

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

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

Job Name : 24 PREBLE ST.  
Drawing : 2 OF 2  
Location : 3RD FLOOR OFFICE  
Remote Area : 3  
Contract : 1-05637-SP-17  
Data File : 3RD. FLOOR CALC..WXF

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**HYDRAULIC CALCULATIONS**  
*for*

**Project name:** 24 PREBLE ST.  
**Location:** 3RD FLOOR OFFICE  
**Drawing no:** 2 OF 2  
**Date:** 8/11/2017

**Design**

**Remote area number:** 3  
**Remote area location:** 3RD FLOOR OFFICE  
**Occupancy classification:** LIGHT HAZARD  
**Density:** .1 - Gpm/SqFt  
**Area of application:** 957 - SqFt  
**Coverage per sprinkler:** 225 - SqFt  
**Type of sprinklers calculated:** RELIABLE F1FR56 200\* K=5.6  
**No. of sprinklers calculated:** 11  
**In-rack demand:** - GPM  
**Hose streams:** 100 - GPM  
**Total water required (including hose streams):** 374.305 - GPM @ 66.522 - Psi  
**Type of system:** WET  
**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 7/6/16  
**Location:** CUMBERLAND AVE. PORTLAND, ME.  
**Source:** PORTLAND WATER DISTRICT

**Name of contractor:** EASTERN FIRE PROTECTION  
**Address:** 170 KITTY HAWK AVE / / AUBURN, ME 04210  
**Phone number:** 207-784-1507  
**Name of designer:** EWM  
**Authority having jurisdiction:** MAINE STATE FIRE MARSHAL  
**Notes: (Include peaking information or gridded systems here.)** REMOTE AREA REDUCED PER NFPA 13 (2016) SEC. 11.2.3.2.3.1

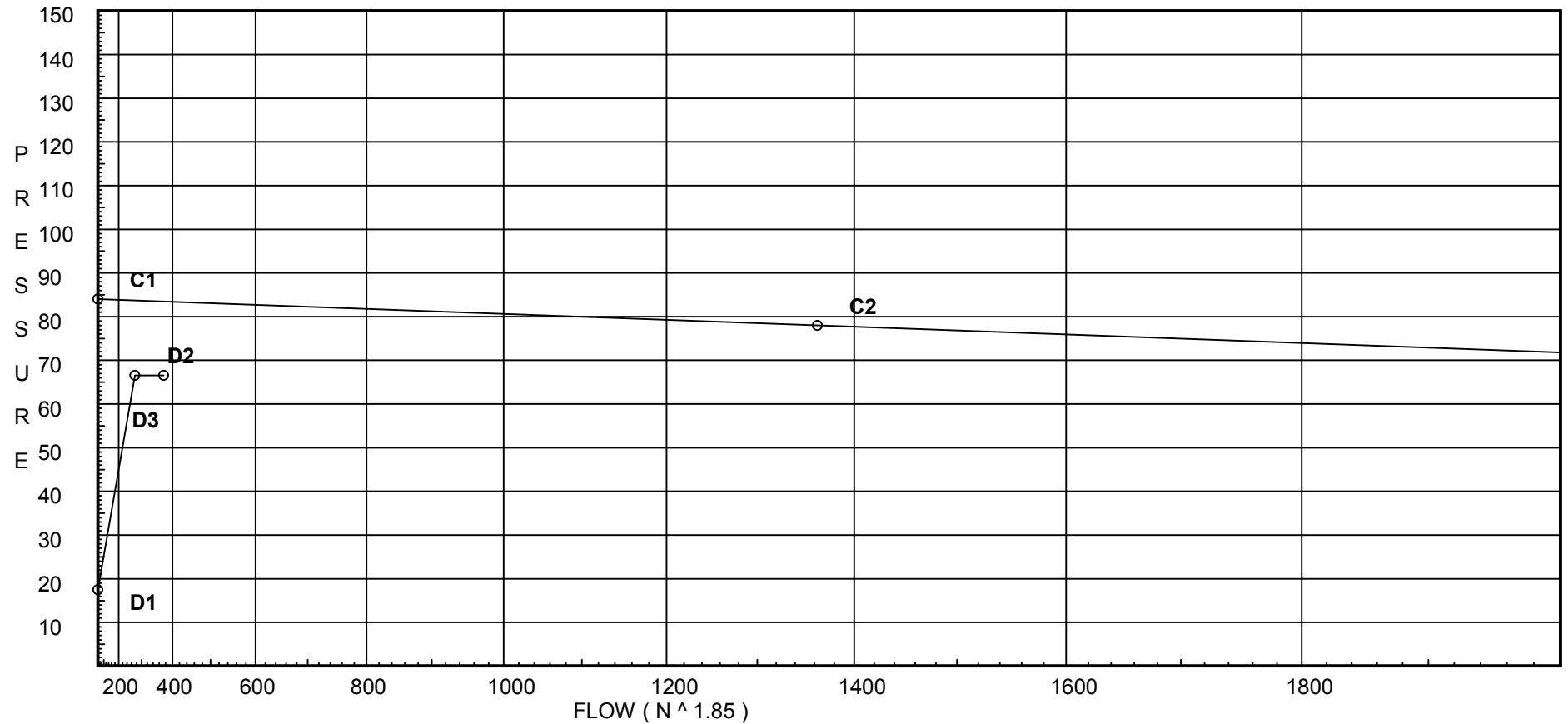
# Water Supply Curve C

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City Water Supply:  
C1 - Static Pressure : 84  
C2 - Residual Pressure: 78  
C2 - Residual Flow : 1363

Demand:  
D1 - Elevation : 17.506  
D2 - System Flow : 274.305  
D2 - System Pressure : 66.522  
Hose ( Demand ) : 100  
D3 - System Demand : 374.305  
Safety Margin : 16.928



# Fittings Used Summary

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## 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
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	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
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
L	NFPA 13 Long Turn Elbow	0.5	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
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
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X	90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0

## 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	84.0	78	1363.0	83.451	374.3	66.522

**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>
HEAD	0.0	5.6	16.14	22.5	
100	143.92	5.6	25.64	28.35	
100A	143.92		28.58		
102	143.25	5.24	18.54	22.58	K=K @ LIN1
103	143.92		19.47		
104	143.25	5.24	19.67	23.26	K=K @ LIN1
105	143.92		20.74		
101	143.92		28.59		
106	143.25	5.24	26.91	27.2	K=K @ LIN1
107	143.92		28.6		
108	143.25	5.24	18.41	22.5	K=K @ LIN1
109	143.92		19.41		
110	143.25	5.24	19.19	22.98	K=K @ LIN1
111	143.92		20.25		
112	143.25	5.24	22.91	25.1	K=K @ LIN1
113	143.92		24.51		
114	143.92		28.66		
115	143.25	5.24	26.97	27.23	K=K @ LIN1
116	143.92		28.81		
117	143.25	5.24	20.05	23.48	K=K @ LIN1
118	143.92		20.55		
119	143.25	5.24	20.9	23.97	K=K @ LIN1
120	143.92		22.01		
121	143.92		28.93		
122	143.92	5.6	24.36	27.64	
123	143.92		28.85		
124	143.92		29.73		
125	143.92		34.27		
126	141.42		37.14		
35	141.42		40.93		
36	129.42		46.73		
37	116.0		53.13		
38	106.5		57.56		
39	106.5		58.59		
TOR	105.83		60.1		
BASE	102.83		66.46		
TEST	102.83		66.52	100.0	

# Final Calculations - Hazen-Williams - 2007

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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	*****
HEAD to LIN1	0 0	5.60	22.50 22.5	1 1.049	E	2.0 0.0 0.0	12.000 2.000 14.000	120 0.1619	16.143 0.0 2.266			Vel = 8.35
LIN1			0.0 22.50						18.409		K Factor = 5.24	
100 to 100A	143.920 143.920	5.60	28.35 28.35	1 1.049	T	5.0 0.0 0.0	6.875 5.000 11.875	120 0.2483	25.637 0.0 2.948			Vel = 10.52
100A to 101	143.920 143.920		0.0 28.35	3 3.26		0.0 0.0 0.0	2.960 0.0 2.960	120 0.0010	28.585 0.0 0.003			Vel = 1.09
101			0.0 28.35						28.588		K Factor = 5.30	
102 to 103	143.250 143.920	5.24	22.58 22.58	1 1.049	E T	2.0 5.0 0.0	0.500 7.000 7.500	120 0.1628	18.541 -0.290 1.221		K = K @ LIN1	Vel = 8.38
103 to 105	143.920 143.920		0.0 22.58	1 1.049		0.0 0.0 0.0	7.790 0.0 7.790	120 0.1629	19.472 0.0 1.269			Vel = 8.38
105			0.0 22.58						20.741		K Factor = 4.96	
104 to 105	143.250 143.920	5.24	23.26 23.26	1 1.049	E T	2.0 5.0 0.0	0.920 7.000 7.920	120 0.1720	19.669 -0.290 1.362		K = K @ LIN1	Vel = 8.63
105 to 101	143.920 143.920		22.58 45.84	1 1.049	T	5.0 0.0 0.0	8.000 5.000 13.000	120 0.6036	20.741 0.0 7.847			Vel = 17.02
101 to 107	143.920 143.920		28.35 74.19	3 3.26		0.0 0.0 0.0	2.330 0.0 2.330	120 0.0056	28.588 0.0 0.013			Vel = 2.85
107			0.0 74.19						28.601		K Factor = 13.87	
106 to 107	143.250 143.920	5.24	27.20 27.2	1 1.049	E T	2.0 5.0 0.0	1.625 7.000 8.625	120 0.2298	26.909 -0.290 1.982		K = K @ LIN1	Vel = 10.10
107 to 114	143.920 143.920		74.20 101.4	3 3.26		0.0 0.0 0.0	5.500 0.0 5.500	120 0.0105	28.601 0.0 0.058			Vel = 3.90
114			0.0 101.40						28.659		K Factor = 18.94	
108 to 109	143.250 143.920	5.24	22.50 22.5	1 1.049	E T	2.0 5.0 0.0	1.000 7.000 8.000	120 0.1618	18.409 -0.290 1.294		K = K @ LIN1	Vel = 8.35
109 to 111	143.920 143.920		0.0 22.5	1 1.049		0.0 0.0 0.0	5.170 0.0 5.170	120 0.1619	19.413 0.0 0.837			Vel = 8.35
111			0.0 22.50						20.250		K Factor = 5.00	

# Final Calculations - Hazen-Williams

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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	*****
110 to 111	143.250 143.920	5.24	22.98	1	E T 2.0 5.0	1.000 7.000	120	19.194 -0.290		K = K @ LIN1	
111 to 113	143.920 143.920		22.98	1.049	0.0	8.000	0.1682	1.346		Vel = 8.53	
111 to 113	143.920 143.920		22.50	1	0.0 0.0	7.170 0.0	120	20.250 0.0			
113			45.48	1.049	0.0	7.170	0.5947	4.264		Vel = 16.88	
113			0.0 45.48					24.514		K Factor = 9.19	
112 to 113	143.250 143.920	5.24	25.10	1	E T 2.0 5.0	2.540 7.000	120	22.914 -0.290		K = K @ LIN1	
113 to 114	143.920 143.920		25.1	1.049	0.0	9.540	0.1981	1.890		Vel = 9.32	
113 to 114	143.920 143.920		45.48	1.25	T 0.0	6.0 6.000	120	24.514 0.0			
114 to 116	143.920 143.920		70.58	1.38	0.0	11.750	0.3528	4.145		Vel = 15.14	
114 to 116	143.920 143.920		101.39	3	0.0 0.0	5.460 0.0	120	28.659 0.0			
116			171.97	3.26	0.0	5.460	0.0278	0.152		Vel = 6.61	
116			0.0 171.97					28.811		K Factor = 32.04	
115 to 116	143.250 143.920	5.24	27.23	1	E T 2.0 5.0	2.250 7.000	120	26.970 -0.290		K = K @ LIN1	
116 to 121	143.920 143.920		27.23	1.049	0.0	9.250	0.2304	2.131		Vel = 10.11	
116 to 121	143.920 143.920		171.98	3	0.0 0.0	3.290 0.0	120	28.811 0.0			
121			199.21	3.26	0.0	3.290	0.0365	0.120		Vel = 7.66	
121			0.0 199.21					28.931		K Factor = 37.04	
117 to 118	143.250 143.920	5.24	23.48	1	2E 0.0 4.0 0.0	0.500 4.000	120	20.049 -0.290		K = K @ LIN1	
118 to 120	143.920 143.920		23.48	1.049	0.0	4.500	0.1749	0.787		Vel = 8.72	
118 to 120	143.920 143.920		0.0	1	0.0 0.0	8.375 0.0	120	20.546 0.0			
120			23.48	1.049	0.0	8.375	0.1752	1.467		Vel = 8.72	
120			0.0 23.48					22.013		K Factor = 5.00	
119 to 120	143.250 143.920	5.24	23.97	1	E T 2.0 5.0	0.710 7.000	120	20.900 -0.290		K = K @ LIN1	
120 to 121	143.920 143.920		23.97	1.049	0.0	7.710	0.1820	1.403		Vel = 8.90	
120 to 121	143.920 143.920		23.49	1	T 0.0	5.0 5.000	120	22.013 0.0			
121 to 124	143.920 143.920		47.46	1.049	0.0	10.750	0.6435	6.918		Vel = 17.62	
121 to 124	143.920 143.920		199.20	3	0.0 0.0	14.790 0.0	120	28.931 0.0			
124			246.66	3.26	0.0	14.790	0.0543	0.803		Vel = 9.48	
124			0.0 246.66					29.734		K Factor = 45.23	
122 to 123	143.920 143.920	5.60	27.64	1	E 0.0	16.960 2.000	120	24.365 0.0			
123			27.64	1.049	0.0	18.960	0.2368	4.489		Vel = 10.26	

# Final Calculations - Hazen-Williams

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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	*****
123 to 124	143.920 143.920		0.0 27.64	1.25 1.38	T 0.0	6.0 6.000	120 0.0623	28.854 0.0		Vel = 5.93	
124 to 125	143.920 143.920		246.66 274.3	3 3.26	T 0.0	20.159 20.159	120 0.0661	29.734 0.0		Vel = 10.54	
125 to 126	143.920 141.420		0.0 274.3	3 3.26	2V 0.0	13.44 13.440	120 0.0661	34.265 1.083		Vel = 10.54	
126 to 35	141.420 141.420		0.0 274.3	3 3.26	B S T	13.44 21.503 20.159	120 0.0661	37.145 0.0 3.781		Vel = 10.54	
35 to 36	141.420 129.420		0.0 274.3	4 4.26	2V 0.0	17.907 17.907	120 0.0180	40.926 5.197		Vel = 6.17	
36 to 37	129.420 116		0.0 274.3	4 4.26	2V 0.0	17.907 17.907	120 0.0179	46.726 5.812		Vel = 6.17	
37 to 38	116 106.500		0.0 274.3	4 4.26	V 0.0	8.954 8.954	120 0.0180	53.127 4.114		Vel = 6.17	
38 to 39	106.500 106.500		0.0 274.3	4 4.26	V X B	8.954 21.067 15.8	120 0.0179	57.565 0.0 1.027		Vel = 6.17	
39 to TOR	106.500 105.830		0.0 274.3	4 4.26	3V T 0.0	26.861 26.334 0.0	120 0.0180	58.592 0.290 1.222		Vel = 6.17	
TOR to BASE	105.830 102.830		0.0 274.3	4 4.26	0.0 0.0 0.0	3.000 0.0 3.000	120 0.0180	60.104 6.299 0.054		** Fixed Loss = 5 Vel = 6.17	
BASE to TEST	102.830 102.830		0.0 274.3	8 8.27	L T G	20.56 55.354 6.326	140 0.0005	66.457 0.0 0.065		Vel = 1.64	
TEST			100.00 374.30					66.522		Qa = 100.00 K Factor = 45.89	