



... Fire Protection by Computer Design

HIGH TECH FIRE PROTECTION
84 HACKETT MILLS ROAD
P.O. BOX 156
POLAND, ME 04274
207-998-2551

Job Name : Asylum Right of Stage 1st Floor Calc #2
Drawing : FP-01
Location : 121 Center Street Portland
Remote Area : #2
Contract : 062716-1
Data File : Right of Stage 1st floor.WXF

HYDRAULIC CALCULATIONS
for

Project name: Asylum Right of Stage 1st floor
Location: 121 Center Street Portland
Drawing no: FP-01
Date: 10/20/16

Design

Remote area number: #2
Remote area location: Addition Right of Stage 1st floor
Occupancy classification: Light Hazard
Density: .1 - Gpm/SqFt
Area of application: 975 - SqFt
Coverage per sprinkler: 196 - SqFt
Type of sprinklers calculated: Quick Response Pendent
No. of sprinklers calculated: 10
In-rack demand: N/A - GPM
Hose streams: 100 - GPM
Total water required (including hose streams): 218 - GPM @ 64 - Psi
Type of system: Wet
Volume of dry or preaction system: N/A - Gal

Water supply information

Date: 10/18/16
Location: Hydrant in front of building
Source: Portland Water District

Name of contractor: HIGH TECH FIRE PROTECTION
Address: 84 HACKETT MILLS ROAD / P.O. BOX 156 / POLAND, ME 04274
Phone number: 207-998-2551
Name of designer: Ed Poulin
Authority having jurisdiction: State of Maine / City of Portland
Notes: (Include peaking information or gridded systems here.)

Water Supply Curve (C)

HIGH TECH FIRE PROTECTION
Asylum Right of Stage 1st Floor Calc #2

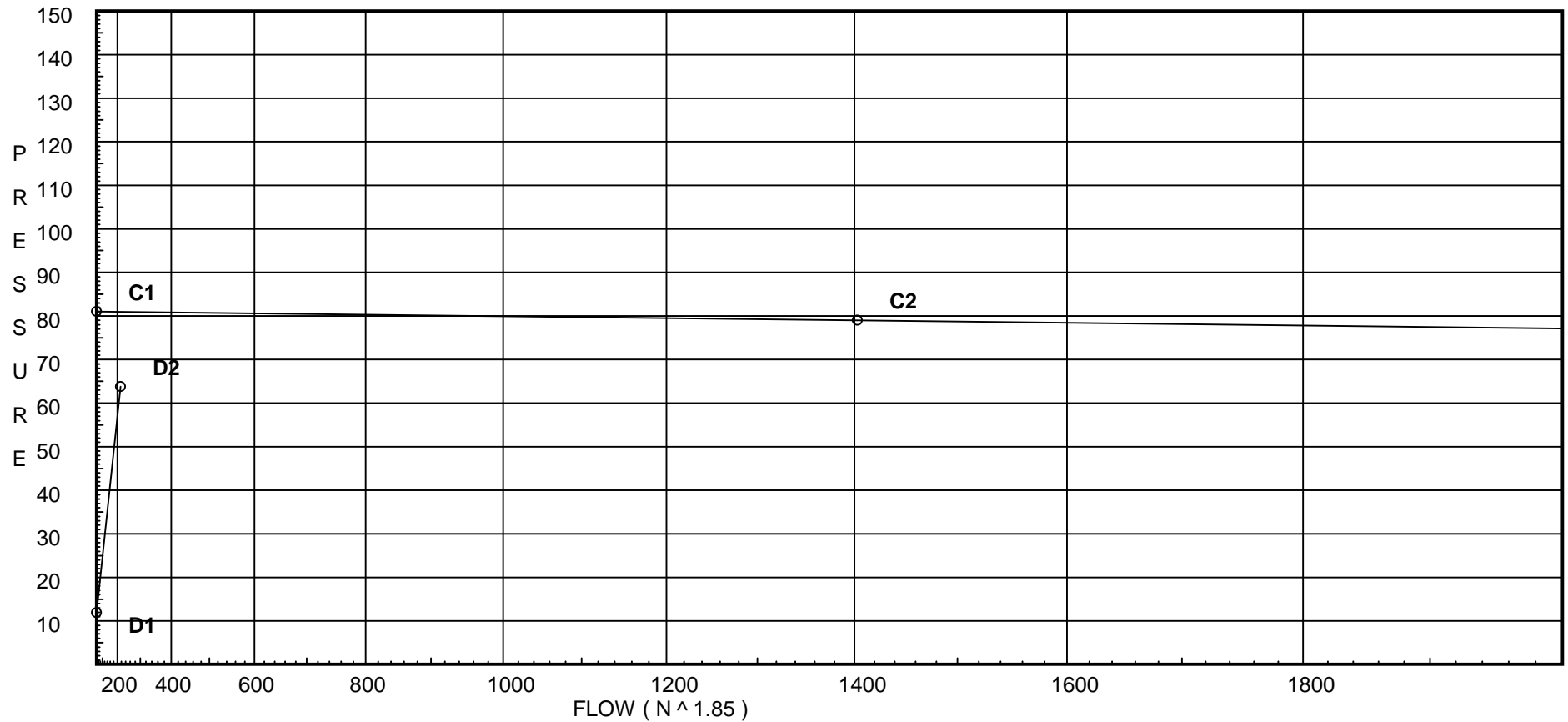
Page 2
Date 9/22/16

City Water Supply:

C1 - Static Pressure : 81
C2 - Residual Pressure: 79
C2 - Residual Flow : 1403

Demand:

D1 - Elevation : 11.910
D2 - System Flow : 217.146
D2 - System Pressure : 63.790
Hose (Demand) :
D3 - System Demand : 217.146
Safety Margin : 17.146



Fittings Used Summary

HIGH TECH FIRE PROTECTION
Asylum Right of Stage 1st Floor Calc #2

Page 3
Date 9/22/16

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
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	1	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
V	90' Ell Firelock #001	0	0	0	0	3.5	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X	90'Tee-BranchFirelock002	0	0	0	0	8	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zib	Wilkins 350A	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

HIGH TECH FIRE PROTECTION
Asylum Right of Stage 1st Floor Calc #2

Page 4
Date 9/22/16

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	-1.0	5.6	12.25	na	19.6	0.1	196	7.0
DP2	-1.0	5.6	12.25	na	19.6	0.1	196	7.0
200	29.5	K = K @ EQ01	13.57	na	20.11			
205	29.5	5.6	12.67	na	19.93	0.1	196	7.0
206	29.5		13.59	na				
215	29.5	K = K @ EQ01	12.88	na	19.6			
216	29.5		14.02	na				
220	29.5	K = K @ EQ01	14.65	na	20.9			
225	29.5		15.65	na				
226	29.0		16.7	na				
230	29.0	K = K @ EQ02	12.89	na	19.9			
231	29.0	K = K @ EQ01	14.18	na	20.57			
232	29.0		17.54	na				
240	29.0	K = K @ EQ02	14.08	na	20.79			
241	29.0	K = K @ EQ01	15.48	na	21.48			
242	29.0		19.11	na				
250	29.0		21.58	na				
251	28.5		22.71	na				
260	28.5	K = K @ EQ01	23.31	na	26.37			
265	28.5	K = K @ EQ01	25.34	na	27.49			
266	28.5		25.81	na				
267	28.5		27.75	na				
270	28.5		30.57	na				
271	28.0		31.56	na				
272	28.0		35.28	na				
273	28.0		40.41	na				
AH	28.0		43.26	na				
AI	8.0		52.19	na				
AJ	8.0		52.47	na				
AK	8.0		54.09	na				
TOR	6.0		55.29	na				
BOR	2.0		60.14	na				
BASE	-2.0		65.39	na				
H1	-2.0		65.47	na				
H2	-2.0		65.48	na				
TEST	2.0		63.79	na				

The maximum velocity is 19.07 and it occurs in the pipe between nodes 266 and 267

Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION
Asylum Right of Stage 1st Floor Calc #2

Page 5
Date 9/22/16

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftn'g's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
DP1 to EQ01	19.60 19.6	1.049 120.0 0.1253	1E 2.0 1T 5.0 0.0	1.500 7.000 8.500	12.250 -0.433 1.065		K Factor = 5.60 Vel = 7.28		
	0.0 19.60					12.882	K Factor = 5.46		
DP2 to EQ02	19.60 19.6	1.049 120.0 0.1253	2E 4.0 0.0 0.0	1.500 4.000 5.500	12.250 -0.433 0.689		K Factor = 5.60 Vel = 7.28		
	0.0 19.60					12.506	K Factor = 5.54		
200 to 206	20.11 20.11	1.682 120.0 0.0129	0.0 0.0 0.0	1.700 0.0 1.700	13.567 0.0 0.022		K Factor @ node EQ01 Vel = 2.90		
	0.0 20.11					13.589	K Factor = 5.46		
205 to 206	19.93 19.93	1.049 120.0 0.1293	1T 5.0 0.0 0.0	2.100 5.000 7.100	12.671 0.0 0.918		K Factor = 5.60 Vel = 7.40		
206 to 216	20.12 40.05	1.682 120.0 0.0472	0.0 0.0 0.0	9.200 0.0 9.200	13.589 0.0 0.434		Vel = 5.78		
	0.0 40.05					14.023	K Factor = 10.70		
215 to 216	19.60 19.6	1.049 120.0 0.1254	1T 5.0 0.0 0.0	4.100 5.000 9.100	12.882 0.0 1.141		K Factor @ node EQ01 Vel = 7.28		
216 to 220	40.05 59.65	1.682 120.0 0.0986	1V 4.331 0.0 0.0	2.000 4.331 6.331	14.023 0.0 0.624		Vel = 8.61		
220 to 225	20.90 80.55	1.682 120.0 0.1718	1V 4.331 0.0 0.0	1.500 4.331 5.831	14.647 0.0 1.002		K Factor @ node EQ01 Vel = 11.63		
225 to 226	0.0 80.55	1.682 120.0 0.1718	1V 4.331 0.0 0.0	0.500 4.331 4.831	15.649 0.217 0.830		Vel = 11.63		
226 to 232	0.0 80.55	1.682 120.0 0.1718	0.0 0.0 0.0	4.900 0.0 4.900	16.696 0.0 0.842		Vel = 11.63		
	0.0 80.55					17.538	K Factor = 19.23		
230 to 231	19.90 19.9	1.049 120.0 0.1290	0.0 0.0 0.0	10.000 0.0 10.000	12.893 0.0 1.290		K Factor @ node EQ02 Vel = 7.39		
231 to 232	20.57 40.47	1.049 120.0 0.4793	1T 5.0 0.0 0.0	2.000 5.000 7.000	14.183 0.0 3.355		K Factor @ node EQ01 Vel = 15.02		
232 to 242	80.54 121.01	2.157 120.0 0.1086	0.0 0.0 0.0	14.500 0.0 14.500	17.538 0.0 1.575		Vel = 10.62		

Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION
Asylum Right of Stage 1st Floor Calc #2

Page 6
Date 9/22/16

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 121.01						19.113		K Factor = 27.68	
240 to 241	20.79	1.049 120.0		0.0	10.000	14.077 0.0			K Factor @ node EQ02	
241 to 242	20.79	0.1398		0.0	10.000	1.398			Vel = 7.72	
241 to 242	21.49	1.049 120.0	1T	5.0	2.000	15.475 0.0			K Factor @ node EQ01	
242 to 250	42.28	0.5197		0.0	7.000	3.638			Vel = 15.70	
242 to 250	121.01	2.157 120.0	1V	4.307	8.750	19.113 0.0				
250 to 251	163.29	0.1892		0.0	13.057	2.470			Vel = 14.34	
250 to 251	0.0	2.157 120.0	1V	4.307	0.500	21.583 0.217				
251 to 260	163.29	0.1889		0.0	4.807	0.908			Vel = 14.34	
251 to 260	0.0	2.157 120.0		0.0	3.200	22.708 0.0				
260 to 266	163.29	0.1894		0.0	3.200	0.606			Vel = 14.34	
260 to 266	26.37	2.157 120.0		0.0	10.000	23.314 0.0			K Factor @ node EQ01	
266	189.66	0.2494		0.0	10.000	2.494			Vel = 16.65	
	0.0 189.66						25.808		K Factor = 37.33	
265 to 266	27.49	1.049 120.0		0.0	2.000	25.340 0.0			K Factor @ node EQ01	
266 to 267	27.49	0.2340		0.0	2.000	0.468			Vel = 10.21	
266 to 267	189.66	2.157 120.0	1V	4.307	1.750	25.808 0.0				
267 to 270	217.15	0.3206		0.0	6.057	1.942			Vel = 19.07	
267 to 270	0.0	2.635 120.0	1V	5.903	17.400	27.750 0.0				
270 to 271	217.15	0.1209		0.0	23.303	2.817			Vel = 12.78	
270 to 271	0.0	2.635 120.0	1V	5.903	0.500	30.567 0.217				
271 to 272	217.15	0.1209		0.0	6.403	0.774			Vel = 12.78	
271 to 272	0.0	2.635 120.0	1X	14.827	16.000	31.558 0.0				
272 to 273	217.15	0.1209		0.0	30.827	3.727			Vel = 12.78	
272 to 273	0.0	2.635 120.0	1V	5.903	36.500	35.285 0.0				
273 to AH	217.15	0.1209		0.0	42.403	5.127			Vel = 12.78	
273 to AH	0.0	2.635 120.0	1X	14.827	8.700	40.412 0.0				
AH	217.15	0.1209		0.0	23.527	2.844			Vel = 12.78	
	0.0 217.15						43.256		K Factor = 33.02	
AH to AI	217.15	4.26 120.0	1V	8.954	14.000	43.256 8.662				
AI	217.15	0.0117		0.0	22.954	0.268			Vel = 4.89	

Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION
Asylum Right of Stage 1st Floor Calc #2

Page 7
Date 9/22/16

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
AI	0.0	4.26	1X	21.067	3.300	52.186				
to		120.0		0.0	21.067	0.0				
AJ	217.15	0.0116		0.0	24.367	0.283		Vel =	4.89	
AJ	0.0	4.26	4V	35.814	77.000	52.469				
to		120.0	1T	26.334	62.148	0.0				
AK	217.15	0.0117		0.0	139.148	1.622		Vel =	4.89	
AK	0.0	4.026	1T	20.0	2.000	54.091				
to		120.0		0.0	20.000	0.866				
TOR	217.15	0.0154		0.0	22.000	0.338		Vel =	5.47	
TOR	0.0	4.26	1Fsp	0.0	1.000	55.295				
to		120.0	1V	8.954	8.954	4.732		* Fixed loss =	3	
BOR	217.15	0.0117		0.0	9.954	0.116		Vel =	4.89	
BOR	0.0	4.26	1Zib	0.0	1.000	60.143				
to		120.0	1E	13.167	13.167	5.083		* Fixed loss =	3.351	
BASE	217.15	0.0116		0.0	14.167	0.165		Vel =	4.89	
BASE	0.0	6.16	1G	4.304	10.000	65.391				
to		140.0	1T	43.037	47.341	0.0				
H1	217.15	0.0015		0.0	57.341	0.084		Vel =	2.34	
H1	0.0	12.24	1T	48.362	5.000	65.475				
to		100.0		0.0	48.362	0.0				
H2	217.15	0.0001		0.0	53.362	0.005		Vel =	0.59	
H2	0.0	6.16	1G	4.304	5.000	65.480				
to		140.0	1E	20.084	24.388	-1.732				
TEST	217.15	0.0014		0.0	29.388	0.042		Vel =	2.34	
	0.0									
	217.15					63.790		K Factor =	27.19	