

. . . Fire Protection by Computer Design

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

Job Name : MAINE EYE CENTER SECOND FLOOR REMOTE CALCULATION
Drawing : 2 OF 2
Location : 161 MARGINAL WAY, PORTLAND, MAINE
Remote Area : TWO
Contract : 5501-16
Data File : MAINE EYE SECOND FLOOR HYDRAULIC REMOTE SUBMITTAL .WXF

HYDRAULIC CALCULATIONS
for

Project name: MAINE EYE CENTER SECOND FLOOR REMOTE CALCULATION
Location: 161 MARGINAL WAY, PORTLAND, MAINE
Drawing no: 2 OF 2
Date: 7/26/16

Design

Remote area number: TWO
Remote area location: SECOND FLOOR
Occupancy classification: LIGHT
Density: .10 - Gpm/SqFt
Area of application: 1011 - SqFt
Coverage per sprinkler: 148 - SqFt
Type of sprinklers calculated: 1/2" K=5.6 RELIABE F1FR CHROME PENDENT
No. of sprinklers calculated: 11
In-rack demand: - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 298 - GPM @ 105.3 - Psi
Type of system: WET
Volume of dry or preaction system: - Gal

Water supply information

Date: 5/31/2016
Location: HYDRANT LOCATED ON MARGINAL WAY
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, PORTLAND FIRE DEPARTMENT
Notes: (Include peaking information or gridded systems here.)
NOTE: REMOTE AREA MODIFIED PER NFPA 13 SECTION 11.2.3.2.3.1

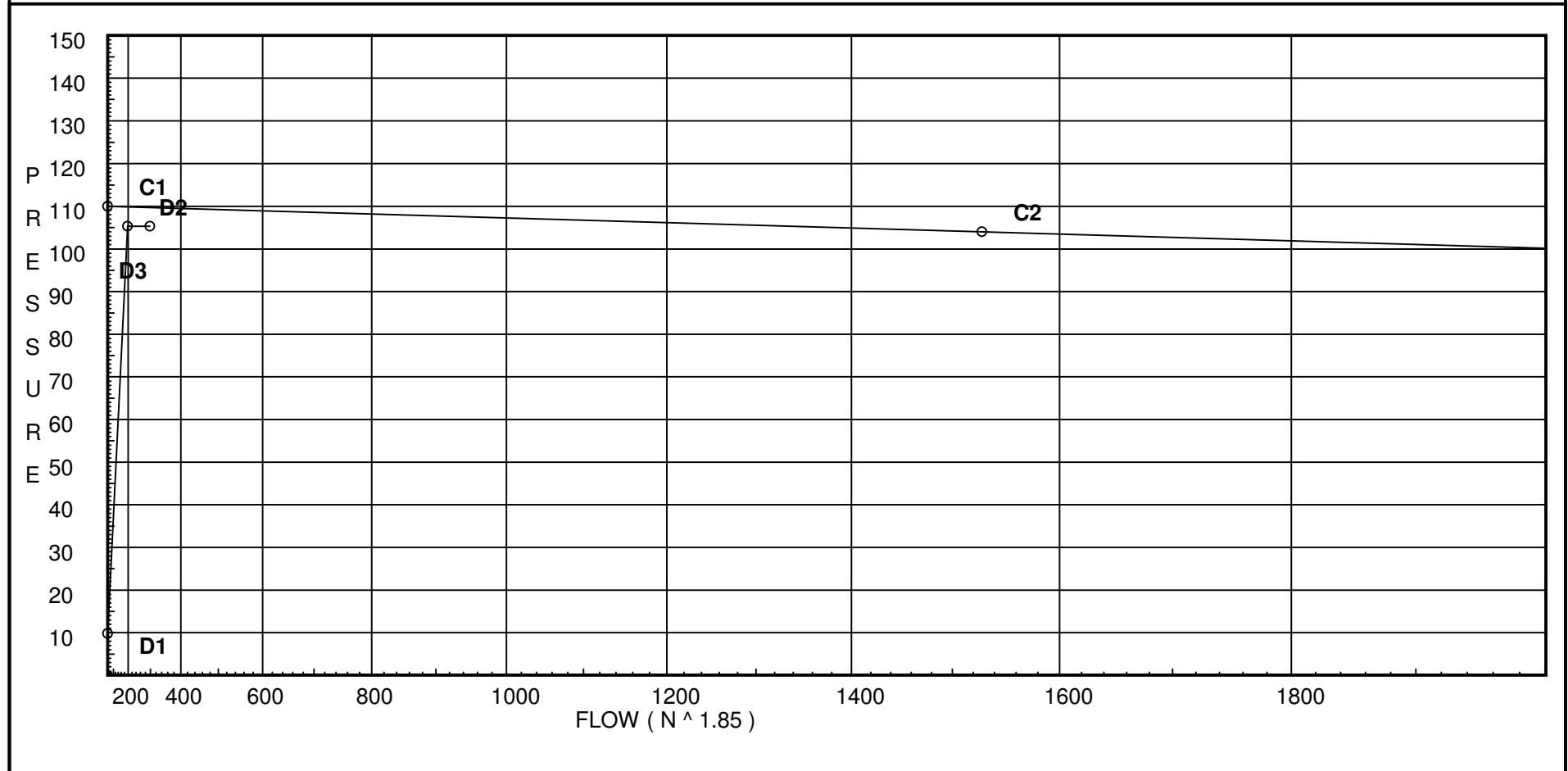
Water Supply Curve C

Eastern Fire Protection
MAINE EYE CENTER SECOND FLOOR REMOTE CALCULATION

Page 2
Date

City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 104
C2 - Residual Flow : 1528

Demand:
D1 - Elevation : 9.818
D2 - System Flow : 198.006
D2 - System Pressure : 105.317
Hose (Demand) : 100
D3 - System Demand : 298.006
Safety Margin : 4.391



Fittings Used Summary

Eastern Fire Protection
 MAINE EYE CENTER SECOND FLOOR REMOTE CALCULATION

Page 3
 Date

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
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
I	90° Grvd-Vic Elbow #10	0	0	2	3	4	3.5	6	5	8	7	8.5	10	13	17	20	23	25	33	36	40
J	90° Tee-Branch Grv Vic #20	0	0	4.5	6	8	8.5	10.8	13	17	16	21	25	33	41	50	65	78	88	98	120
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
Zcb	Colt C200 Vert 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	110.0	104	1528.0	109.708	298.01	105.317

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
D1	0.0	5.6	7.0	14.82	
260	122.67	4.06	16.02	16.23	K=K @ L1
261	122.67	4.06	16.81	16.62	K=K @ L1
262	122.67		20.09		
262A	122.67		23.01		
263	122.67	4.06	23.26	19.56	K=K @ L1
264	122.67	4.06	25.15	20.33	K=K @ L1
265	122.67	4.06	32.78	23.22	K=K @ L1
250	122.67	4.06	13.35	14.82	K=K @ L1
252	122.67	4.06	13.8	15.06	K=K @ L1
251	122.67	4.06	15.04	15.73	K=K @ L1
253	122.67		15.7		
254	122.67	4.06	20.51	18.36	K=K @ L1
255	122.67	4.06	20.02	18.14	K=K @ L1
256	122.67		20.8		
257	122.67	4.06	24.15	19.93	K=K @ L1
258	122.67		33.54		
259	122.67		47.75		
266	122.67		48.74		
267	122.67		54.08		
268	122.67		59.75		
212	122.67		69.18		
216	122.67		76.49		
217	122.67		78.71		
114	109.0		87.78		
A	109.0		89.22		
TOR	109.0		90.75		
B1	109.0		97.24		
BASE	101.0		104.69		
TEST	100.0		105.32	100.0	

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	*****
D1 to L1	0 0	5.60	14.82	1	E T	2.0 5.0 0.0	78.000 7.000 85.000	120	7.000 0.0 6.350			Vel = 5.50
L1			0.0 14.82						13.350		K Factor = 4.06	
260 to 261	122.670 122.670	4.06	16.23	1		0.0 0.0 0.0	8.870 0.0 8.870	120	16.022 0.0 0.785		K = K @ L1	Vel = 6.03
261 to 262	122.670 122.670	4.06	16.63	1	T	5.0 0.0 0.0	5.080 5.000 10.080	120	16.807 0.0 3.286		K = K @ L1	Vel = 12.20
262 to 262A	122.670 122.670		0.0	1		0.0 0.0 0.0	8.960 0.0 8.960	120	20.093 0.0 2.921			Vel = 12.20
262A to 263	122.670 122.670		0.0	1.25		0.0 0.0 0.0	2.920 0.0 2.920	120	23.014 0.0 0.250			Vel = 7.05
263 to 264	122.670 122.670	4.06	19.56	1.25		0.0 0.0 0.0	9.250 0.0 9.250	120	23.264 0.0 1.882		K = K @ L1	Vel = 11.24
264 to 265	122.670 122.670	4.06	20.33	1.25	2E	6.0 0.0 0.0	14.460 6.000 20.460	120	25.146 0.0 7.634		K = K @ L1	Vel = 15.61
265 to 266	122.670 122.670	4.06	23.22	1.25	T	6.0 0.0 0.0	19.620 6.000 25.620	120	32.780 0.0 15.957		K = K @ L1	Vel = 20.59
266			0.0 95.97						48.737		K Factor = 13.75	
250 to 252	122.670 122.670	4.06	14.82	1	E	2.0 0.0 0.0	4.000 2.000 6.000	120	13.350 0.0 0.448		K = K @ L1	Vel = 5.50
252 to 253	122.670 122.670	4.06	15.06	1	T	5.0 0.0 0.0	1.960 5.000 6.960	120	13.798 0.0 1.903		K = K @ L1	Vel = 11.09
253			0.0 29.88						15.701		K Factor = 7.54	
251 to 253	122.670 122.670	4.06	15.73	1	T	5.0 0.0 0.0	2.920 5.000 7.920	120	15.041 0.0 0.660		K = K @ L1	Vel = 5.84
253 to 254	122.670 122.670		29.88	1		0.0 0.0 0.0	8.040 0.0 8.040	120	15.701 0.0 4.808			Vel = 16.93
254 to 256	122.670 122.670	4.06	18.36	1.25		0.0 0.0 0.0	1.000 0.0 1.000	120	20.509 0.0 0.294		K = K @ L1	Vel = 13.72

Final Calculations - Hazen-Williams

Eastern Fire Protection
 MAINE EYE CENTER SECOND FLOOR REMOTE CALCULATION

Page 6
 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	*****
			0.0 63.97						20.803		K Factor = 14.03	
255 to 256	122.670 122.670	4.06	18.14	1	T	5.0 0.0	2.250 5.000	120	20.015 0.0		K = K @ L1	
			18.14	1.049		0.0	7.250	0.1087	0.788		Vel = 6.73	
256 to 257	122.670 122.670		63.97	1.25		0.0 0.0	7.170 0.0	120	20.803 0.0			
			82.11	1.38		0.0	7.170	0.4668	3.347		Vel = 17.61	
257 to 258	122.670 122.670	4.06	19.93	1.25		0.0 0.0	13.460 0.0	120	24.150 0.0		K = K @ L1	
			102.04	1.38		0.0	13.460	0.6976	9.390		Vel = 21.89	
258 to 259	122.670 122.670		0.0	1.25	T	6.0 0.0	14.370 6.000	120	33.540 0.0			
			102.04	1.38		0.0	20.370	0.6977	14.212		Vel = 21.89	
259 to 266	122.670 122.670		0.0	2		0.0 0.0	12.420 0.0	120	47.752 0.0			
			102.04	2.157		0.0	12.420	0.0793	0.985		Vel = 8.96	
266 to 267	122.670 122.670		95.97	2	T	12.307 0.0	7.460 12.307	120	48.737 0.0			
			198.01	2.157		0.0	19.767	0.2701	5.340		Vel = 17.39	
267 to 268	122.670 122.670		0.0	2.5	3l	24.711 0.0	30.960 24.711	120	54.077 0.0			
			198.01	2.635		0.0	55.671	0.1019	5.675		Vel = 11.65	
268 to 212	122.670 122.670		0.0	2.5	5l	41.186 0.0	51.330 41.186	120	59.752 0.0			
			198.01	2.635		0.0	92.516	0.1019	9.430		Vel = 11.65	
212 to 216	122.670 122.670		0.0	2.5	l T	8.237 16.474	47.000 24.711	120	69.182 0.0			
			198.01	2.635		0.0	71.711	0.1019	7.310		Vel = 11.65	
216 to 217	122.670 122.670		0.0	2.5	T	16.474 0.0	5.330 16.474	120	76.492 0.0			
			198.01	2.635		0.0	21.804	0.1019	2.222		Vel = 11.65	
217 to 114	122.670 109		0.0	3	3l 2J	20.159 34.943	32.000 55.102	120	78.714 5.920			
			198.01	3.26		0.0	87.102	0.0362	3.150		Vel = 7.61	
114 to A	109 109		0.0	3	2l	13.44 0.0	26.170 13.440	120	87.784 0.0			
			198.01	3.26		0.0	39.610	0.0362	1.432		Vel = 7.61	
A to TOR	109 109		0.0	3	2l J	13.44 17.471	11.580 30.911	120	89.216 0.0			
			198.01	3.26		0.0	42.491	0.0361	1.536		Vel = 7.61	
TOR to B1	109 109		0.0	3	B 6l	13.44 40.319	104.120 75.262	120	90.752 0.0			
			198.01	3.26	S	21.503	179.382	0.0362	6.485		Vel = 7.61	
B1 to BASE	109 101		0.0	4	l Zcb	9.217 0.0	8.000 9.217	120	97.237 7.282		* * Fixed Loss = 3.817	
			198.01	4.26		0.0	17.217	0.0098	0.169		Vel = 4.46	

Final Calculations - Hazen-Williams

Eastern Fire Protection
 MAINE EYE CENTER SECOND FLOOR REMOTE CALCULATION

Page 7
 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	*****
BASE to TEST	101 100		0.0 198.01	6 6.16	L G T	12.911 4.304 43.037	100.000 60.252 160.252	140 0.0012	104.688 0.433 0.196	Vel = 2.13	
TEST			100.00 298.01						105.317	Qa = 100.00 K Factor = 29.04	