

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

EASTERN FIRE PROTECTION  
170 KITTY HAWK AVE  
LEW/AUB IND PARK  
AUBURN, MAINE 04210  
207-784-1508

Job Name : 23 OCEAN AVE  
Drawing : FIRST FLOOR  
Location : PORTLAND, ME  
Remote Area : DRY SYSTEM  
Contract : 1-5744-SP-17  
Data File : 5744 DRY.WXF

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**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** 23 OCEAN AVE  
**Location:** PORTLAND, ME  
**Drawing no:** FIRST FLOOR  
**Date:** 1/25/2018

**Design**

**Remote area number:** DRY SYSTEM  
**Remote area location:** CARPORT  
**Occupancy classification:** ORDINARY HAZARD  
**Density:** .15 - Gpm/SqFt  
**Area of application:** 988 - SqFt  
**Coverage per sprinkler:** 130 - SqFt  
**Type of sprinklers calculated:** RELIABLE 5.6K F1FR56 1/2" 200 DEGREE  
**No. of sprinklers calculated:** 12  
**In-rack demand:** - GPM  
**Hose streams:** 250 - GPM  
**Total water required (including hose streams):** 518.367 - GPM @ 72.242 - Psi  
**Type of system:** DRY  
**Volume of dry or preaction system:** 18 - Gal

**Water supply information**

**Date:** 6/22/2016  
**Location:** PLEASANT & FORREST  
**Source:** PORTLAND WATER DISTRICT

**Name of contractor:** EASTERN FIRE PROTECTION  
**Address:** 170 KITTYHAWK AVE AUBURN, ME 04210  
**Phone number:** 207-784-1507  
**Name of designer:** S. COTE  
**Authority having jurisdiction:** PORTLAND FIRE DEPARTMENT  
**Notes: (Include peaking information or gridded systems here.)**

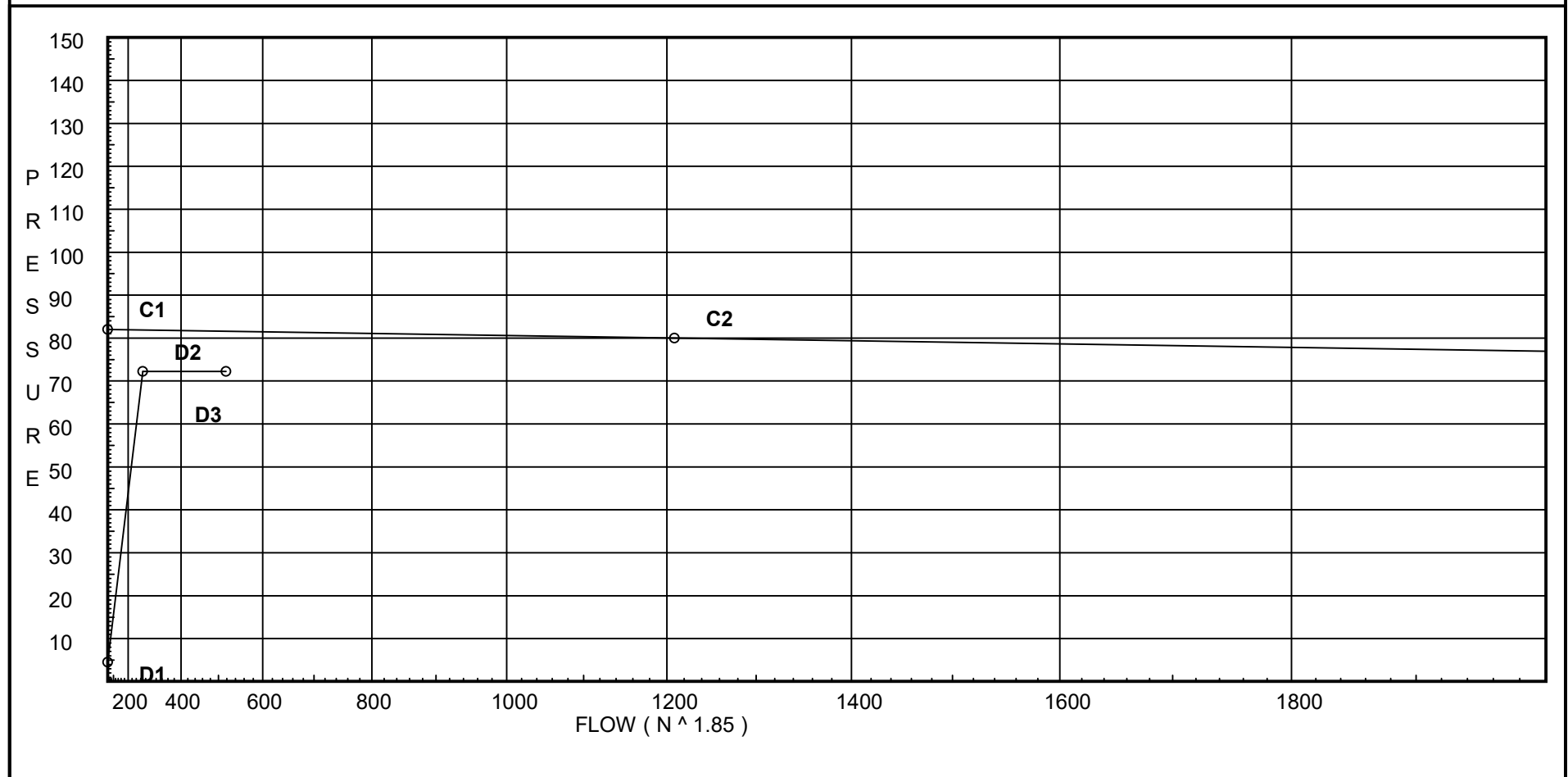
# Water Supply Curve C

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City Water Supply:  
C1 - Static Pressure : 82  
C2 - Residual Pressure: 80  
C2 - Residual Flow : 1209

Demand:  
D1 - Elevation : 4.548  
D2 - System Flow : 268.367  
D2 - System Pressure : 72.242  
Hose ( Demand ) : 250  
D3 - System Demand : 518.367  
Safety Margin : 9.340



# 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	
Dvc	Dry Vic 768 NXT					3	9	8	17		21		22	50								
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	
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.

**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	82.0	80	1209.0	81.583	518.37	72.242

**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>
DP1	0.0	5.6	12.13	19.5	
D1	108.5	5.43	12.92	19.5	K=K @ DP2
D2	108.5	5.6	14.52	21.34	
D3	108.5	5.6	16.68	22.87	
D4	108.5	5.43	13.23	19.74	K=K @ DP2
D5	108.5	5.6	14.87	21.59	
D6	108.5	5.6	17.07	23.14	
D7	108.5	5.43	14.24	20.47	K=K @ DP2
D8	108.5	5.6	15.98	22.39	
D9	108.5	5.6	18.34	23.98	
D10	108.5	5.43	17.17	22.48	K=K @ DP2
D11	108.5	5.6	19.25	24.57	
D12	108.5	5.6	22.05	26.3	
112	108.5		19.69		
113	108.5		20.15		
114	108.5		21.63		
116	108.5		25.96		
115	108.5		26.78		
117	108.5		31.39		
118	98.666		44.66		
TOD	98.666		58.04		
HDD	92.666		67.05		
BASE	91.666		73.87		
TEST	98.0		72.24	250.0	

# 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	*****
DP1 to DP2	0 0	5.60	19.50 19.5	1 1.049	T	3.568 0.0	1.000 3.568 4.568	100 0.1740	12.125 0.0 0.795		Vel = 7.24	
DP2			0.0 19.50						12.920		K Factor = 5.43	
D1 to D2	108.500 108.500	5.43	19.50 19.5	1 1.049	T	3.568 0.0	5.625 3.568 9.193	100 0.1740	12.920 0.0 1.600		K = K @ DP2 Vel = 7.24	
D2 to D3	108.500 108.500	5.60	21.34 40.84	1.25 1.38		0.0 0.0	12.000 0.0 12.000	100 0.1796	14.520 0.0 2.155		Vel = 8.76	
D3 to 112	108.500 108.500	5.60	22.87 63.71	1.25 1.38	T	4.282 0.0	3.083 4.282 7.365	100 0.4090	16.675 0.0 3.012		Vel = 13.67	
112			0.0 63.71						19.687		K Factor = 14.36	
D4 to D5	108.500 108.500	5.43	19.74 19.74	1 1.049	T	3.568 0.0	5.625 3.568 9.193	100 0.1779	13.234 0.0 1.635		K = K @ DP2 Vel = 7.33	
D5 to D6	108.500 108.500	5.60	21.59 41.33	1.25 1.38		0.0 0.0	12.000 0.0 12.000	100 0.1837	14.869 0.0 2.204		Vel = 8.87	
D6 to 113	108.500 108.500	5.60	23.14 64.47	1.25 1.38	T	4.282 0.0	3.083 4.282 7.365	100 0.4181	17.073 0.0 3.079		Vel = 13.83	
113			0.0 64.47						20.152		K Factor = 14.36	
D7 to D8	108.500 108.500	5.43	20.47 20.47	1 1.049	T	3.568 0.0	5.625 3.568 9.193	100 0.1904	14.235 0.0 1.750		K = K @ DP2 Vel = 7.60	
D8 to D9	108.500 108.500	5.60	22.39 42.86	1.25 1.38		0.0 0.0	12.000 0.0 12.000	100 0.1964	15.985 0.0 2.357		Vel = 9.19	
D9 to 114	108.500 108.500	5.60	23.98 66.84	1.25 1.38	T	4.282 0.0	3.083 4.282 7.365	100 0.4468	18.342 0.0 3.291		Vel = 14.34	
114			0.0 66.84						21.633		K Factor = 14.37	
D10 to D11	108.500 108.500	5.43	22.48 22.48	1 1.049	T	3.568 0.0	5.625 3.568 9.193	100 0.2264	17.172 0.0 2.081		K = K @ DP2 Vel = 8.35	
D11 to D12	108.500 108.500	5.60	24.57 47.05	1.25 1.38		0.0 0.0	12.000 0.0 12.000	100 0.2335	19.253 0.0 2.802		Vel = 10.09	
D12 to 116	108.500 108.500	5.60	26.30 73.35	1.25 1.38	T	4.282 0.0	3.083 4.282 7.365	100 0.5308	22.055 0.0 3.909		Vel = 15.73	
			0.0									

# 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	*****
116			73.35					25.964		K Factor = 14.40	
112 to 113	108.500 108.500		63.71	2	0.0	10.000	100	19.687 0.0			
113 to 114	108.500 108.500		63.71	2.157	0.0	10.000	0.0465	0.465		Vel = 5.59	
113 to 114	108.500 108.500		64.46	2	0.0	8.750	100	20.152 0.0			
114 to 115	108.500 108.500		128.17	2.157	0.0	8.750	0.1693	1.481		Vel = 11.25	
114 to 115	108.500 108.500		66.85	2	T	8.783	100	21.633 0.0			
115			195.02	2.157	0.0	13.991	0.3681	5.150		Vel = 17.12	
115			0.0 195.02					26.783		K Factor = 37.68	
116 to 115	108.500 108.500		73.35	2	T	8.783	100	25.964 0.0			
115 to 117	108.500 108.500		73.35	2.157	0.0	13.574	0.0603	0.819		Vel = 6.44	
115 to 117	108.500 108.500		195.02	2	E	4.392	100	26.783 0.0			
117 to 118	108.500 108.500		268.37	2.157	0.0	6.932	0.6643	4.605		Vel = 23.56	
117 to 118	108.500 108.500		0.0	2	E	4.392	100	31.388 4.259			
118 to TOD	98.666 98.666		268.37	2.157	0.0	13.557	0.6645	9.008		Vel = 23.56	
118 to TOD	98.666 98.666		0.0	2	E	4.392	100	44.655 0.0			
TOD			0.0 268.37			20.141	0.6644	13.382		Vel = 23.56	
TOD								58.037		K Factor = 35.23	
TOD to HDD	98.666 92.666		268.37	2.5	Dvc T	7.838 11.758	100	58.037 2.599			
HDD to BASE	92.666 91.666		268.37	2.635		0.0	0.2507	6.416		Vel = 15.79	
HDD to BASE	92.666 91.666		0.0	3	5E	47.038	120	67.052 5.433		** Fixed Loss = 5	
BASE to TEST	91.666 98		268.37	3.26		0.0	0.0634	1.384		Vel = 10.32	
BASE to TEST	91.666 98		0.0	4	E T	14.534 29.067	140	73.869 -2.743			
TEST			268.37	4.1	G	2.907	0.0156	1.116		Vel = 6.52	
TEST			250.00 518.37					72.242		Qa = 250.00 K Factor = 60.99	