

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

EASTERN FIRE PROTECTION  
170 KITTY HAWK AVE.  
AUBURN/LEWISTON INDUSTRIAL PK  
AUBURN, MAINE  
207-784-1507

Job Name : 52 MONUMENT STREET  
Drawing : 1 OF 1  
Location : PORTLAND  
Remote Area : 1  
Contract : A-5122-14  
Data File : 5122 52 MONUMENT BASEMENT.WXF

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**HYDRAULIC CALCULATIONS**  
*for*

**Project name:** 52 MONUMENT STREET  
**Location:** PORTLAND  
**Drawing no:** 1 OF 1  
**Date:** 02/25/2014

**Design**

**Remote area number:** 1  
**Remote area location:** BASEMENT  
**Occupancy classification:** ORDINARY HAZARD I  
**Density:** .15 - Gpm/SqFt  
**Area of application:** 865 - SqFt  
**Coverage per sprinkler:** 100 - SqFt  
**Type of sprinklers calculated:** TYCO TYFRB BRASS UR TY313 200\*QR  
**No. of sprinklers calculated:** 11  
**In-rack demand:** - GPM  
**Hose streams:** - GPM  
**Total water required (including hose streams):** 207.255 - GPM @ 49.209 - Psi  
**Type of system:** WET  
**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 07/16/2012  
**Location:** CORNER CUMBERLAND AND SHERIDAN STREETS  
**Source:** PORTLAND WATER DISTRICT

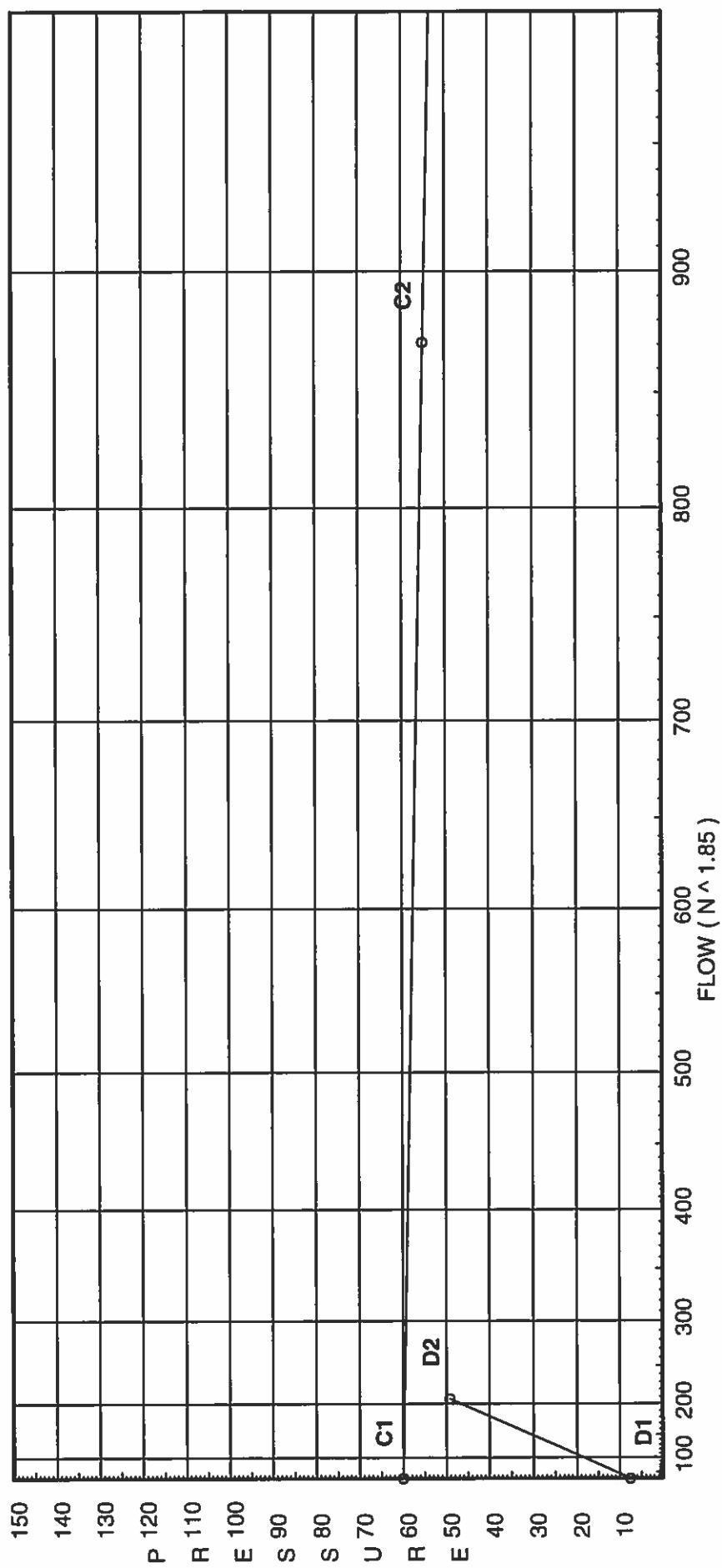
**Name of contractor:** EASTERN FIRE PROTECTION  
**Address:** 170 KITTY HAWK AVE. / AUBURN/LEWISTON INDUSTRIAL PK / AUBURN  
**Phone number:** 207-784-1507  
**Name of designer:** MJBII  
**Authority having jurisdiction:** SFMO  
**Notes:** (Include peaking information or gridded systems here.)

# Water Supply Curve C

EASTERN FIRE PROTECTION  
52 MONUMENT STREET

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

Demand:  
D1 - Elevation : 7.579  
D2 - System Flow : 207.255  
D2 - System Pressure : 49.209  
Hose ( Demand ) : 207.255  
D3 - System Demand : 10.440  
Safety Margin : 10.440



# Fittings Used Summary

EASTERN FIRE PROTECTION  
52 MONUMENT STREET

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
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
Zca Coil C200 Horz Butt	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**

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
TEST	60.0	55	871.0	59.649	207.26	49.209

**NODE ANALYSIS**

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
21	106.083	5.6	7.13	14.96	
20	106.0	5.6	8.34	16.17	
22	106.0		8.51		
23	106.083	5.6	9.1	16.89	
25	106.0	5.6	9.65	17.4	
24	106.0		10.36		
7	106.0		12.42		
26	106.083	5.6	11.48	18.98	
27	106.0		12.97		
28	106.0	5.6	12.81	20.05	
30	106.0	5.6	12.4	19.72	
31	106.0		13.41		
32	106.0	5.6	11.63	19.1	
33	106.0	5.6	12.43	19.75	
34	106.0		13.48		
29	106.0		13.71		
35	106.0		14.13		
36	106.0	5.6	15.33	21.92	
37	106.083	5.6	15.9	22.33	
TOR	106.083		18.93		
BASE	101.0		29.21		
UG1	94.0		46.67		
TEST	88.5		49.21		

Final Calculations - Hazen-Williams - 2007

EASTERN FIRE PROTECTION  
52 MONUMENT STREET

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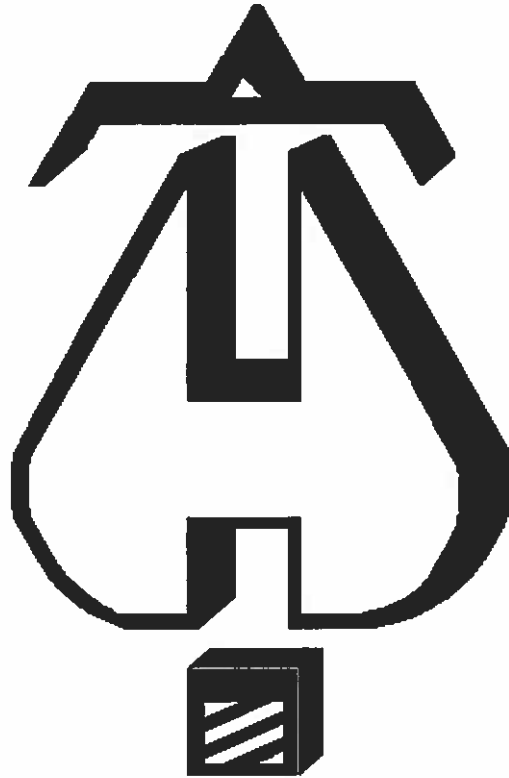
Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqv.	Ln.	Pipe Ftng's Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
21 to 22	106.083 106'1	5.60	14.96	1	3E T	6.0 5.0 0.0	6.625 11.000 17.625	120	7.134 0.036 1.340			Vel = 5.55
22			0.0 14.96						8.510			K Factor = 5.13
20 to 22	106'1 106'1	5.60	16.17	1		0.0 0.0 0.0	1.958 0.0 1.958	120	8.338 0.0 0.172			Vel = 6.00
22 to 23	106'1 106.083		14.96	1.25		0.0 0.0 0.0	8.042 0.0 8.042	120	8.510 -0.036 0.624			Vel = 6.68
23 to 24	106.083 106'1	5.60	16.89	1.5	T	8.0 0.0 0.0	7.000 8.000 15.000	120	9.098 0.036 1.224			Vel = 7.57
24			0.0 48.02						10.358			K Factor = 14.92
25 to 24	106'1 106'1	5.60	17.40	1	T	5.0 0.0 0.0	2.000 5.000 7.000	120	9.654 0.0 0.704			Vel = 6.46
24 to 7	106'1 106'1		48.02	1.5	E	4.95 0.0 0.0	12.667 4.950 17.617	120	10.358 0.0 2.060			Vel = 9.45
7 to 27	106'1 106'1		0.0	1.5		0.0 0.0 0.0	4.750 0.0 4.750	120	12.418 0.0 0.556			Vel = 9.45
27			0.0 65.42						12.974			K Factor = 18.16
26 to 27	106.083 106'1	5.60	18.98	1	T	5.0 0.0 0.0	7.333 5.000 12.333	120	11.482 0.036 1.456			Vel = 7.05
27 to 35	106'1 106'1		65.41	2	E T	6.153 12.307 0.0	2.292 18.460 20.752	120	12.974 0.0 1.157			Vel = 7.41
35			0.0 84.39						14.131			K Factor = 22.45
28 to 29	106'1 106'1	5.60	20.05	1	T	5.0 0.0 0.0	1.833 5.000 6.833	120	12.814 0.0 0.893			Vel = 7.44
29			0.0 20.05						13.707			K Factor = 5.42
30 to 31	106'1 106'1	5.60	19.72	1	E	2.0 0.0 0.0	5.958 2.000 7.958	120	12.400 0.0 1.009			Vel = 7.32
31 to 34	106'1 106'1		0.0	1.5		0.0 0.0 0.0	5.333 0.0 5.333	120	13.409 0.0 0.068			Vel = 2.85

Final Calculations - Hazen-Williams

EASTERN FIRE PROTECTION  
52 MONUMENT STREET

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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	*****
			0.0 19.72					13.477		K Factor = 5.37	
32 to 33	106'1 106'1	5.60	19.10 19.1	1 1.049		0.0 0.0 6.750	120 0.1196	11.628 0.0 0.807		Vel = 7.09	
33 to 34	106'1 106'1	5.60	19.74 38.84	1.25 1.38	T 0.0	6.0 6.000 8.917	120 0.1169	12.435 0.0 1.042		Vel = 8.33	
34 to 29	106'1 106'1		19.72 58.56	1.5 1.682		0.0 0.0 2.417	120 0.0952	13.477 0.0 0.230		Vel = 8.46	
29 to 35	106'1 106'1		20.05 78.61	1.5 1.682		0.0 0.0 2.583	120 0.1642	13.707 0.0 0.424		Vel = 11.35	
35 to 36	106'1 106'1		84.39 163.0	2.5 2.635	E 0.0	8.237 8.237 16.820	120 0.0712	14.131 0.0 1.197		Vel = 9.59	
36 to 37	106'1 106.083	5.60	21.93 184.93	2.5 2.635		0.0 0.0 6.750	120 0.0898	15.328 -0.036 0.606		Vel = 10.88	
37 to TOR	106.083 106.083	5.60	22.33 207.26	2.5 2.635	E T 0.0	8.237 16.474 24.711 27.294	120 0.1109	15.898 0.0 3.027		Vel = 12.19	
TOR to BASE	106.083 101		0.0 207.26	2.5 2.635	2E Zca 0.0	16.474 8.417 0.0 16.474 24.891	120 0.1109	18.925 7.525 2.761		** Fixed Loss = 5.323 Vel = 12.19	
BASE to UG1	101 94		0.0 207.26	2 1.917	E G T 0.0	5.235 1.047 10.47 41.752	150 0.3455	29.211 3.032 14.427		Vel = 23.04	
UG1 to TEST	94 88.500		0.0 207.26	6 6.16	E T G 4.304	20.084 43.037 117.425	140 0.0013	46.670 2.382 0.157		Vel = 2.23	
TEST			0.0 207.26					49.209		K Factor = 29.55	



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

EASTERN FIRE PROTECTION  
170 KITTY HAWK AVE.  
AUBURN/LEWISTON INDUSTRIAL PK  
AUBURN, MAINE  
207-784-1507

Job Name : 52 MONUMENT STREET PROOF CALC  
Drawing : WOOD FRAME  
Location : 52 MONUMENT STREET PORTLAND MAINE  
Remote Area : PROOF  
Contract : A-5122-14  
Data File : 5122 52 MONUMENT 3RD FLOOR.WXF



HYDRAULIC DESIGN INFORMATION SHEET

Name - 52 MONUMENT STREET Date - 2/12/2014  
Location - 52 MONUMENT STREET PORTLAND MAINE  
Building - WOOD FRAME System No. - PROOF  
Contractor - EASTERN FIRE PROTECTION Contract No. - A-5122-14  
Calculated By - MJBII Drawing No. - 1 OF 1  
Construction: (X) Combustible ( ) Non-Combustible Ceiling Height 9-1  
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 - 14 Gpm System Type  
Listed Pres. at Start Point - 10.1 Psi (X) Wet ( ) Dry  
D MAXIMUM LISTED SPACING 14 x 14 ( ) Deluge ( ) PreAction  
E Domestic Flow Added - Gpm Sprinkler or Nozzle  
S Additional Flow Added - Gpm Make TYCO Model LFII  
I Elevation at Highest Outlet - 133' Feet Size 1/2 K-Factor 4.4/4.9  
G Note: Temperature Rating 155  
N

Calculation Gpm Required 59.980 Psi Required 49.558 At Test  
Summary C-Factor Used: Overhead 120 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:  
A Date of Test - 7/16/2012 Rated Cap. Cap.  
T Time of Test - N/A @ Psi Elev.  
E Static (Psi) - 60 Elev.  
R Residual (Psi) - 55 Other Well  
Flow (Gpm) - 871 Proof Flow Gpm  
S Elevation - 88.5

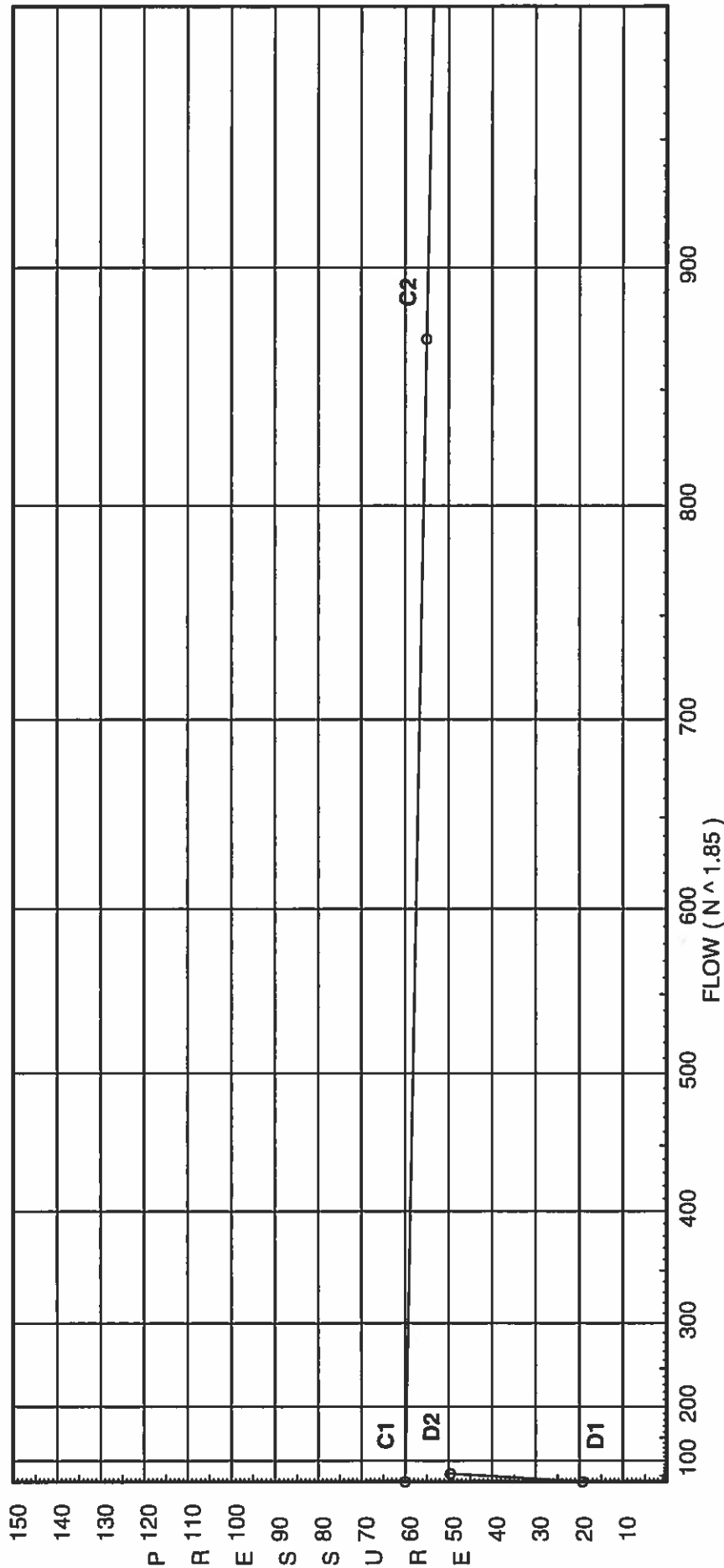
P Location: CORNER OF CUMBERLAND AND SHERIDAN STREETS  
P  
L Source of Information: PORTLAND WATER DISTRICT  
Y

Water Supply Curve C

EASTERN FIRE PROTECTION  
52 MONUMENT STREET PROOF CALC

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

Demand:  
D1 - Elevation : 19.273  
D2 - System Flow : 59.98  
D2 - System Pressure : 49.558  
Hose ( Demand ) :  
D3 - System Demand : 59.98  
Safety Margin : 10.407



# Fittings Used Summary

EASTERN FIRE PROTECTION  
52 MONUMENT STREET PROOF CALC

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
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
Zca	Colt C200 Horz Butt	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**

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
TEST	60.0	55	871.0	59.965	59.98	49.558

**NODE ANALYSIS**

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
DPR1	0.0	4.9	7.0	12.96	
1	133.0	4.4	10.1	13.98	
2	133.0	4.4	10.8	14.46	
2A	133.0	4.4	11.06	14.63	
3	133.0		11.49		
4	133.0		13.32		
4A	133.417	4.78	12.49	16.9	K=K @ EQO1
4B	133.0		14.67		
5	115.25		24.55		
6	106.083		30.14		
7	106.083		31.42		
27	106.083		32.01		
35	106.083		32.62		
TOR	106.083		33.19		
BASE	101.0		42.67		
UG1	94.0		47.16		
TEST	88.5		49.56		

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	*****
DPR1 to EQO1	0 0	4.90	12.96 12.96	1 1.049	T 5.0 0.0	1.000 5.000 6.000	120 0.0583	7.000 0.0 0.350			Vel = 4.81
EQO1			0.0 12.96					7.350			K Factor = 4.78
1 to 2	133 133	4.40	13.98 13.98	1 1.049	0.0 0.0	10.500 0.0	120 0.0671	10.100 0.0 0.705			Vel = 5.19
2 to 3	133 133	4.40	14.47 28.45	1.25 1.38	0.0 0.0	10.500 0.0	120 0.0656	10.805 0.0 0.689			Vel = 6.10
3			0.0 28.45					11.494			K Factor = 8.39
2A to 3	133 133	4.40	14.63 14.63	1 1.049	T 5.0 0.0	1.000 5.000 6.000	120 0.0730	11.056 0.0 0.438			Vel = 5.43
3 to 4	133 133		28.45 43.08	1.25 1.38	E 3.0 0.0	9.917 3.000 12.917	120 0.1415	11.494 0.0 1.828			Vel = 9.24
4 to 4B	133 133		16.90 59.98	1.25 1.38	E 3.0 0.0	2.167 3.000 5.167	120 0.2611	13.322 0.0 1.349			Vel = 12.87
4B			0.0 59.98					14.671			K Factor = 15.66
4A to 4	133.417 133	4.78	16.90 16.9	1.25 1.38	E 3.0 12.0 2T	10.833 15.000 25.833	120 0.0250	12.494 0.181 0.647			K = K @ EQO1 Vel = 3.63
4			0.0 16.90					13.322			K Factor = 4.63
4B to 5	133 115.250		59.98 59.98	1.5 1.61	0.0 0.0	17.750 0.0	120 0.1232	14.671 7.688 2.187			Vel = 9.45
5 to 6	115.250 106.083		0.0 59.98	1.5 1.61	E 4.0 0.0	9.167 4.000 13.167	120 0.1233	24.546 3.970 1.623			Vel = 9.45
6 to 7	106.083 106.083		0.0 59.98	1.5 1.61	T 8.0 0.0	2.417 8.000 10.417	120 0.1232	30.139 0.0 1.283			Vel = 9.45
7 to 27	106.083 106.083		0.0 59.98	1.5 1.61	0.0 0.0	4.750 0.0	120 0.1234	31.422 0.0 0.586			Vel = 9.45
27 to 35	106.083 106.083		0.0 59.98	2 2.157	E 6.153 12.307 T	2.292 18.460	120 0.0296	32.008 0.0 0.615			Vel = 5.27
35 to TOR	106.083 106.083		0.0 59.98	2.5 2.635	2E 16.474 T 16.474	17.958 32.948 50.906	120 0.0112	32.623 0.0 0.570			Vel = 3.53

Final Calculations - Hazen-Williams

EASTERN FIRE PROTECTION  
52 MONUMENT STREET PROOF CALC

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Date

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 *****
TOR to BASE	106.083 101		0.0 59.98	2.5 2.635	2E Zca	16.474 0.0	8.417 16.474	120	33.193 9.201	** Fixed Loss = 7 Vel = 3.53
BASE to UG1	101 94		0.0 59.98	2 1.917	E G T	5.235 1.047 10.47	25.000 16.752 41.752	150	42.673 3.032 1.455	Vel = 6.67
UG1 to TEST	94 88.500		0.0 59.98	6 6.16	T E G	43.037 20.084 4.304	50.000 67.425 117.425	140	47.160 2.382 0.016	Vel = 0.65
TEST			0.0 59.98						49.558	K Factor = 8.52