

. . . Fire Protection by Computer Design

Eastern Fire Protection
170 Kitty Hawk Ave.
P.O. Box 1390
Auburn, Maine, 04211
207-784-1507

Job Name : 118 MUNJOY HILL GARAGE
Drawing : 1 of 2
Location : 118 Congress St., Portland, Maine
Remote Area : one
Contract : 5174
Data File : 1-5174GARAGEsubmittal.WXF

HYDRAULIC CALCULATIONS
for

Project name: 118 MUNJOY HILL GARAGE
Location: 118 Congress St., Portland, Maine
Drawing no: 1 of 2
Date: 080814

Design

Remote area number: one
Remote area location: Parking Garage
Occupancy classification: Ordinary Hazard I
Density: .1500 - Gpm/SqFt
Area of application: 2018 - SqFt
Coverage per sprinkler: 126 - SqFt
Type of sprinklers calculated: Tyco TY-FRB Upright
No. of sprinklers calculated: 20
In-rack demand: - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 661.997 - GPM @ 40.06 - Psi
Type of system: Dry
Volume of dry or preaction system: 175 - Gal

Water supply information

Date: 04/30/14
Location: Hydrant on the corner of Congress and St. Lawrence
Source: Portland Water District

Name of contractor: Eastern Fire Protection
Address: 170 Kitty Hawk Ave. / P.O. Box 1390 / Auburn, Maine, 04211
Phone number: 207-784-1507
Name of designer: WAF
Authority having jurisdiction: State Fire Marshal
Notes: (Include peaking information or gridded systems here.)

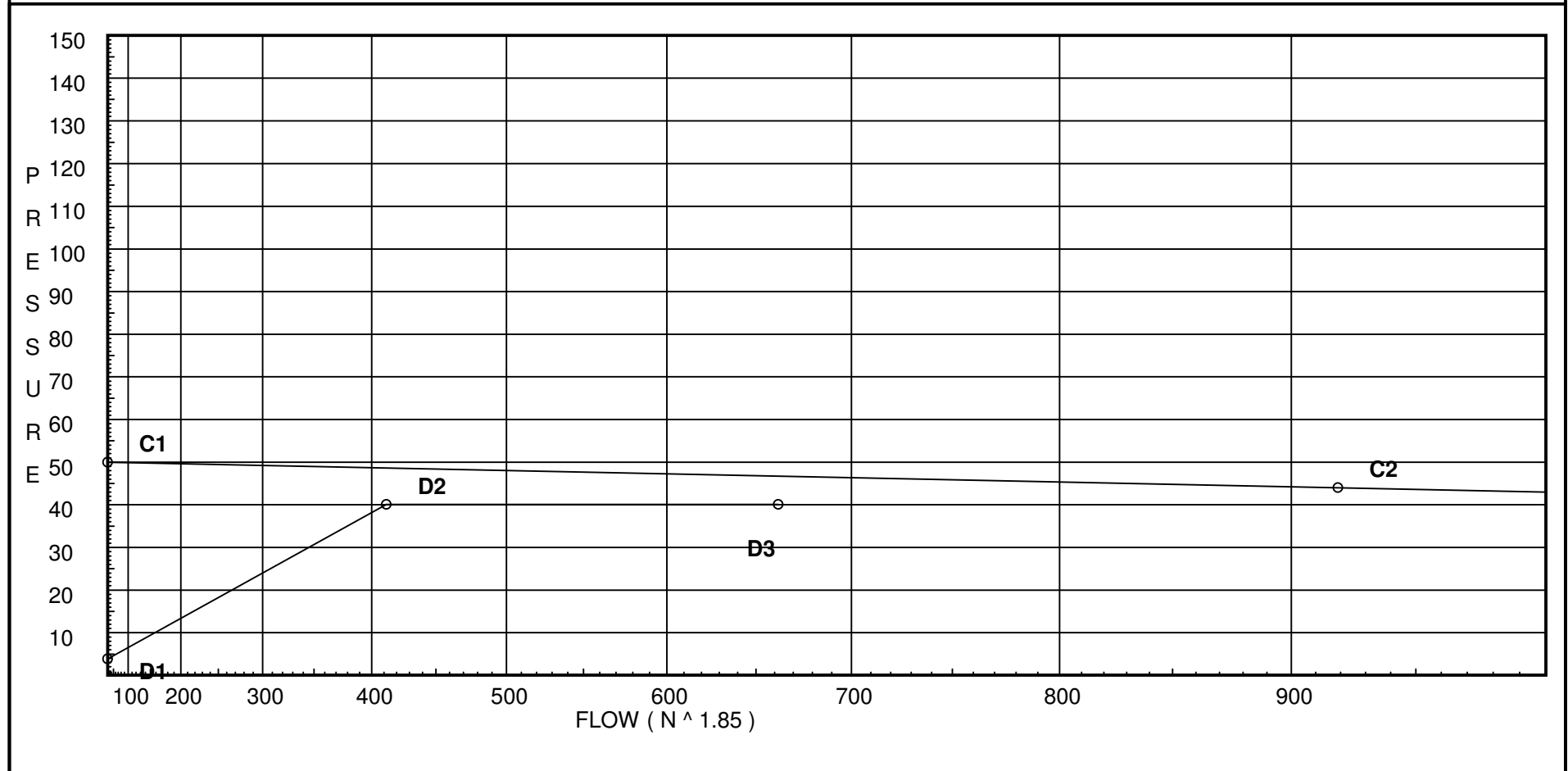
Water Supply Curve C

Eastern Fire Protection
118 MUNJOY HILL GARAGE

Page 2
Date 080814

City Water Supply:
C1 - Static Pressure : 50
C2 - Residual Pressure: 44
C2 - Residual Flow : 919

Demand:
D1 - Elevation : 3.898
D2 - System Flow : 411.997
D2 - System Pressure : 40.086
Hose (Demand) : 250
D3 - System Demand : 661.997
Safety Margin : 6.644



Fittings Used Summary

Eastern Fire Protection
118 MUNJOY HILL GARAGE

Page 3
Date 080814

Fitting Legend		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
Abbrev.	Name																				
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
D	Dry Rel D										28		47								
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
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
Zcc	Colt C200N 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

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	50.0	44	919.0	46.73	662.0	40.086

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
22	158.0	5.6	15.89	22.32	
23	158.0	5.6	16.28	22.59	
18	158.0	5.6	12.98	20.18	
19	158.0	5.6	13.18	20.33	
20	158.0	5.6	13.9	20.88	
21	158.0	5.6	15.35	21.94	
TOR3	158.0		17.54		
15	158.0	5.6	13.27	20.4	
16	158.0	5.6	13.47	20.55	
17	158.0	5.6	14.65	21.43	
11	158.0	5.6	11.68	19.14	
12	158.0	5.6	11.86	19.29	
13	158.0	5.6	12.99	20.19	
14	158.0	5.6	14.43	21.27	
TOR2	158.0		16.85		
5	158.0	5.6	13.13	20.29	
6	158.0	5.6	13.34	20.45	
7	158.0	5.6	14.59	21.39	
1	158.0	5.6	11.39	18.9	
2	158.0	5.6	11.57	19.05	
3	158.0	5.6	12.97	20.17	
4	158.0	5.6	14.38	21.24	
TOR1	158.0		16.77		
8	158.0		18.7		
9	158.0		18.8		
10	158.0		19.16		
DPV	153.33		26.86		
HDR1	151.5		31.02		
FLG	148.5		39.76		
TEST	149.0		40.09	250.0	

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	*****
22 to 23	158 158	5.60	22.32	1.5	2L	2.855	11.210 0.0 2.855	100	15.888 0.0			
			22.32	1.61		0.0	14.065	0.0277	0.390	Vel =	3.52	
23 to TOR3	158 158	5.60	22.59	1.5	T	5.71	6.790 0.0 5.710	100	16.278 0.0			
			44.91	1.61		0.0	12.500	0.1011	1.264	Vel =	7.08	
TOR3			0.0 44.91						17.542	K Factor =	10.72	
18 to 19	158 158	5.60	20.18	1.5		0.0	8.670 0.0 0.0	100	12.984 0.0			
			20.18	1.61		0.0	8.670	0.0231	0.200	Vel =	3.18	
19 to 20	158 158	5.60	20.33	1.5		0.0	8.620 0.0 0.0	100	13.184 0.0			
			40.51	1.61		0.0	8.620	0.0835	0.720	Vel =	6.38	
20 to 21	158 158	5.60	20.88	1.5		0.0	8.000 0.0 0.0	100	13.904 0.0			
			61.39	1.61		0.0	8.000	0.1802	1.442	Vel =	9.67	
21 to TOR3	158 158	5.60	21.94	1.5	T	5.71	1.210 0.0 5.710	100	15.346 0.0			
			83.33	1.61		0.0	6.920	0.3173	2.196	Vel =	13.13	
TOR3 to 10	158 158		44.92	2	T	7.137	0.620 0.0 7.137	100	17.542 0.0			
			128.25	2.067		0.0	7.757	0.2086	1.618	Vel =	12.26	
10			0.0 128.25						19.160	K Factor =	29.30	
15 to 16	158 158	5.60	20.40	1.5		0.0	8.670 0.0 0.0	100	13.265 0.0			
			20.4	1.61		0.0	8.670	0.0235	0.204	Vel =	3.21	
16 to 17	158 158	5.60	20.55	1.5	2L	2.855	11.000 0.0 2.855	100	13.469 0.0			
			40.95	1.61		0.0	13.855	0.0852	1.180	Vel =	6.45	
17 to TOR2	158 158	5.60	21.43	1.5	T	5.71	6.130 0.0 5.710	100	14.649 0.0			
			62.38	1.61		0.0	11.840	0.1857	2.199	Vel =	9.83	
TOR2			0.0 62.38						16.848	K Factor =	15.20	
11 to 12	158 158	5.60	19.14	1.5		0.0	8.670 0.0 0.0	100	11.683 0.0			
			19.14	1.61		0.0	8.670	0.0209	0.181	Vel =	3.02	
12 to 13	158 158	5.60	19.29	1.5	2L	2.855	12.040 0.0 2.855	100	11.864 0.0			
			38.43	1.61		0.0	14.895	0.0758	1.129	Vel =	6.06	
13 to 14	158 158	5.60	20.19	1.5		0.0	8.670 0.0 0.0	100	12.993 0.0			
			58.62	1.61		0.0	8.670	0.1654	1.434	Vel =	9.24	

Final Calculations - Hazen-Williams

Eastern Fire Protection
118 MUNJOY HILL GARAGE

Page 6
Date 080814

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	*****
14 to TOR2	158 158	5.60	21.27 79.89	1.5 1.61	T	5.71 0.0 0.0	2.540 5.710 8.250	100 0.2935	14.427 0.0 2.421		Vel = 12.59	
TOR2 to 9	158 158		62.38 142.27	2 2.067	T	7.137 0.0 0.0	0.580 7.137 7.717	100 0.2527	16.848 0.0 1.950		Vel = 13.60	
9			0.0 142.27						18.798		K Factor = 32.81	
5 to 6	158 158	5.60	20.29	1.5 1.61		0.0 0.0 0.0	8.670 0.0 8.670	100 0.0233	13.133 0.0 0.202		Vel = 3.20	
6 to 7	158 158	5.60	20.45 40.74	1.5 1.61	2L	2.855 0.0 0.0	12.000 2.855 14.855	100 0.0844	13.335 0.0 1.254		Vel = 6.42	
7 to TOR1	158 158	5.60	21.39 62.13	1.5 1.61	T	5.71 0.0 0.0	6.130 5.710 11.840	100 0.1844	14.589 0.0 2.183		Vel = 9.79	
TOR1			0.0 62.13						16.772		K Factor = 15.17	
1 to 2	158 158	5.60	18.90 18.9	1.5 1.61		0.0 0.0 0.0	8.670 0.0 8.670	100 0.0203	11.391 0.0 0.176		Vel = 2.98	
2 to 3	158 158	5.60	19.05 37.95	1.5 1.61	2L	2.855 0.0 0.0	16.080 2.855 18.935	100 0.0740	11.567 0.0 1.402		Vel = 5.98	
3 to 4	158 158	5.60	20.16 58.11	1.5 1.61		0.0 0.0 0.0	8.670 0.0 8.670	100 0.1629	12.969 0.0 1.412		Vel = 9.16	
4 to TOR1	158 158	5.60	21.24 79.35	1.5 1.61	T	5.71 0.0 0.0	2.540 5.710 8.250	100 0.2898	14.381 0.0 2.391		Vel = 12.51	
TOR1 to 8	158 158		62.13 141.48	2 2.067	T	7.137 0.0 0.0	0.580 7.137 7.717	100 0.2501	16.772 0.0 1.930		Vel = 13.53	
8 to 9	158 158		0.0 141.48	4 4.26		0.0 0.0 0.0	13.000 0.0 13.000	100 0.0074	18.702 0.0 0.096		Vel = 3.18	
9 to 10	158 158		142.27 283.75	4 4.26		0.0 0.0 0.0	13.500 0.0 13.500	100 0.0268	18.798 0.0 0.362		Vel = 6.39	
10 to DPV	158 153.330		128.25 412.0	4 4.26	2L	11.277 0.0 0.0	95.080 11.276 106.356	100 0.0534	19.160 2.023 5.678		Vel = 9.27	
DPV to HDR1	153.330 151.500		0.0 412.0	4 4.26	D B L	36.868 15.8 7.9	1.500 86.902 88.402	120 0.0381	26.861 0.793 3.368		Vel = 9.27	

Final Calculations - Hazen-Williams

Eastern Fire Protection
118 MUNJOY HILL GARAGE

Page 7
Date 080814

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	*****
					T	26.334					
HDR1 to FLG	151.500 148.500		0.0 412.0	4 4.26	Zcc	0.0 0.0 0.0	1.500 0.0	120 8.685		* * Fixed Loss = 7.386	
FLG to TEST	148.500 149		0.0 412.0	6 6.16	2L G T	25.822 4.304 43.037	40.000 73.163 113.163	140 -0.217 0.539		Vel = 9.27	
TEST			250.00 662.00					40.086		Qa = 250.00 K Factor = 104.56	