

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

EASTERN FIRE PROTECTION  
170 KITTY HAWK AVE  
AUBURN, ME 04210  
207-784-1507

Job Name : 43 Cumberland Ave.  
Drawing : Wood Construction  
Location : Portland, ME  
Remote Area : Wet  
Contract : 4962  
Data File : 4th floor calc.WXF

HYDRAULIC DESIGN INFORMATION SHEET

Name - 43 Cumberland Ave. Date - 12/21/12  
Location - Portland, ME  
Building - Wood Construction System No. - Wet  
Contractor - EFP Contract No. - 4962  
Calculated By - Robert Peters Drawing No. - 2 of 2  
Construction: (x) Combustible ( ) Non-Combustible Ceiling Height varies  
OCCUPANCY - residential

S Type of Calculation: ( )NFPA 13 Residential (x)NFPA 13R ( )NFPA 13D  
Y Number of Sprinklers Flowing: ( )1 ( )2 (x)4 ( )  
S ( )Other  
T ( )Specific Ruling Made by Date  
E  
M Listed Flow at Start Point - 13 Gpm System Type  
Listed Pres. at Start Point - 7 Psi (x) Wet ( ) Dry  
D MAXIMUM LISTED SPACING 16 x 16 ( ) Deluge ( ) PreAction  
E Domestic Flow Added - Gpm Sprinkler or Nozzle  
S Additional Flow Added - Gpm Make Tyco Model LF-II  
I Elevation at Highest Outlet - 146.75Feet Size 1/2 K-Factor 4.9  
G Note: Temperature Rating 155  
N

Calculation Gpm Required 57.35 Psi Required 54.52 At Test  
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:  
A Date of Test - 7/16/12 Rated Cap. Cap.  
T Time of Test - 12:30 pm @ Psi Elev.  
E Static (Psi) - 60 Elev.  
R Residual (Psi) - 55 Other Well  
Flow (Gpm) - 871 Proof Flow Gpm  
S Elevation - 82

P Location: Sheridan St.

P  
L Source of Information: Portland Water District  
Y

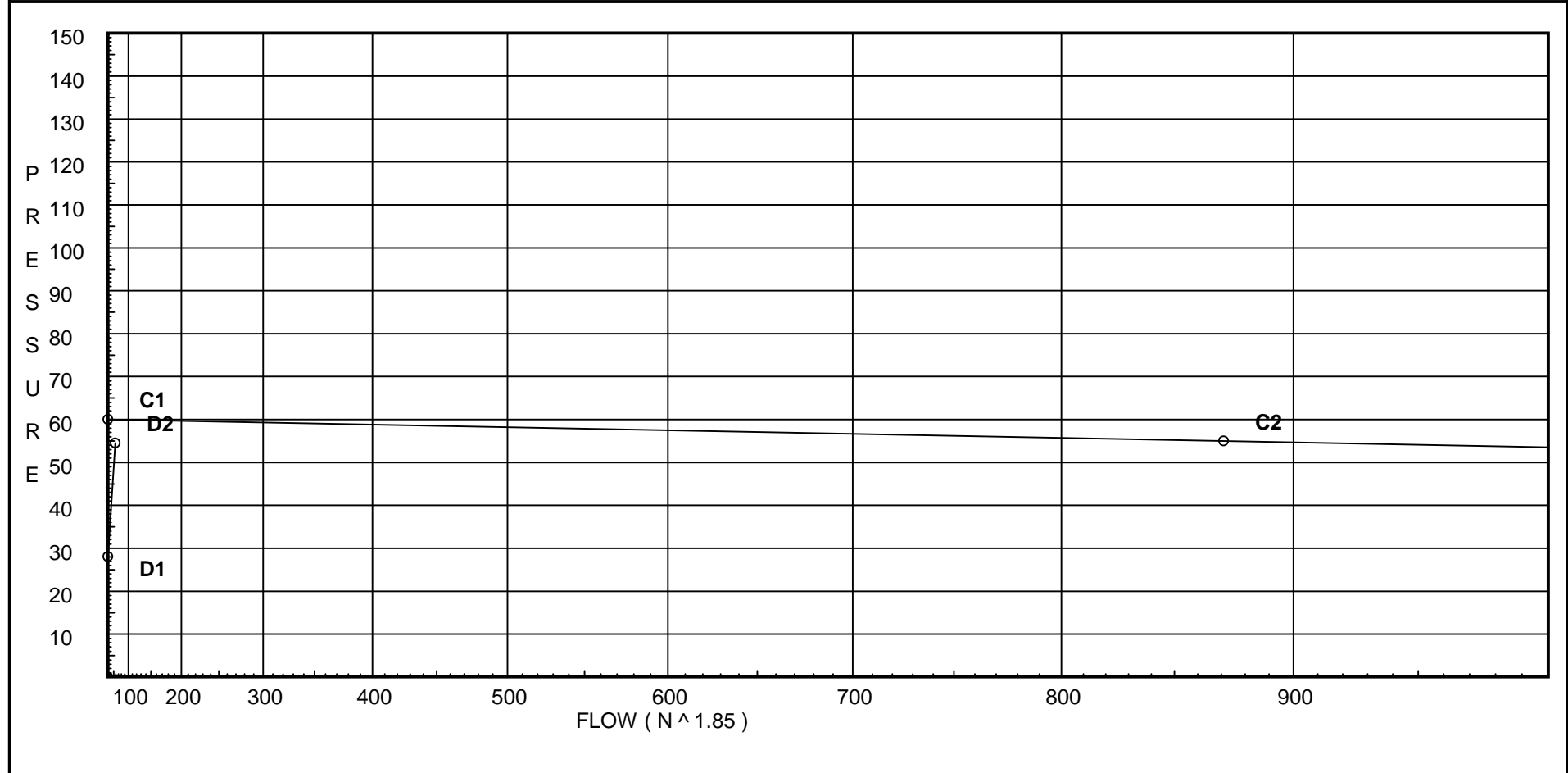
# Water Supply Curve (C)

EASTERN FIRE PROTECTION  
43 Cumberland Ave.

Page 2  
Date 12/21/12

City Water Supply:  
C1 - Static Pressure : 60  
C2 - Residual Pressure: 55  
C2 - Residual Flow : 871

Demand:  
D1 - Elevation : 28.043  
D2 - System Flow : 57.352  
D2 - System Pressure : 54.523  
Hose ( Demand ) : \_\_\_\_\_  
D3 - System Demand : 57.352  
Safety Margin : 5.444



# Fittings Used Summary

EASTERN FIRE PROTECTION  
43 Cumberland Ave.

Page 3  
Date 12/21/12

## Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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	1	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
Zaa	Ames 2000B	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.

**SUPPLY ANALYSIS**

<b>Node at Source</b>	<b>Static Pressure</b>	<b>Residual Pressure</b>	<b>Flow</b>	<b>Available Pressure</b>	<b>Total Demand</b>	<b>Required Pressure</b>
TEST	60.0	55	871.0	59.967	57.35	54.523

**NODE ANALYSIS**

<b>Node Tag</b>	<b>Elevation</b>	<b>Node Type</b>	<b>Pressure at Node</b>	<b>Discharge at Node</b>	<b>Notes</b>
LIN	0.0	4.9	7.0	12.96	
4TH	0.0		70.7		
1	146.75	4.85	7.49	13.27	K=K @ DRP
3	146.75	4.85	7.23	13.04	K=K @ DRP
4	146.75	4.85	7.15	12.96	K=K @ DRP
A	146.75		7.63		
B	146.75		7.71		
C	146.75		8.0		
F	146.75		9.33		
2	146.75	4.85	13.9	18.08	K=K @ DRP
D1	146.75		14.29		
D	146.75		14.47		
E	146.75		14.82		
3RD	0.0		70.7		
G	136.75		14.77		
H	136.75		16.85		
P	136.75		19.41		
Q	136.75		20.28		
2ND	0.0		70.7		
I	127.083		21.91		
J	127.083		23.5		
R	127.083		24.62		
S	127.083		25.02		
1ST	0.0		70.7		
K	117.083		28.38		
T	117.083		29.49		
GRND	0.0		70.7		
L	107.083		32.93		
M	107.083		33.29		
N	107.083		34.07		
O	106.753		34.44		
U	107.083		33.87		
V	106.753		34.37		
TOR	106.753		34.64		
BFP	103.0		39.37		
BASE	100.0		46.67		
TEST	82.0		54.52		

# Final Calculations - Hazen-Williams - 2007

EASTERN FIRE PROTECTION  
43 Cumberland Ave.

Page 5  
Date 12/21/12

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	*****
LIN to DRP	0 0	4.90	12.96 12.96	1 1.101	1E	3.825 0.0 0.0	1.000 3.825 4.825	150 0.0305	7.000 0.0 0.147			Vel = 4.37
DRP			0.0 12.96						7.147		K Factor = 4.85	
1 to C	146.750 146.750	4.85	13.27 13.27	1 1.101	1T	9.563 0.0 0.0	6.417 9.562 15.979	150 0.0319	7.490 0.0 0.509		K = K @ DRP	Vel = 4.47
C			0.0 13.27						7.999		K Factor = 4.69	
3 to B	146.750 146.750	4.85	13.04 13.04	1 1.101	1T	9.563 0.0 0.0	6.083 9.562 15.645	150 0.0309	7.227 0.0 0.483		K = K @ DRP	Vel = 4.39
B			0.0 13.04						7.710		K Factor = 4.70	
4 to A	146.750 146.750	4.85	12.96 12.96	1 1.101	1T	9.563 0.0 0.0	6.417 9.562 15.979	150 0.0305	7.147 0.0 0.488		K = K @ DRP	Vel = 4.37
A to B	146.750 146.750		0.0 12.96	1.25 1.394		0.0 0.0 0.0	7.750 0.0 7.750	150 0.0097	7.635 0.0 0.075			Vel = 2.72
B to C	146.750 146.750		13.04 26.0	1.25 1.394		0.0 0.0 0.0	8.250 0.0 8.250	150 0.0350	7.710 0.0 0.289			Vel = 5.47
C to F	146.750 146.750		13.27 39.27	1.25 1.394	1T	9.523 0.0 0.0	8.250 9.523 17.773	150 0.0751	7.999 0.0 1.335			Vel = 8.26
F to G	146.750 136.750		0.0 39.27	1.25 1.394	1E	4.762 0.0 0.0	10.000 4.761 14.761	150 0.0751	9.334 4.331 1.109			Vel = 8.26
G			0.0 39.27						14.774		K Factor = 10.22	
2 to D1	146.750 146.750	4.85	18.08 18.08	1 1.101	1E	3.825 0.0 0.0	3.000 3.825 6.825	150 0.0566	13.900 0.0 0.386		K = K @ DRP	Vel = 6.09
D1 to D	146.750 146.750		0.0 18.08	1.25 1.394	1E	4.762 0.0 0.0	5.750 4.761 10.511	150 0.0179	14.286 0.0 0.188			Vel = 3.80
D to E	146.750 146.750		0.0 18.08	1.25 1.394	1E 1T	4.762 9.523 0.0	5.000 14.284 19.284	150 0.0178	14.474 0.0 0.344			Vel = 3.80
E to P	146.750 136.75		0.0 18.08	1.25 1.394	1E	4.762 0.0 0.0	10.000 4.761 14.761	150 0.0180	14.818 4.331 0.265			Vel = 3.80
P			0.0 18.08						19.414		K Factor = 4.10	
G to H	136.750 136.75		39.27 39.27	1.5 1.598	3T 1E	34.968 5.828 0.0	12.833 40.796 53.629	150 0.0386	14.774 0.0 2.072			Vel = 6.28

# Final Calculations - Hazen-Williams - 2007

EASTERN FIRE PROTECTION  
43 Cumberland Ave.

Page 6  
Date 12/21/12

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	*****
H to I	136.75 127.083		0.0 39.27	1.5 1.598	1T	11.656 0.0	10.917 11.656	150	16.846 4.187			
			0.0							Vel =	6.28	
I			39.27						21.905	K Factor =	8.39	
P to Q	136.75 136.750		18.08	1.25 1.394	1E 3T	4.762 28.57	15.167 33.330	150	19.414 0.0			
			18.08			0.0	48.497	0.0179	0.867	Vel =	3.80	
Q to R	136.750 127.083		0.0	1.5 1.598	1E	5.828 0.0	10.917 5.828	150	20.281 4.187			
			18.08			0.0	16.745	0.0092	0.154	Vel =	2.89	
R			0.0									
			18.08						24.622	K Factor =	3.64	
I to J	127.083 127.083		39.27	1.5 1.61	1E 1T	4.0 8.0	16.417 12.000	120	21.905 0.0			
			39.27			0.0	28.417	0.0563	1.600	Vel =	6.19	
J to K	127.083 117.083		0.0	1.5 1.61		0.0 0.0	9.750 0.0	120	23.505 4.331			
			39.27			0.0	9.750	0.0563	0.549	Vel =	6.19	
K			0.0									
			39.27						28.385	K Factor =	7.37	
R to S	127.083 127.083		18.08	1.5 1.61	4E	16.0 0.0	14.000 16.000	120	24.622 0.0			
			18.08			0.0	30.000	0.0134	0.402	Vel =	2.85	
S to T	127.083 117.083		0.0	1.5 1.61		0.0 0.0	9.750 0.0	120	25.024 4.331			
			18.08			0.0	9.750	0.0134	0.131	Vel =	2.85	
T			0.0									
			18.08						29.486	K Factor =	3.33	
K to L	117.083 107.083		39.27	2 2.157	1E	6.153 0.0	10.000 6.153	120	28.385 4.331			
			39.27			0.0	16.153	0.0136	0.219	Vel =	3.45	
L			0.0									
			39.27						32.935	K Factor =	6.84	
T to U	117.083 107.083		18.08	2 2.157	1E	6.153 0.0	10.000 6.153	120	29.486 4.331			
			18.08			0.0	16.153	0.0032	0.052	Vel =	1.59	
U			0.0									
			18.08						33.869	K Factor =	3.11	
L to M	107.083 107.083		39.27	2 2.157	1E 1T	6.153 12.307	7.500 18.460	120	32.935 0.0			
			39.27			0.0	25.960	0.0135	0.351	Vel =	3.45	
M to N	107.083 107.083		0.0	2 2.157	2E 1T	12.307 12.307	33.000 24.614	120	33.286 0.0			
			39.27			0.0	57.614	0.0136	0.781	Vel =	3.45	
N to O	107.083 106.753		0.0	2	1T	12.307 0.0	5.000 12.307	120	34.067 0.143			
			39.27			0.0	17.307	0.0135	0.234	Vel =	3.45	

# Final Calculations - Hazen-Williams - 2007

EASTERN FIRE PROTECTION  
43 Cumberland Ave.

Page 7  
Date 12/21/12

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	*****
O to TOR	106.753 106.753		18.08 57.35	2 2.157	1E	6.153 0.0	1.000 6.153	120 0.0274	34.444 0.0 0.196			Vel = 5.04
TOR			0.0 57.35						34.640		K Factor = 9.74	
U to V	107.083 106.753		18.08 18.08	2 2.157	3T 4E	36.92 24.613	49.000 61.533	120 0.0032	33.869 0.143 0.356			Vel = 1.59
V to O	106.753 106.753		0.0 18.08	2 2.157	1E 1T	6.153 12.307	5.083 18.460	120 0.0032	34.368 0.0 0.076			Vel = 1.59
O			0.0 18.08						34.444		K Factor = 3.08	
TOR to BFP	106.753 103		57.35 57.35	2 2.067	1Fsp	0.0 0.0	3.000 0.0	120 0.0337	34.640 4.625 0.101			* Fixed loss = 3 Vel = 5.48
BFP to BASE	103 100		0.0 57.35	2 2.067	1Zaa 1E	0.0 5.0	3.167 5.000	120 0.0335	39.366 7.027 0.274			* Fixed loss = 5.728 Vel = 5.48
BASE to TEST	100 82		0.0 57.35	4 4.1	1E 1T 1G	14.534 29.067 2.907	20.000 46.508 66.508	140 0.0009	46.667 7.796 0.060			Vel = 1.39
TEST			0.0 57.35						54.523		K Factor = 7.77	