150.0		0.0	2.544	0.0				
1000	78.76	0.1187		0.0	12.544	1.489				Vel = 11.77
1000	0.0	1.959	T	11.635	42.000	33.924				
to		150.0	G	1.164	12.799	0.0				
2000	78.76	0.0519		0.0	54.799	2.845				Vel = 8.38

# Final Calculations - Hazen-Williams

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 4

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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	*****
2000	0.0	6.16	0.0	150.000	36.769				
to		140.0	0.0	0.0	0.0				
TEST	78.76	0.0002	0.0	150.000	0.033		Vel = 0.85		
	0.0								
	78.76				36.802		K Factor = 12.98		

# Water Supply Curve C

SPRINKLER SYSTEMS INC.  
23 Emerson Street Area 4

Page 21  
Date

City Water Supply:  
C1 - Static Pressure : 68  
C2 - Residual Pressure: 65  
C2 - Residual Flow : 150

Demand:  
D1 - Elevation : 3.032  
D2 - System Flow : 78.759  
D2 - System Pressure : 36.802  
Hose ( Demand ) : \_\_\_\_\_  
D3 - System Demand : 78.759  
Safety Margin : 30.287

