



. . . Fire Protection by Computer Design

Sprinkler Systems Inc.
2-4 Avon Street
P. O. Box 1285
Lewiston, Maine 04243
207-782-0104

Job Name : 72 BISHOP STREET
Building :
Location : 72 BISHOP STREET, PORTLAND, MAINE 04103
System : 1 OF 1
Contract : 16-049
Data File : 1604972BISHOPSTREETA1.WXF

Hydraulic Design Information Sheet

Name - 72 BISHOP STREET Date - 8-12-2016
 Location - 72 BISHOP STREET, PORTLAND, MAINE 04103
 Building - System No. - 1 OF 1
 Contractor - GREAT FALLS CONSTRUCTION Contract No. - 16-049
 Calculated By - SCOTT E. GARLAND Drawing No. - 1-3 OF 3
 Construction: (X) Combustible () Non-Combustible Ceiling Height - 8'-11"
 Occupancy - APARTMENTS - LIGHT HAZARD

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

Specific Ruling	Made By	Date
Area of Sprinkler Operation - 900	System Type	Sprinkler/Nozzle
Density - .10	(X) Wet	Make RELIABLE
Area Per Sprinkler - 148	() Dry	Model G5-56
Elevation at Highest Outlet - 131.417	() Deluge	Size 1/2 X 1/2
Hose Allowance - Inside -	() Preaction	K-Factor 5.6
Rack Sprinkler Allowance -	() Other	Temp.Rat.155 DEG
Hose Allowance - Outside - 100		

N Note DESIGN AREA #1 - 3RD FLOOR APARTMENTS

Calculation Flow Required - 147.577 Press Required - 52.991 AT BASE OF RISER
 Summary C-Factor Used: 150 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
Date of Test - 8-3-2016	Rated Cap.-	Cap. -
Time of Test -	@ Press -	Elev.-
Static Press - 70	Elev. -	Well
Residual Press - 66		Proof Flow
Flow - 1363		
Elevation - 100.0		

U Location - ON BISHOP STREET, IN FRONT OF THE BUILDING

P Source of Information - PORTLAND WATER DISTRICT

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

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

G Horizontal Barriers Provided:

Fittings Used Summary

Sprinkler Systems Inc.
72 BISHOP STREET

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Bvcb	B Fly Vic 705W	0	0	0	0	0	0	5	5	0	12	12	8	11	12	14	0	0	0	0	0
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																			

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.
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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
TYP1	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
TYP2	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
1	131.417		14.85	na				
2	131.417	K = K @ DROP	14.85	na	21.0			
3	131.417		14.94	na				
4	131.417		15.12	na				
5	131.417	K = K @ DROP	15.24	na	21.27			
6	131.417		15.64	na				
7	131.417		16.19	na				
8	131.417	K = K @ DROP	16.59	na	22.19			
A	131.417		18.72	na				
9	131.417	K = K @ DRP2	9.69	na	16.75			
10	131.417		9.73	na				
11	131.417		9.85	na				
12	128.667	5.6	7.0	na	14.82	0.1	14.817	7.0
13	128.667	K = K @ DRP1	7.39	na	14.82			
D	131.417		9.95	na				
14	131.417		10.07	na				
15	131.417	K = K @ DRP2	11.05	na	17.89			
16	131.417	K = K @ DRP2	12.25	na	18.83			
E	131.417		16.72	na				
B	131.417		21.73	na				
C	131.417		21.86	na				
F	131.417		23.5	na				
G	131.417		29.16	na				
H	119.667		41.69	na				
J	108.667		48.08	na				
TOR	108.667		48.38	na				
BKFL	105.0		52.99	na				
BASE	101.0		57.03	na				
HOSE	100.0		57.63	na	100.0			
TEST	100.0		57.67	na				

The maximum velocity is 17.47 and it occurs in the pipe between nodes 16 and E

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to DROP	14.82	1.101 150.0 0.0390	T	9.563 0.0 0.0	0.458 9.562 10.020	7.001 0.0 0.391		K Factor = 5.60 Vel = 4.99	
	0.0 14.82					7.392		K Factor = 5.45	
TYP1 to DRP1	14.82	1.101 150.0 0.0390	T	9.563 0.0 0.0	0.333 9.562 9.895	7.001 0.0 0.386		K Factor = 5.60 Vel = 4.99	
	0.0 14.82					7.387		K Factor = 5.45	
TYP2 to DRP2	14.82	1.101 150.0 0.0390	E T	3.825 9.563 0.0	1.417 13.387 14.804	7.001 0.0 0.578		K Factor = 5.60 Vel = 4.99	
	0.0 14.82					7.579		K Factor = 5.38	
1 to 2	0.0	1.101 150.0 0.0		0.0 0.0 0.0	3.750 0.0 3.750	14.852 0.0 0.0		Vel = 0	
2 to 3	21.00	1.394 150.0 0.0235		0.0 0.0 0.0	3.917 0.0 3.917	14.852 0.0 0.092		K Factor @ node DROP Vel = 4.41	
3 to 4	0.0	1.394 150.0 0.0236		0.0 0.0 0.0	7.458 0.0 7.458	14.944 0.0 0.176		Vel = 4.41	
4 to 5	0.0	1.394 150.0 0.0236		0.0 0.0 0.0	4.958 0.0 4.958	15.120 0.0 0.117		Vel = 4.41	
5 to 6	21.28	1.394 150.0 0.0863		0.0 0.0 0.0	4.625 0.0 4.625	15.237 0.0 0.399		K Factor @ node DROP Vel = 8.89	
6 to 7	0.0	1.394 150.0 0.0860		0.0 0.0 0.0	6.417 0.0 6.417	15.636 0.0 0.552		Vel = 8.89	
7 to 8	0.0	1.394 150.0 0.0861		0.0 0.0 0.0	4.625 0.0 4.625	16.188 0.0 0.398		Vel = 8.89	
8 to A	22.19	1.394 150.0 0.1880		0.0 0.0 0.0	11.375 0.0 11.375	16.586 0.0 2.139		K Factor @ node DROP Vel = 13.55	
A to B	64.47	0.1880	T	9.523 0.0 0.0	6.458 9.523 15.981	18.725 0.0 3.004		Vel = 13.55	
	0.0 64.47					21.729		K Factor = 13.83	
9 to 10	16.75	1.101 150.0 0.0490		0.0 0.0 0.0	1.000 0.0 1.000	9.686 0.0 0.049		K Factor @ node DRP2 Vel = 5.64	
10 to 11	0.0	1.394 150.0 0.0155		0.0 0.0 0.0	7.667 0.0 7.667	9.735 0.0 0.119		Vel = 3.52	

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
11 to D	0.0 16.75	1.394 150.0 0.0155		0.0 0.0 0.0	6.333 0.0 6.333	9.854 0.0 0.098			Vel = 3.52	
	0.0 16.75					9.952			K Factor = 5.31	
12 to 13	14.82 14.82	1.101 150.0 0.0390	T	9.563 0.0 0.0	0.333 9.562 9.895	7.001 0.0 0.386			K Factor = 5.60 Vel = 4.99	
13 to D	14.81 29.63	1.101 150.0 0.1408	2E T	7.65 9.563 0.0	9.458 17.212 26.670	7.387 -1.191 3.756			K Factor @ node DRP1 Vel = 9.98	
	0.0 29.63					9.952			K Factor = 9.39	
D to 14	46.38 46.38	1.394 150.0 0.1022		0.0 0.0 0.0	1.125 0.0 1.125	9.952 0.0 0.115			Vel = 9.75	
14 to 15	0.0 46.38	1.394 150.0 0.1023		0.0 0.0 0.0	9.583 0.0 9.583	10.067 0.0 0.980			Vel = 9.75	
15 to 16	17.89 64.27	1.394 150.0 0.1868		0.0 0.0 0.0	6.417 0.0 6.417	11.047 0.0 1.199			K Factor @ node DRP2 Vel = 13.51	
16 to E	18.84 83.11	1.394 150.0 0.3007		0.0 0.0 0.0	14.875 0.0 14.875	12.246 0.0 4.473			K Factor @ node DRP2 Vel = 17.47	
E to C	0.0 83.11	1.394 150.0 0.3007	T	9.523 0.0 0.0	7.583 9.523 17.106	16.719 0.0 5.144			Vel = 17.47	
	0.0 83.11					21.863			K Factor = 17.77	
B to C	64.47 64.47	2.635 120.0 0.0128		0.0 0.0 0.0	10.500 0.0 10.500	21.729 0.0 0.134			Vel = 3.79	
C to F	83.11 147.58	2.635 120.0 0.0592	T	16.474 0.0 0.0	11.167 16.474 27.641	21.863 0.0 1.636			Vel = 8.68	
F to G	0.0 147.58	2.635 120.0 0.0592	E T	8.237 16.474 0.0	70.917 24.711 95.628	23.499 0.0 5.658			Vel = 8.68	
G to H	0.0 147.58	2.635 120.0 0.0592	Bvcb 2E S T Fsp	6.864 16.474 19.22 16.474 0.0	16.125 59.032 75.157	29.157 8.089 4.448		** Fixed Loss = 3 Vel = 8.68		
H to J	0.0 147.58	2.635 120.0 0.0592	E	8.237 0.0 0.0	19.209 8.237 27.446	41.694 4.764 1.624			Vel = 8.68	
J to TOR	0.0 147.58	4.26 120.0 0.0057	2E	26.334 0.0 0.0	26.333 26.334 52.667	48.082 0.0 0.300			Vel = 3.32	

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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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	*****
TOR to BKFL	0.0 147.58	4.26 120.0 0.0057	Fsp 0.0 0.0	3.667 0.0 3.667	48.382 4.588 0.021			** Fixed Loss = 3 Vel = 3.32	
BKFL to BASE	0.0 147.58	4.26 120.0 0.0058	Zac 0.0 0.0	4.000 0.0 4.000	52.991 4.020 0.023			** Fixed Loss = 2.288 Vel = 3.32	
BASE to HOSE	0.0 147.58	6.16 140.0 0.0007	3E F G T 60.252 10.042 4.304 43.037	110.000 117.635 227.635	57.034 0.433 0.163			Vel = 1.59	
HOSE to TEST	100.00 247.58	7.98 140.0 0.0005	T 46.522 0.0 0.0	38.000 46.522 84.522	57.630 0.0 0.044			Qa = 100 Vel = 1.59	
	0.0 247.58							57.674 K Factor = 32.60	

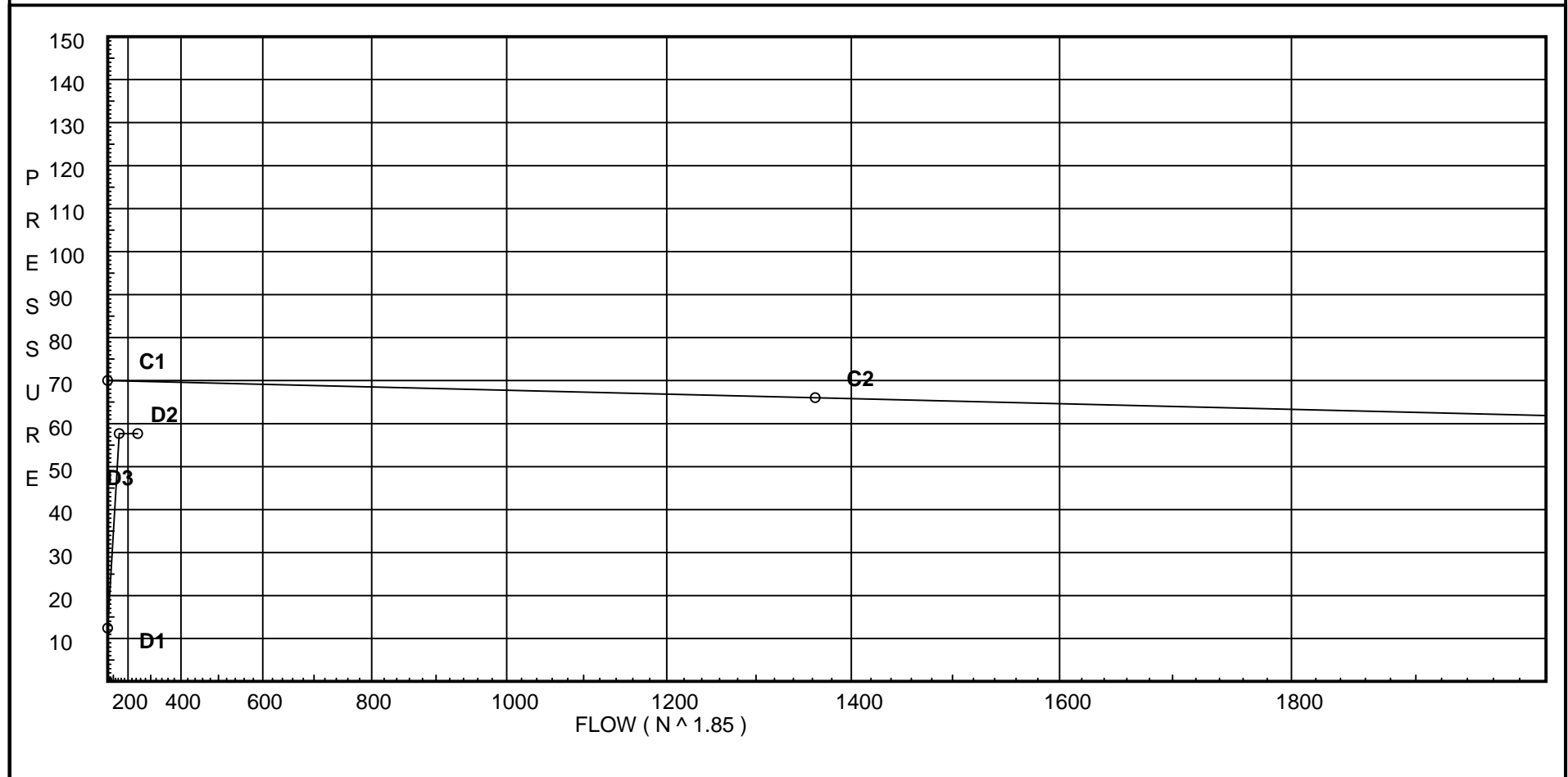
Water Supply Curve C

Sprinkler Systems Inc.
72 BISHOP STREET

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City Water Supply:
C1 - Static Pressure : 70
C2 - Residual Pressure: 66
C2 - Residual Flow : 1363

Demand:
D1 - Elevation : 12.416
D2 - System Flow : 147.577
D2 - System Pressure : 57.674
Hose (Demand) : 100
D3 - System Demand : 247.577
Safety Margin : 12.156





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2-4 Avon Street
P. O. Box 1285
Lewiston, Maine 04243
207-782-0104

Job Name : 72 BISHOP STREET
Building :
Location : 72 BISHOP STREET, PORTLAND, MAINE 04103
System : 1 OF 1
Contract : 16-049
Data File : 1604972BISHOPSTREET2.WXF

Hydraulic Design Information Sheet

Name - 72 BISHOP STREET Date - 8-12-2016
 Location - 72 BISHOP STREET, PORTLAND, MAINE 04103
 Building - System No. - 1 OF 1
 Contractor - GREAT FALLS CONSTRUCTION Contract No. - 16-049
 Calculated By - SCOTT E. GARLAND Drawing No. - 1-3 OF 3
 Construction: (X) Combustible () Non-Combustible Ceiling Height - VARIES
 Occupancy - CONCEALED SPACE SPRINKLERS - LIGHT HAZARD

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

Specific Ruling	Made By	Date
Area of Sprinkler Operation - 1000	System Type	Sprinkler/Nozzle
Density - .10	(X) Wet	Make RELIABLE
Area Per Sprinkler - 148	() Dry	Model KFR-CCS
Elevation at Highest Outlet - 131.417	() Deluge	Size 1/2 X 1/2
Hose Allowance - Inside -	() Preaction	K-Factor 5.6
Rack Sprinkler Allowance -	() Other	Temp.Rat.212 DEG
Hose Allowance - Outside - 100		

N Note DESIGN AREA #2 - 3RD FLOOR CONCEALED CEILING SPACE

Calculation Flow Required - 157.504 Press Required - 51.733 AT BASE OF RISER
 Summary C-Factor Used: 150 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
Date of Test - 8-3-2016	Rated Cap.-	Cap. -
Time of Test -	@ Press -	Elev.-
Static Press - 70	Elev. -	Well
Residual Press - 66		Proof Flow
Flow - 1363		
Elevation - 100.0		

U Location - ON BISHOP STREET, IN FRONT OF THE BUILDING

P Source of Information - PORTLAND WATER DISTRICT

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

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

G Horizontal Barriers Provided:

Fittings Used Summary

Sprinkler Systems Inc.
72 BISHOP STREET

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Bvcb	B Fly Vic 705W	0	0	0	0	0	0	5	5	0	12	12	8	11	12	14	0	0	0	0	0
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																			

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.
72 BISHOP STREET

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
1	131.417	K = K @ SPRG	7.43	na	14.82			
2	131.417		7.57	na				
3	131.417	K = K @ SPRG	7.62	na	15.01			
4	131.417	K = K @ SPRG	7.96	na	15.34			
5	131.417		8.44	na				
6	131.417	K = K @ SPRG	8.89	na	16.21			
7	131.417	K = K @ SPRG	9.99	na	17.19			
8	131.417		11.25	na				
A	131.417		14.33	na				
9	131.417		7.51	na				
10	131.417	K = K @ SPRG	7.51	na	14.91			
11	131.417	K = K @ SPRG	7.61	na	15.0			
12	128.667		9.09	na				
13	128.667		9.09	na				
D	131.417		7.9	na				
14	131.417	K = K @ SPRG	8.06	na	15.44			
15	131.417	K = K @ SPRG	9.0	na	16.31			
16	131.417	K = K @ SPRG	10.11	na	17.29			
E	131.417		14.18	na				
B	131.417		18.66	na				
C	131.417		18.85	na				
F	131.417		20.7	na				
G	131.417		27.08	na				
H	119.667		40.19	na				
J	108.667		46.78	na				
TOR	108.667		47.12	na				
BKFL	105.0		51.73	na				
BASE	101.0		55.84	na				
HOSE	100.0		56.46	na	100.0			
TEST	100.0		56.5	na				

The maximum velocity is 16.59 and it occurs in the pipe between nodes 16 and E

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to SPRG	14.82	1.101 150.0	T 9.563	1.333	7.001			K Factor = 5.60	
	14.82	0.0390	0.0	9.562	0.0			Vel = 4.99	
	0.0								
	14.82				7.426			K Factor = 5.44	
1 to 2	14.82	1.101 150.0	0.0	3.750	7.426			K Factor @ node SPRG	
	14.82	0.0392	0.0	0.0	0.0			Vel = 4.99	
2 to 3	0.0	1.394 150.0	0.0	3.917	7.573				
	14.82	0.0123	0.0	0.0	0.0			Vel = 3.12	
3 to 4	15.01	1.394 150.0	0.0	7.458	7.621			K Factor @ node SPRG	
	29.83	0.0452	0.0	0.0	0.0			Vel = 6.27	
4 to 5	15.34	1.394 150.0	0.0	4.958	7.958			K Factor @ node SPRG	
	45.17	0.0974	0.0	0.0	0.0			Vel = 9.50	
5 to 6	0.0	1.394 150.0	0.0	4.625	8.441				
	45.17	0.0973	0.0	0.0	0.0			Vel = 9.50	
6 to 7	16.21	1.394 150.0	0.0	6.417	8.891			K Factor @ node SPRG	
	61.38	0.1716	0.0	0.0	0.0			Vel = 12.90	
7 to 8	17.19	1.394 150.0	0.0	4.625	9.992			K Factor @ node SPRG	
	78.57	0.2711	0.0	0.0	0.0			Vel = 16.52	
8 to A	0.0	1.394 150.0	0.0	11.375	11.246				
	78.57	0.2709	0.0	0.0	0.0			Vel = 16.52	
A to B	0.0	1.394 150.0	T 9.523	6.458	14.328				
	78.57	0.2710	0.0	9.523	0.0			Vel = 16.52	
	0.0								
	78.57				18.659			K Factor = 18.19	
9 to 10	0.0	1.101 150.0	0.0	1.000	7.515				
	0.0	0.0	0.0	0.0	0.0			Vel = 0	
10 to 11	14.91	1.394 150.0	0.0	7.667	7.515			K Factor @ node SPRG	
	14.91	0.0125	0.0	0.0	0.0			Vel = 3.13	
11 to D	15.00	1.394 150.0	0.0	6.333	7.611			K Factor @ node SPRG	
	29.91	0.0453	0.0	0.0	0.0			Vel = 6.29	
	0.0								
	29.91				7.898			K Factor = 10.64	
12 to 13	0.0	1.101 150.0	T 9.563	0.333	9.089				
	0.0	0.0	0.0	9.562	0.0			Vel = 0	

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
13 to D	0.0	1.101 150.0	2E T	7.65 9.563	9.458 17.212	9.089 -1.191				
	0.0	0.0		0.0	26.670	0.0			Vel = 0	
	0.0					7.898			K Factor = 0	
D to 14	29.91	1.101 150.0		0.0	1.125	7.898				
	29.91	0.1440		0.0	1.125	0.0			Vel = 10.08	
14 to 15	15.43	1.394 150.0		0.0	9.583	8.060			K Factor @ node SPRG	
	45.34	0.0980		0.0	9.583	0.0			Vel = 9.53	
15 to 16	16.31	1.394 150.0		0.0	6.417	8.999			K Factor @ node SPRG	
	61.65	0.1730		0.0	6.417	0.0			Vel = 12.96	
16 to E	17.29	1.394 150.0		0.0	14.875	10.109			K Factor @ node SPRG	
	78.94	0.2734		0.0	14.875	0.0			Vel = 16.59	
E to C	0.0	1.394 150.0	T	9.523	7.583	14.176				
	78.94	0.2734		0.0	9.523	0.0			Vel = 16.59	
	0.0					18.853			K Factor = 18.18	
B to C	78.57	2.635 120.0		0.0	10.500	18.659				
	78.57	0.0185		0.0	10.500	0.0			Vel = 4.62	
C to F	78.93	2.635 120.0	T	16.474	11.167	18.853				
	157.5	0.0667		0.0	16.474	0.0			Vel = 9.27	
F to G	0.0	2.635 120.0	E T	8.237 16.474	70.917 24.711	20.698 0.0				
	157.5	0.0667		0.0	95.628	6.383			Vel = 9.27	
G to H	0.0	2.635 120.0	Bvcb 2E	6.864 16.474	16.125 59.032	27.081 8.089			** Fixed Loss = 3	
	157.5	0.0668	S T	19.22 16.474	75.157	5.017			Vel = 9.27	
			Fsp	0.0						
H to J	0.0	2.635 120.0	E	8.237	19.209	40.187				
	157.5	0.0667		0.0	8.237	4.764			Vel = 9.27	
J to TOR	0.0	4.26 120.0	2E	26.334	26.333	46.783				
	157.5	0.0064		0.0	26.334	0.0			Vel = 3.55	
TOR to BKFL	0.0	4.26 120.0	Fsp	0.0	3.667	47.121			** Fixed Loss = 3	
	157.5	0.0065		0.0	0.0	4.588			Vel = 3.55	
BKFL to BASE	0.0	4.26 120.0	Zac	0.0	4.000	51.733			** Fixed Loss = 2.348	
	157.5	0.0065		0.0	0.0	4.080			Vel = 3.55	
				0.0	4.000	0.026				

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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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	*****
BASE to HOSE	0.0 157.5	6.16 140.0 0.0008	3E F G T	60.252 10.042 4.304 43.037	110.000 117.635 227.635	55.839 0.433 0.183		Vel = 1.70	
HOSE to TEST	100.00 257.5	7.98 140.0 0.0006	T	46.522 0.0 0.0	38.000 46.522 84.522	56.455 0.0 0.048		Qa = 100 Vel = 1.65	
	0.0 257.50					56.503		K Factor = 34.26	

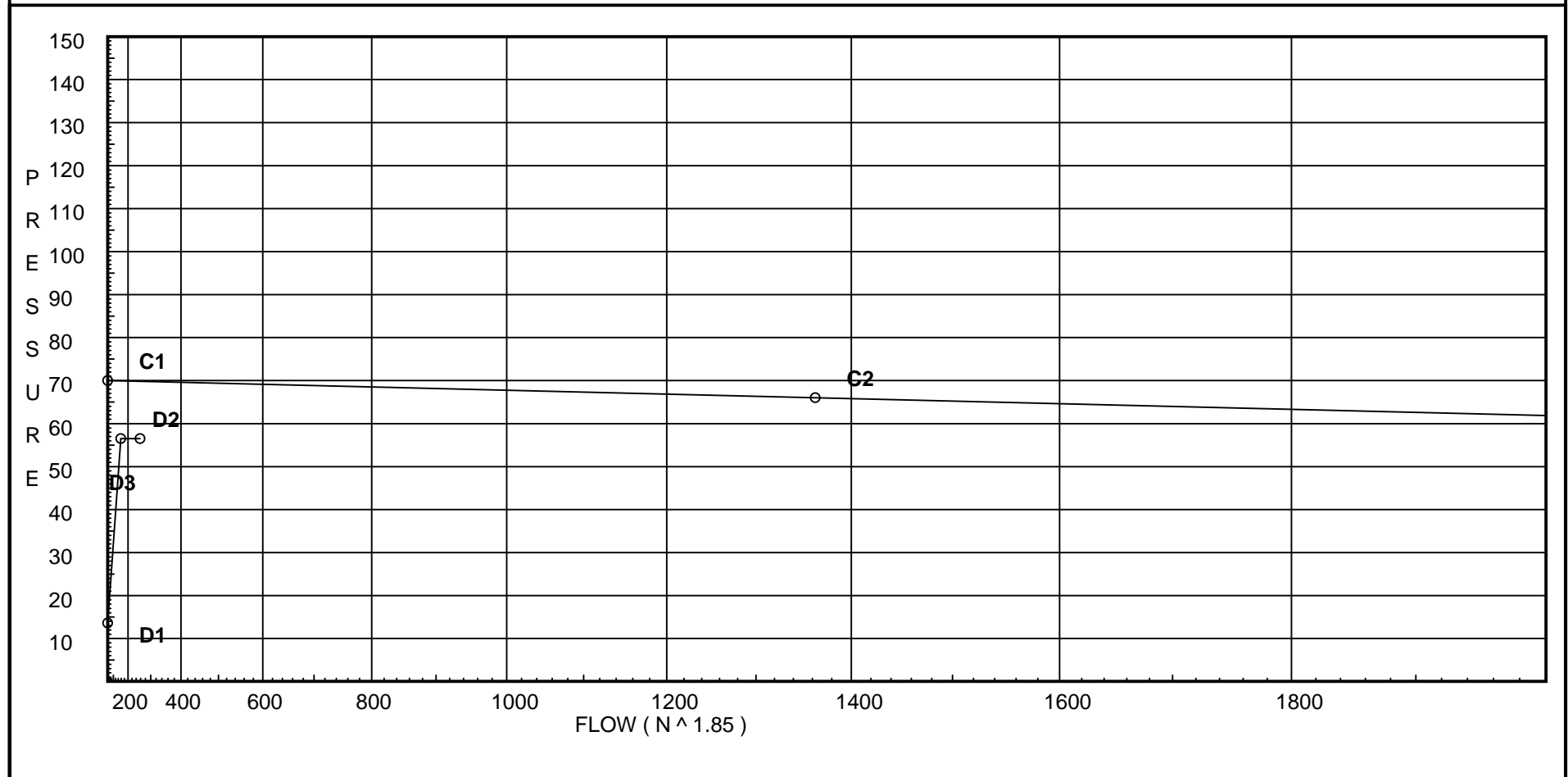
Water Supply Curve C

Sprinkler Systems Inc.
72 BISHOP STREET

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City Water Supply:
C1 - Static Pressure : 70
C2 - Residual Pressure: 66
C2 - Residual Flow : 1363

Demand:
D1 - Elevation : 13.607
D2 - System Flow : 157.504
D2 - System Pressure : 56.503
Hose (Demand) : 100
D3 - System Demand : 257.504
Safety Margin : 13.314





. . . Fire Protection by Computer Design

Sprinkler Systems Inc.
2-4 Avon Street
P. O. Box 1285
Lewiston, Maine 04243
207-782-0104

Job Name : 72 BISHOP STREET
Building :
Location : 72 BISHOP STREET, PORTLAND, MAINE 04103
System : 1 OF 1
Contract : 16-049
Data File : 1604972BISHOPSTREET.A3.WXF

Hydraulic Design Information Sheet

Name - 72 BISHOP STREET Date - 8-12-2016
 Location - 72 BISHOP STREET, PORTLAND, MAINE 04103
 Building - System No. - 1 OF 1
 Contractor - GREAT FALLS CONSTRUCTION Contract No. - 16-049
 Calculated By - SCOTT E. GARLAND Drawing No. - 1-3 OF 3
 Construction: (X) Combustible () Non-Combustible Ceiling Height - VARIES
 Occupancy - MAIN COMMON AREA - LIGHT HAZARD

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

M	Area of Sprinkler Operation - LG ROOM	System Type	Sprinkler/Nozzle
	Density - .10	(X) Wet	Make RELIABLE
D	Area Per Sprinkler - 148	() Dry	Model G5-56
E	Elevation at Highest Outlet - 122.375	() Deluge	Size 1/2 X 1/2
S	Hose Allowance - Inside -	() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance -	() Other	Temp.Rat.155 DEG
G	Hose Allowance - Outside - 100		

N Note DESIGN AREA #2 - 1ST FLOOR MAIN COMMON AREA

Calculation Flow Required - 340.6 Press Required - 55.048 AT BASE OF RISER
 Summary C-Factor Used: 150 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 8-3-2016		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 70	@ Press -	
R	Residual Press - 66	Elev. -	Well
S	Flow - 1363		Proof Flow
U	Elevation - 100.0		

P Location - ON BISHOP STREET, IN FRONT OF THE BUILDING

L Source of Information - PORTLAND WATER DISTRICT

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

G Horizontal Barriers Provided:
 E

Fittings Used Summary

Sprinkler Systems Inc.
72 BISHOP STREET

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Bvcb	B Fly Vic 705W	0	0	0	0	0	0	5	5	0	12	12	8	11	12	14	0	0	0	0	0
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																			

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.
72 BISHOP STREET

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Date 8-12-2016

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
TYP	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
TYP1	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
TYP2	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
TYP3	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
TYP4	0.0	5.6	7.0	na	14.82	0.1	148.17	7.0
20	120.417	K = K @ DROP	9.05	na	16.37			
21	122.375	K = K @ DROP	7.41	na	14.82			
M	120.417		9.12	na				
22	120.667	K = K @ DRP1	10.05	na	17.04			
N	120.417		10.17	na				
23	119.209	K = K @ DROP	10.48	na	17.62			
P	119.209		11.24	na				
24	117.625	K = K @ DROP	12.11	na	18.94			
Q	117.625		13.21	na				
25	117.042	K = K @ DROP	13.5	na	19.99			
S	117.042		14.19	na				
26	109.833	K = K @ DROP	21.82	na	25.42			
27	109.833	K = K @ DROP	20.7	na	24.76			
U	109.833		22.65	na				
28	109.833	K = K @ DROP	23.15	na	26.18			
V	109.833		25.8	na				
T	109.833		25.94	na				
29	109.833	K = K @ DROP	23.55	na	26.41			
30	109.833	K = K @ DROP	24.92	na	27.17			
W	0.0		73.86	na				
31	109.333	K = K @ DRP2	19.55	na	23.76			
32	109.333	K = K @ DRP3	21.1	na	24.62			
AA	109.333		21.28	na				
DD	109.333		23.07	na				
EE	109.333		25.9	na				
FF	109.333		28.01	na				
GG	109.333		28.3	na				
HH	109.333		28.33	na				
33	109.333	K = K @ DRP4	28.42	na	28.62			
Y	109.333		28.88	na				
34	109.333	K = K @ DRP4	28.97	na	28.89			
X	108.667		30.17	na				
J	108.667		48.95	na				
TOR	108.667		50.36	na				
BKFL	105.0		55.05	na				
BASE	101.0		60.33	na				
HOSE	100.0		61.53	na	100.0			
TEST	100.0		61.66	na				

The maximum velocity is 20.04 and it occurs in the pipe between nodes X and J

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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Date 8-12-2016

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to DROP	14.82 14.82	1.101 150.0 0.0390	T 9.563 0.0 0.0	1.000 9.562 10.562	7.001 0.0 0.412		K Factor = 5.60 Vel = 4.99		
	0.0 14.82				7.413		K Factor = 5.44		
TYP1 to DRP1	14.82 14.82	1.101 150.0 0.0391	E T 3.825 9.563 0.0	1.917 13.387 15.304	7.001 0.0 0.598		K Factor = 5.60 Vel = 4.99		
	0.0 14.82				7.599		K Factor = 5.38		
TYP2 to DRP2	14.82 14.82	1.101 150.0 0.0390	E T 3.825 9.563 0.0	2.042 13.387 15.429	7.001 0.0 0.602		K Factor = 5.60 Vel = 4.99		
	0.0 14.82				7.603		K Factor = 5.37		
TYP3 to DRP3	14.82 14.82	1.101 150.0 0.0391	E T 3.825 9.563 0.0	3.125 13.387 16.512	7.001 0.0 0.645		K Factor = 5.60 Vel = 4.99		
	0.0 14.82				7.646		K Factor = 5.36		
TYP4 to DRP4	14.82 14.82	1.101 150.0 0.0390	E T 3.825 9.563 0.0	2.417 13.387 15.804	7.001 0.0 0.617		K Factor = 5.60 Vel = 4.99		
	0.0 14.82				7.618		K Factor = 5.37		
20 to M	16.37 16.37	1.101 150.0 0.0466		0.0 1.417 0.0 1.417	9.050 0.0 0.066		K Factor @ node DROP Vel = 5.52		
	0.0 16.37				9.116		K Factor = 5.42		
21 to M	14.82 14.82	1.101 150.0 0.0391	E T 3.825 9.563 0.0	8.500 13.387 21.887	7.413 0.848 0.855		K Factor @ node DROP Vel = 4.99		
	0.0 14.82				9.116		K Factor = 4.91		
M to N	31.19 31.19	1.394 150.0 0.0491	T 9.523 0.0 0.0	12.042 9.523 21.565	9.116 0.0 1.058		Vel = 6.56		
	0.0 31.19				10.174		K Factor = 9.78		
22 to N	17.04 17.04	1.394 150.0 0.0160		0.0 1.000 0.0 1.000	10.050 0.108 0.016		K Factor @ node DRP1 Vel = 3.58		
	0.0 17.04				10.174		K Factor = 5.34		
N to P	48.23 48.23	1.394 150.0 0.1099		0.0 4.958 0.0 4.958	10.174 0.523 0.545		Vel = 10.14		

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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Date 8-12-2016

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftn'g's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 48.23					11.242			K Factor = 14.38	
23 to P	17.62	1.101 150.0	T	9.563	4.625 9.562	10.479 0.0			K Factor @ node DROP	
	17.62	0.0538		0.0	14.187	0.763			Vel = 5.94	
	0.0 17.62					11.242			K Factor = 5.26	
P to Q	65.84	1.394 150.0		0.0	6.542 0.0	11.242 0.686				
	65.84	0.1955		0.0	6.542	1.279			Vel = 13.84	
	0.0 65.84					13.207			K Factor = 18.12	
24 to Q	18.94	1.101 150.0	T	9.563	8.292 9.562	12.109 0.0			K Factor @ node DROP	
	18.94	0.0615		0.0	17.854	1.098			Vel = 6.38	
	0.0 18.94					13.207			K Factor = 5.21	
Q to S	84.78	1.394 150.0		0.0	2.333 0.0	13.207 0.252				
	84.78	0.3120		0.0	2.333	0.728			Vel = 17.82	
	0.0 84.78					14.187			K Factor = 22.51	
25 to S	19.99	1.101 150.0	T	9.563	0.583 9.562	13.498 0.0			K Factor @ node DROP	
	19.99	0.0679		0.0	10.145	0.689			Vel = 6.74	
	0.0 19.99					14.187			K Factor = 5.31	
S to T	104.77	1.598 150.0	2E T	11.656 11.656	13.042 23.312	14.187 3.122				
	104.77	0.2374		0.0	36.354	8.630			Vel = 16.76	
	0.0 104.77					25.939			K Factor = 20.57	
26 to U	25.42	1.101 150.0		0.0	7.750 0.0	21.824 0.0			K Factor @ node DROP	
	25.42	0.1061		0.0	7.750	0.822			Vel = 8.57	
	0.0 25.42					22.646			K Factor = 5.34	
27 to U	24.76	1.101 150.0	T	9.563	9.709 9.562	20.700 0.0			K Factor @ node DROP	
	24.76	0.1010		0.0	19.271	1.946			Vel = 8.34	
	0.0 24.76					22.646			K Factor = 5.20	
U to 28	50.18	1.394 150.0		0.0	4.250 0.0	22.646 0.0				
	50.18	0.1184		0.0	4.250	0.503			Vel = 10.55	
28 to V	26.18	1.394 150.0	T	9.523	0.792 9.523	23.149 0.0			K Factor @ node DROP	
	76.36	0.2571		0.0	10.315	2.652			Vel = 16.05	

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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Date 8-12-2016

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
V to T	0.0 76.36	2.635 120.0 0.0175		0.0 0.0 0.0	7.875 0.0 7.875	25.801 0.0 0.138			Vel = 4.49	
	0.0 76.36					25.939			K Factor = 14.99	
T to W	181.14 181.14	2.635 120.0 0.0863		0.0 0.0 0.0	4.125 0.0 4.125	25.939 47.569 0.356			Vel = 10.66	
	0.0 181.14					73.864			K Factor = 21.08	
29 to 30	26.41 26.41	1.101 150.0 0.1138		0.0 0.0 0.0	12.000 0.0 12.000	23.553 0.0 1.366			K Factor @ node DROP Vel = 8.90	
30 to W	27.17 53.58	1.394 150.0 0.1334	T	9.523 0.0 0.0	0.792 9.523 10.315	24.919 47.569 1.376			K Factor @ node DROP Vel = 11.26	
	0.0 53.58					73.864			K Factor = 6.23	
W to X	234.72 234.72	2.635 120.0 0.1396	2E	16.474 0.0 0.0	7.667 16.474 24.141	73.864 -47.064 3.371			Vel = 13.81	
	0.0 234.72					30.171			K Factor = 42.73	
31 to AA	23.76 23.76	1.101 150.0 0.0936	T	9.563 0.0 0.0	9.000 9.562 18.562	19.546 0.0 1.737			K Factor @ node DRP2 Vel = 8.01	
	0.0 23.76					21.283			K Factor = 5.15	
32 to AA	24.62 24.62	1.101 150.0 0.0999		0.0 0.0 0.0	1.792 0.0 1.792	21.104 0.0 0.179			K Factor @ node DRP3 Vel = 8.30	
	0.0 24.62					21.283			K Factor = 5.34	
AA to DD	48.37 48.37	1.394 150.0 0.1105		0.0 0.0 0.0	16.209 0.0 16.209	21.283 0.0 1.791			Vel = 10.17	
DD to EE	0.0 48.37	1.394 150.0 0.1105		0.0 0.0 0.0	25.625 0.0 25.625	23.074 0.0 2.831			Vel = 10.17	
EE to FF	0.0 48.37	1.394 150.0 0.1105	T	9.523 0.0 0.0	9.542 9.523 19.065	25.905 0.0 2.106			Vel = 10.17	
FF to GG	0.0 48.37	2.635 120.0 0.0075	T	16.474 0.0 0.0	21.709 16.474 38.183	28.011 0.0 0.287			Vel = 2.85	
GG to HH	0.0 48.37	2.635 120.0 0.0076		0.0 0.0 0.0	4.500 0.0 4.500	28.298 0.0 0.034			Vel = 2.85	

Final Calculations - Hazen-Williams

Sprinkler Systems Inc.
72 BISHOP STREET

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Date 8-12-2016

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftn'g's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
HH to Y	0.0 48.37	2.635 120.0 0.0075	T 16.474 0.0 0.0	57.000 16.474 73.474	28.332 0.0 0.552			Vel = 2.85	
	0.0 48.37				28.884			K Factor = 9.00	
33 to Y	28.62 28.62	1.101 150.0 0.1320	0.0 0.0 0.0	3.500 0.0 3.500	28.422 0.0 0.462			K Factor @ node DRP4 Vel = 9.64	
	0.0 28.62				28.884			K Factor = 5.33	
Y to 34	76.99 76.99	2.635 120.0 0.0178	0.0 0.0 0.0	4.667 0.0 4.667	28.884 0.0 0.083			Vel = 4.53	
34 to X	28.90 105.89	2.635 120.0 0.0320	E T 16.474 8.237 16.474 0.0	3.875 24.711 28.586	28.967 0.288 0.916			K Factor @ node DRP4 Vel = 6.23	
	0.0 105.89				30.171			K Factor = 19.28	
X to J	340.60 340.6	2.635 120.0 0.2780	Bvcb E S T Fsp 6.864 8.237 19.22 16.474 0.0	5.958 50.795 56.753	30.171 3.000 15.779			** Fixed Loss = 3 Vel = 20.04	
J to TOR	0.0 340.6	4.26 120.0 0.0268	2E 26.334 0.0 0.0	26.333 26.334 52.667	48.950 0.0 1.412			Vel = 7.67	
TOR to BKFL	0.0 340.6	4.26 120.0 0.0267	Fsp 0.0 0.0 0.0	3.667 0.0 3.667	50.362 4.588 0.098			** Fixed Loss = 3 Vel = 7.67	
BKFL to BASE	0.0 340.6	4.26 120.0 0.0270	Zac 0.0 0.0 0.0	4.000 0.0 4.000	55.048 5.178 0.108			** Fixed Loss = 3.446 Vel = 7.67	
BASE to HOSE	0.0 340.6	6.16 140.0 0.0033	3E F G T 60.252 10.042 4.304 43.037	110.000 117.635 227.635	60.334 0.433 0.761			Vel = 3.67	
HOSE to TEST	100.00 440.6	7.98 140.0 0.0015	T 46.522 0.0 0.0	38.000 46.522 84.522	61.528 0.0 0.129			Qa = 100 Vel = 2.83	
	0.0 440.60				61.657			K Factor = 56.11	

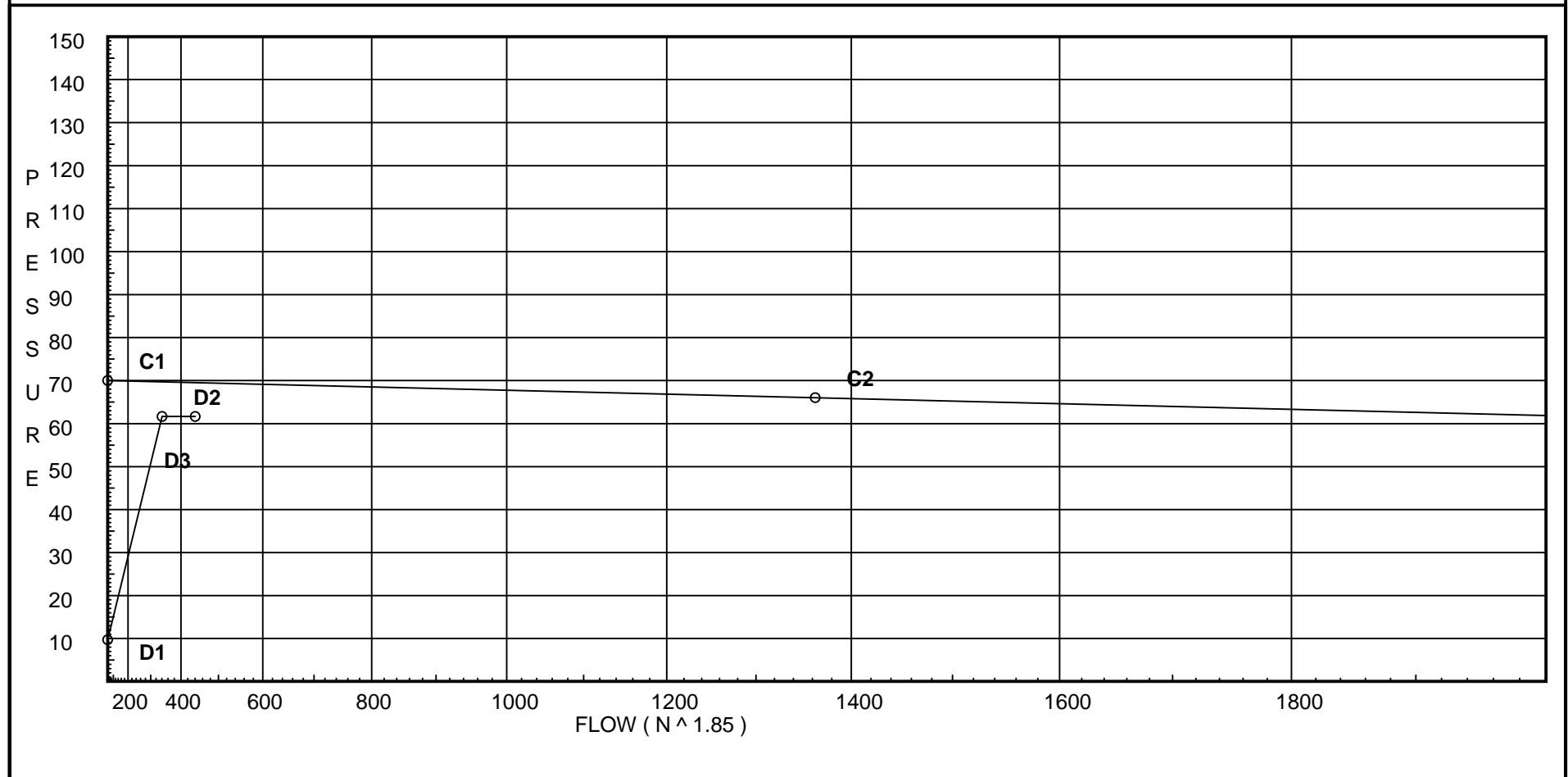
Water Supply Curve C

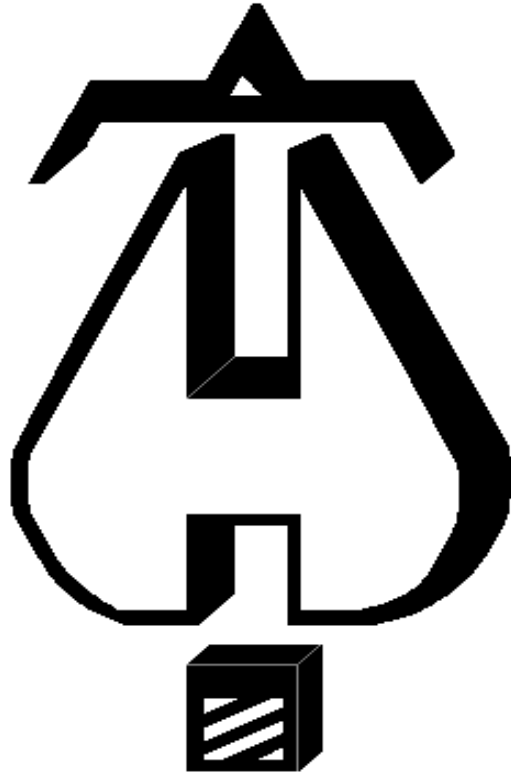
Sprinkler Systems Inc.
72 BISHOP STREET

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Date 8-12-2016

City Water Supply:
C1 - Static Pressure : 70
C2 - Residual Pressure: 66
C2 - Residual Flow : 1363

Demand:
D1 - Elevation : 9.691
D2 - System Flow : 340.6
D2 - System Pressure : 61.657
Hose (Demand) : 100
D3 - System Demand : 440.6
Safety Margin : 7.848





. . . Fire Protection by Computer Design

Sprinkler Systems Inc.
2-4 Avon Street
P. O. Box 1285
Lewiston, Maine 04243
207-782-0104

Job Name : 72 BISHOP STREET
Building :
Location : 72 BISHOP STREET, PORTLAND, MAINE 04103
System : 1 OF 1
Contract : 16-049
Data File : 1604972BISHOPSTREETA4.WXF

Hydraulic Design Information Sheet

Name - 72 BISHOP STREET Date - 8-12-2016
 Location - 72 BISHOP STREET, PORTLAND, MAINE 04103
 Building - System No. - 1 OF 1
 Contractor - GREAT FALLS CONSTRUCTION Contract No. - 16-049
 Calculated By - SCOTT E. GARLAND Drawing No. - 1-3 OF 3
 Construction: (X) Combustible () Non-Combustible Ceiling Height - 8'-7"
 Occupancy - MECHANICAL ROOM - 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

Area of Sprinkler Operation	ENTIRE	System Type	Sprinkler/Nozzle
Density	- .20	(X) Wet	Make RELIABLE
Area Per Sprinkler	- 92	() Dry	Model F1FR56
Elevation at Highest Outlet	- 109.333	() Deluge	Size 1/2 X 1/2
S Hose Allowance - Inside	-	() Preaction	K-Factor 5.6
I Rack Sprinkler Allowance	-	() Other	Temp.Rat.200 DEG
G Hose Allowance - Outside	- 250		

N Note DESIGN AREA #4 - 1ST FLOOR MECHANICAL ROOM

Calculation Flow Required - 74.393 Press Required - 26.505 AT BASE OF RISER
 Summary C-Factor Used: 150 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
A Date of Test - 8-3-2016		Cap. -
T Time of Test -	Rated Cap.-	Elev.-
E Static Press - 70	@ Press -	
R Residual Press - 66	Elev. -	Well
Flow - 1363		Proof Flow
S Elevation - 100.0		

U Location - ON BISHOP STREET, IN FRONT OF THE BUILDING

P Source of Information - PORTLAND WATER DISTRICT

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

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

G Horizontal Barriers Provided:

Fittings Used Summary

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Bvcb	B Fly Vic 705W	0	0	0	0	0	0	5	5	0	12	12	8	11	12	14	0	0	0	0	0
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																			

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.
TYP	0.0	5.6	10.8	na	18.4	0.2	92.004	10.797
TYP1	0.0	5.6	10.8	na	18.4	0.2	92.004	10.797
42	109.333	K = K @ DROP	11.68	na	18.4			
43	109.333	K = K @ DROP	12.13	na	18.75			
40	109.333	K = K @ DRP1	11.73	na	18.45			
41	109.333	K = K @ DRP1	12.18	na	18.8			
JJ	109.333		15.35	na				
KK	109.333		15.42	na				
HH	109.333		15.81	na				
Y	109.333		17.04	na				
34	109.333		17.12	na				
X	108.667		17.88	na				
J	108.667		21.83	na				
TOR	108.667		21.91	na				
BKFL	105.0		26.51	na				
BASE	101.0		31.28	na				
HOSE	100.0		31.76	na	250.0			
TEST	100.0		31.84	na				

The maximum velocity is 7.83 and it occurs in the pipe between nodes 41 and KK

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
TYP to DROP	18.40 18.4	1.101 150.0 0.0583	E T	3.825 9.563 0.0	1.792 13.387 15.179	10.797 0.0 0.885		K Factor = 5.60 Vel = 6.20	
	0.0 18.40					11.682		K Factor = 5.38	
TYP1 to DRP1	18.40 18.4	1.101 150.0 0.0583	E T	3.825 9.563 0.0	1.625 13.387 15.012	10.797 0.0 0.875		K Factor = 5.60 Vel = 6.20	
	0.0 18.40					11.672		K Factor = 5.39	
42 to 43	18.40 18.4	1.101 150.0 0.0583		0.0 0.0 0.0	7.667 0.0 7.667	11.682 0.0 0.447		K Factor @ node DROP Vel = 6.20	
43 to JJ	18.75 37.15	1.394 150.0 0.0678	T	9.523 0.0 0.0	38.000 9.523 47.523	12.129 0.0 3.223		K Factor @ node DROP Vel = 7.81	
	0.0 37.15					15.352		K Factor = 9.48	
40 to 41	18.45 18.45	1.101 150.0 0.0586		0.0 0.0 0.0	7.667 0.0 7.667	11.730 0.0 0.449		K Factor @ node DRP1 Vel = 6.22	
41 to KK	18.79 37.24	1.394 150.0 0.0681	T	9.523 0.0 0.0	38.000 9.523 47.523	12.179 0.0 3.237		K Factor @ node DRP1 Vel = 7.83	
	0.0 37.24					15.416		K Factor = 9.48	
JJ to KK	37.15 37.15	2.635 120.0 0.0046		0.0 0.0 0.0	13.917 0.0 13.917	15.352 0.0 0.064		Vel = 2.19	
KK to HH	37.24 74.39	2.635 120.0 0.0167	T	16.474 0.0 0.0	7.417 16.474 23.891	15.416 0.0 0.398		Vel = 4.38	
HH to Y	0.0 74.39	2.635 120.0 0.0167	T	16.474 0.0 0.0	57.000 16.474 73.474	15.814 0.0 1.224		Vel = 4.38	
Y to 34	0.0 74.39	2.635 120.0 0.0167		0.0 0.0 0.0	4.667 0.0 4.667	17.038 0.0 0.078		Vel = 4.38	
34 to X	0.0 74.39	2.635 120.0 0.0167	E T	8.237 16.474 0.0	3.875 24.711 28.586	17.116 0.288 0.477		Vel = 4.38	
X to J	0.0 74.39	2.635 120.0 0.0167	Bvcb E S T Fsp	6.864 8.237 19.22 16.474 0.0	5.958 50.795 56.753	17.881 3.000 0.946		** Fixed Loss = 3 Vel = 4.38	
J to TOR	0.0 74.39	4.26 120.0 0.0016	2E	26.334 0.0 0.0	26.333 26.334 52.667	21.827 0.0 0.084		Vel = 1.67	

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	*****
TOR	0.0	4.26	Fsp 0.0	3.667	21.911				
to BKFL	74.39	120.0 0.0016	0.0	0.0	4.588		** Fixed Loss = 3		
BKFL	0.0	4.26	Zac 0.0	4.000	26.505				
to BASE	74.39	120.0 0.0018	0.0	0.0	4.772		** Fixed Loss = 3.04		
BASE	0.0	6.16	3E 60.252	110.000	31.284				
to HOSE	74.39	140.0 0.0002	F 10.042 G 4.304 T 43.037	117.635 227.635	0.433 0.046		Vel = 0.80		
HOSE	250.00	7.98	T 46.522	38.000	31.763		Qa = 250		
to TEST	324.39	140.0 0.0009	0.0	46.522	0.0		Vel = 2.08		
	0.0 324.39								
					31.836		K Factor = 57.49		

Water Supply Curve C

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City Water Supply:
C1 - Static Pressure : 70
C2 - Residual Pressure: 66
C2 - Residual Flow : 1363

Demand:
D1 - Elevation : 4.042
D2 - System Flow : 74.393
D2 - System Pressure : 31.836
Hose (Demand) : 250
D3 - System Demand : 324.393
Safety Margin : 37.883

