

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

Accendo Fire Protection, LLC  
38 Additon Road  
Greene, Maine 04236  
207-946-6182

Job Name : BEDECS MOB SECOND FLOOR MOST DEMANDING  
Drawing : 2  
Location : 1945 CONGRESS STREET PORTLAND, MAINE  
Remote Area : 2  
Contract : 17-1015  
Data File : 2-17-1015 SECOND FLOOR MOST DEMANDING.WXF

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**HYDRAULIC CALCULATIONS**  
*for*

**Project name:** BEDECS MOB  
**Location:** 1945 CONGRESS STREET PORTLAND, MAINE  
**Drawing no:** 2  
**Date:** 8/22/17

**Design**

**Remote area number:** 2  
**Remote area location:** SECOND FLOOR MOST REMOTE  
**Occupancy classification:** LIGHT  
**Density:** .10 - Gpm/SqFt  
**Area of application:** 2120 - SqFt  
**Coverage per sprinkler:** 90/122 - SqFt  
**Type of sprinklers calculated:** QR K5.6 1/2" BRASS UPRIGHTS  
**No. of sprinklers calculated:** 26  
**In-rack demand:** - GPM  
**Hose streams:** 100 - GPM  
**Total water required (including hose streams):** 577.927 - GPM @ 63.821 - Psi  
**Type of system:** 6/14/17 WET  
**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 9/28/2000  
**Location:** 150'-0" FROM THE BUILDING  
**Source:** THE PORTLAND WATER DISTRICT

**Name of contractor:** ACCENDO FIRE PROTECTION LLC  
**Address:** 38 ADDITON ROAD GREENE, MAINE 04236  
**Phone number:** 946-6182  
**Name of designer:** CKD  
**Authority having jurisdiction:** SFM, PORTLAND  
**Notes: (Include peaking information or gridded systems here.)**  
REMOTE AREA PER NFPA 13 SECTION 11.2.3.2.4

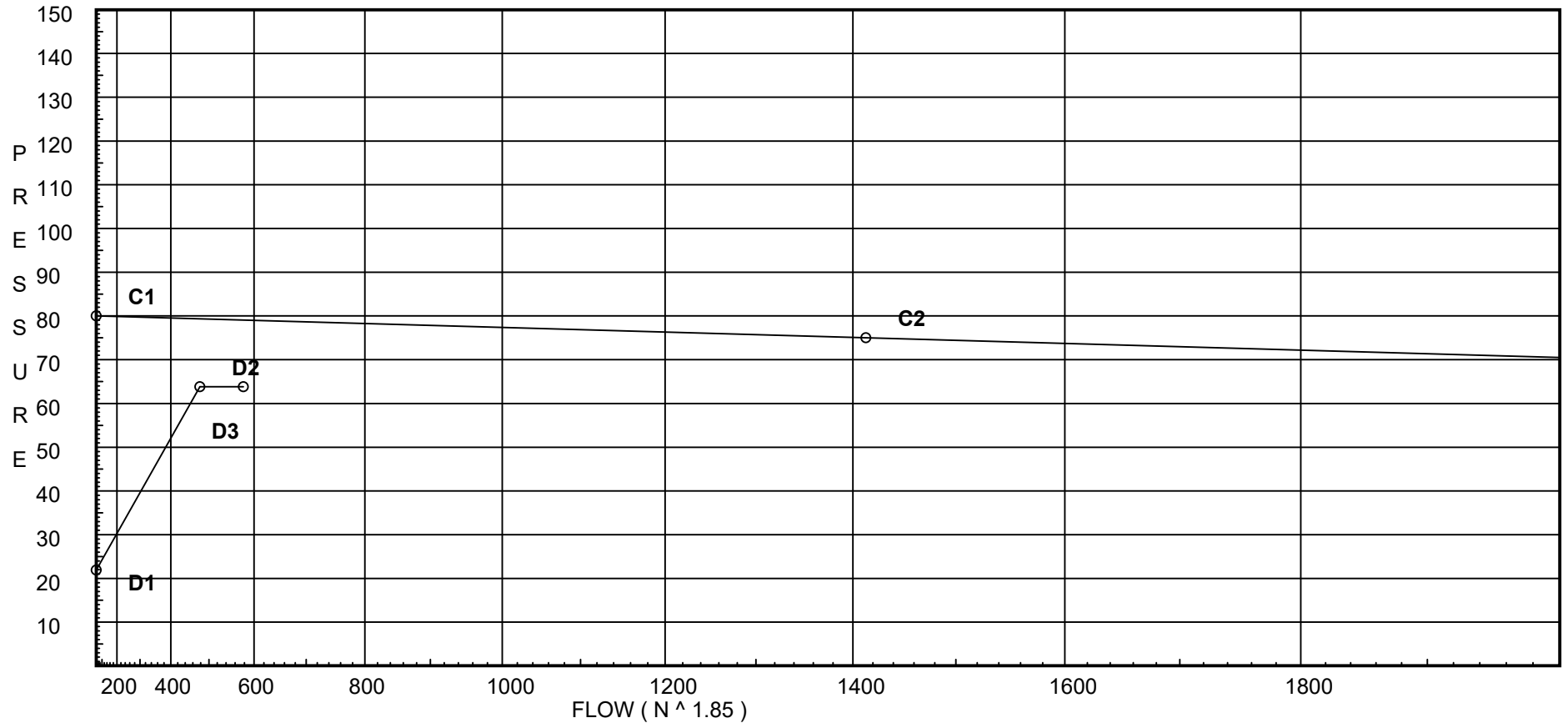
# Water Supply Curve C

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BEDECS MOB SECOND FLOOR MOST DEMANDING

Page 2  
Date 8/22/17

City Water Supply:  
C1 - Static Pressure : 80  
C2 - Residual Pressure: 75  
C2 - Residual Flow : 1413

Demand:  
D1 - Elevation : 21.924  
D2 - System Flow : 477.927  
D2 - System Pressure : 63.821  
Hose ( Demand ) : 100  
D3 - System Demand : 577.927  
Safety Margin : 15.223



# Fittings Used Summary

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BEDECS MOB SECOND FLOOR MOST DEMANDING

Page 3  
Date 8/22/17

## 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
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.

# Pressure / Flow Summary - STANDARD

Accendo Fire Protection, LLC  
 BEDECS MOB SECOND FLOOR MOST DEMANDING

Page 4  
 Date 8/22/17

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
SP1	0.0	5.6	7.0	na	14.82	0.1	148	7.0
10	131.42	K = K @ L1	16.13	na	21.69			
D	131.42		16.29	na				
29	131.42	K = K @ L1	12.28	na	18.93			
30	131.42	K = K @ L1	12.38	na	19.01			
31	131.42	K = K @ L1	12.74	na	19.28			
32	131.42	K = K @ L1	13.5	na	19.85			
33	131.42	K = K @ L1	13.2	na	19.62			
34	131.42	K = K @ L1	13.3	na	19.7			
35	131.42	K = K @ L1	13.68	na	19.98			
36	131.42	K = K @ L1	14.5	na	20.57			
H	131.42		16.29	na				
11	142.83	5.6	9.27	na	17.05	0.1	148	7.0
12	142.83	5.6	9.29	na	17.07	0.1	148	7.0
13	142.83	5.6	9.37	na	17.14	0.1	148	7.0
14	142.83	5.6	9.54	na	17.29	0.1	148	7.0
15	142.83	5.6	9.87	na	17.59	0.1	148	7.0
16	142.83	5.6	9.89	na	17.61	0.1	148	7.0
14A	142.83		10.08	na				
17	148.62	5.6	7.0	na	14.82	0.1	148	7.0
18	148.62	5.6	7.02	na	14.83	0.1	148	7.0
19	148.62	5.6	7.08	na	14.9	0.1	148	7.0
20	148.62	5.6	7.21	na	15.03	0.1	148	7.0
21	148.62	5.6	7.46	na	15.3	0.1	148	7.0
22	148.62	5.6	7.48	na	15.31	0.1	148	7.0
20A	148.62		7.63	na				
23	142.83	5.6	9.56	na	17.31	0.1	148	7.0
24	142.83	5.6	9.58	na	17.33	0.1	148	7.0
25	142.83	5.6	9.66	na	17.4	0.1	148	7.0
26	142.83	5.6	9.83	na	17.56	0.1	148	7.0
27	142.83	5.6	10.17	na	17.86	0.1	148	7.0
28	142.83	5.6	10.2	na	17.88	0.1	148	7.0
26A	142.83		10.4	na				
E	131.42		16.39	na				
F	131.42		16.53	na				
G	131.42		16.74	na				
M	131.42		20.57	na				
N	131.42		26.48	na				
Q	131.42		28.39	na				
R	108.33		40.27	na				
TOR	108.33		44.78	na				
HDR	102.0		49.95	na				
HDR1	102.0		51.37	na				
BASE	101.0		61.16	na				
TEST	98.0		63.82	na	100.0			

The maximum velocity is 11.53 and it occurs in the pipe between nodes 36 and H

# Final Calculations - Hazen-Williams - 2007

Accendo Fire Protection, LLC  
 BEDECS MOB SECOND FLOOR MOST DEMANDING

Page 5  
 Date 8/22/17

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	*****
SP1 to L1	0 0	5.60	14.82 14.82	1 1.049	T 0.0	5.0 0.0 7.000	120 0.0747	7.000 0.0 0.523		Vel = 5.50	
L1			0.0 14.82					7.523		K Factor = 5.40	
10 to D	131.420 131.420	5.4	21.69 21.69	1.5 1.682	T 0.0	9.9 0.0 10.570	120 0.0151	16.127 0.0 0.160		K = K @ L1 Vel = 3.13	
D to H	131.420 131.420		0.0 21.69	4 4.26		0.0 0.0 14.670 0.0	120 0.0002	16.287 0.0 0.003		Vel = 0.49	
H			0.0 21.69					16.290		K Factor = 5.37	
29 to 30	131.420 131.420	5.4	18.93 18.93	1.5 1.682		0.0 0.0 8.370	120 0.0117	12.282 0.0 0.098		K = K @ L1 Vel = 2.73	
30 to 31	131.420 131.420	5.4	19.01 37.94	1.5 1.682		0.0 0.0 8.370	120 0.0427	12.380 0.0 0.357		K = K @ L1 Vel = 5.48	
31 to 32	131.420 131.420	5.4	19.28 57.22	1.5 1.682		0.0 0.0 8.370	120 0.0913	12.737 0.0 0.764		K = K @ L1 Vel = 8.26	
32 to H	131.420 131.420	5.4	19.85 77.07	1.5 1.682	T 0.0	9.9 0.0 17.610	120 0.1584	13.501 0.0 2.789		K = K @ L1 Vel = 11.13	
H			0.0 77.07					16.290		K Factor = 19.10	
33 to 34	131.420 131.420	5.4	19.62 19.62	1.5 1.682		0.0 0.0 8.370	120 0.0125	13.198 0.0 0.105		K = K @ L1 Vel = 2.83	
34 to 35	131.420 131.420	5.4	19.71 39.33	1.5 1.682		0.0 0.0 8.370	120 0.0456	13.303 0.0 0.382		K = K @ L1 Vel = 5.68	
35 to 36	131.420 131.420	5.4	19.98 59.31	1.5 1.682		0.0 0.0 8.370	120 0.0975	13.685 0.0 0.816		K = K @ L1 Vel = 8.56	
36 to H	131.420 131.420	5.4	20.57 79.88	1.5 1.682	T 0.0	9.9 0.0 10.570	120 0.1693	14.501 0.0 1.789		K = K @ L1 Vel = 11.53	
H to E	131.420 131.420		98.76 178.64	4 4.26		0.0 0.0 11.920 0.0	120 0.0081	16.290 0.0 0.096		Vel = 4.02	
E			0.0 178.64					16.386		K Factor = 44.13	
11 to 12	142.830 142.830	5.60	17.05 17.05	2 2.157		0.0 0.0 7.500	120 0.0028	9.269 0.0 0.021		Vel = 1.50	
12 to 13	142.830 142.830	5.60	17.07 34.12	2 2.157		0.0 0.0 7.500	120 0.0105	9.290 0.0 0.079		Vel = 3.00	

# Final Calculations - Hazen-Williams

Accendo Fire Protection, LLC  
 BEDECS MOB SECOND FLOOR MOST DEMANDING

Page 6  
 Date 8/22/17

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	*****
13 to 14	142.830 142.830	5.60	17.14 51.26	2 2.157	0.0 0.0	7.500 0.0	120	9.369 0.0			
									0.0221	0.166	Vel = 4.50
14 to 14A	142.830 142.830	5.60	17.29 68.55	2 2.157	T 0.0	12.307 12.307	2.170 14.477	120 0.0	9.535 0.0		Vel = 6.02
			0.0 68.55							10.085	K Factor = 21.59
15 to 16	142.830 142.830	5.60	17.59 17.59	2 2.157	0.0 0.0	7.500 0.0	120	9.867 0.0			Vel = 1.54
									0.0031	0.023	
16 to 14A	142.830 142.830	5.60	17.61 35.2	2 2.157	T 0.0	12.307 12.307	5.330 17.637	120 0.0	9.890 0.0		Vel = 3.09
									0.0111	0.195	
14A to E	142.830 131.420		68.55 103.75	2 2.157	T 0.0	12.307 12.307	4.330 16.637	120 0.0	10.085 4.942		Vel = 9.11
			0.0 103.75							16.386	K Factor = 25.63
17 to 18	148.620 148.620	5.60	14.82 14.82	2 2.157	0.0 0.0	7.500 0.0	120	7.000 0.0			Vel = 1.30
									0.0023	0.017	
18 to 19	148.620 148.620	5.60	14.83 29.65	2 2.157	0.0 0.0	7.500 0.0	120	7.017 0.0			Vel = 2.60
									0.0080	0.060	
19 to 20	148.620 148.620	5.60	14.90 44.55	2 2.157	0.0 0.0	7.500 0.0	120	7.077 0.0			Vel = 3.91
									0.0171	0.128	
20 to 20A	148.620 148.620	5.60	15.03 59.58	2 2.157	T 0.0	12.307 12.307	2.170 14.477	120 0.0	7.205 0.0		Vel = 5.23
			0.0 59.58							0.0293	0.424
										7.629	K Factor = 21.57
21 to 22	148.620 148.620	5.60	15.30 15.3	2 2.157	0.0 0.0	7.500 0.0	120	7.461 0.0			Vel = 1.34
									0.0024	0.018	
22 to 20A	148.620 148.620	5.60	15.31 30.61	2 2.157	T 0.0	12.307 12.307	5.330 17.637	120 0.0	7.479 0.0		Vel = 2.69
									0.0085	0.150	
20A to F	148.620 131.420		59.58 90.19	2 2.157	T 0.0	12.307 12.307	10.750 23.057	120 0.0	7.629 7.449		Vel = 7.92
			0.0 90.19							0.0631	1.455
										16.533	K Factor = 22.18
23 to 24	142.830 142.830	5.60	17.31 17.31	2 2.157	0.0 0.0	7.500 0.0	120	9.556 0.0			Vel = 1.52
									0.0031	0.023	
24 to 25	142.830 142.830	5.60	17.33 34.64	2 2.157	0.0 0.0	7.500 0.0	120	9.579 0.0			Vel = 3.04
									0.0107	0.080	

# Final Calculations - Hazen-Williams

Accendo Fire Protection, LLC  
 BEDECS MOB SECOND FLOOR MOST DEMANDING

Page 7  
 Date 8/22/17

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	*****
25 to 26	142.830 142.830	5.60	17.41 52.05	2 2.157		0.0 0.0 7.500	120 0.0228	9.659 0.0 0.171		Vel = 4.57	
26 to 26A	142.830 142.830	5.60	17.56 69.61	2 2.157	T 0.0	12.307 0.0 12.307 14.477	120 0.0391	9.830 0.0 0.566		Vel = 6.11	
26A			0.0 69.61					10.396		K Factor = 21.59	
27 to 28	142.830 142.830	5.60	17.86 17.86	2 2.157		0.0 0.0 7.500	120 0.0031	10.172 0.0 0.023		Vel = 1.57	
28 to 26A	142.830 142.830	5.60	17.88 35.74	2 2.157	T 0.0	12.307 0.0 12.307 17.637	120 0.0114	10.195 0.0 0.201		Vel = 3.14	
26A to G	142.830 131.420		69.61 105.35	2 2.157	T 0.0	12.307 0.0 12.307 16.637	120 0.0840	10.396 4.942 1.398		Vel = 9.25	
G			0.0 105.35					16.736		K Factor = 25.75	
E to F	131.420 131.420		282.39 282.39	4 4.26		0.0 0.0 7.750	120 0.0190	16.386 0.0 0.147		Vel = 6.36	
F to G	131.420 131.420		90.19 372.58	4 4.26		0.0 0.0 6.420 6.420	120 0.0316	16.533 0.0 0.203		Vel = 8.39	
G to M	131.420 131.420		105.35 477.93	4 4.26	T 0.0	26.334 0.0 26.334 76.374	120 0.0501	16.736 0.0 3.830		Vel = 10.76	
M to N	131.420 131.420		0.0 477.93	4 4.26	B S L T	15.8 28.968 7.9 26.334	120 0.0502	20.566 0.0 5.918		Vel = 10.76	
N to Q	131.420 131.420		0.0 477.93	4 4.26	T 0.0	26.334 0.0 26.334 38.004	120 0.0501	26.484 0.0 1.905		Vel = 10.76	
Q to R	131.420 108.330		0.0 477.93	4 4.26	T 0.0	26.334 0.0 26.334 37.504	120 0.0502	28.389 10.000 1.881		Vel = 10.76	
R to TOR	108.330 108.330		0.0 477.93	4 4.26	4L 0.0	31.601 0.0 31.601 89.931	120 0.0501	40.270 0.0 4.510		Vel = 10.76	
TOR to HDR	108.330 102		0.0 477.93	4 4.26	T B 0.0	26.334 15.8 42.134 48.464	120 0.0501	44.780 2.742 2.430		Vel = 10.76	
HDR to HDR1	102 102		0.0 477.93	4 4.26	T 0.0	26.334 0.0 26.334 28.334	120 0.0502	49.952 0.0 1.421		Vel = 10.76	
HDR1 to BASE	102 101		0.0 477.93	4 4.26	E Zca 0.0	13.167 0.0 13.167 19.167	120 0.0501	51.373 8.827 0.961		* * Fixed Loss = 8.394 Vel = 10.76	



# Final Calculations - Hazen-Williams

Accendo Fire Protection, LLC  
 BEDECS MOB SECOND FLOOR MOST DEMANDING

Page 8  
 Date 8/22/17

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 98		0.0 477.93	6 6.16	E G T	20.084 4.304 43.037	150.000 67.425 217.425	140 1.299 1.361		Vel = 5.15	
TEST			100.00 577.93					63.821		Qa = 100.00 K Factor = 72.34	