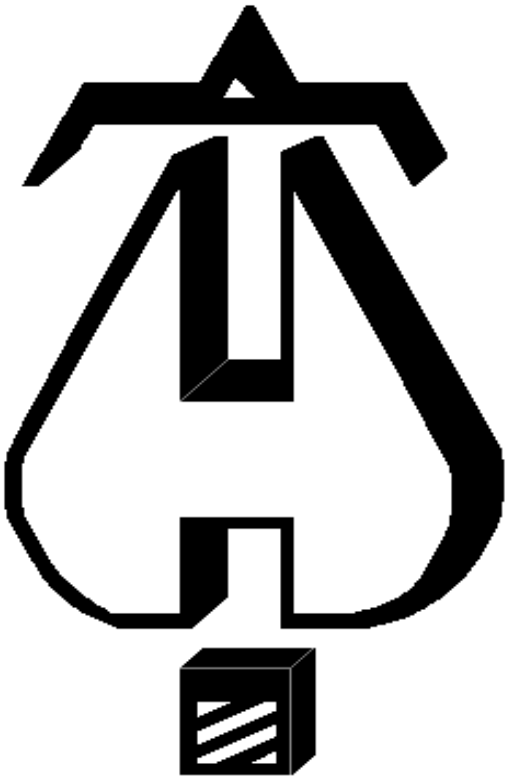


. . . Fire Protection by Computer Design

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

Job Name	:	Asylum Stage Open area calc #1
Drawing	:	FP-02
Location	:	121 Center Street Portland
Remote Area	:	#1
Contract	:	062716-1
Data File	:	Stage calc.WXF

HYDRAULIC CALCULATIONS
for

Project name: Asylum Stage Open area calc
Location: 121 Center Street Portland
Drawing no: FP-02
Date: 10/20/16

Design

Remote area number: #1
Remote area location: Addition Stage High Ceiling
Occupancy classification: Ordinary Hazard Group 2
Density: .2 - Gpm/SqFt
Area of application: 1500 - SqFt
Coverage per sprinkler: 113 - SqFt
Type of sprinklers calculated: Quick Response Upright
No. of sprinklers calculated: 18
In-rack demand: N/A - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 428 - GPM @ 65 - 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)

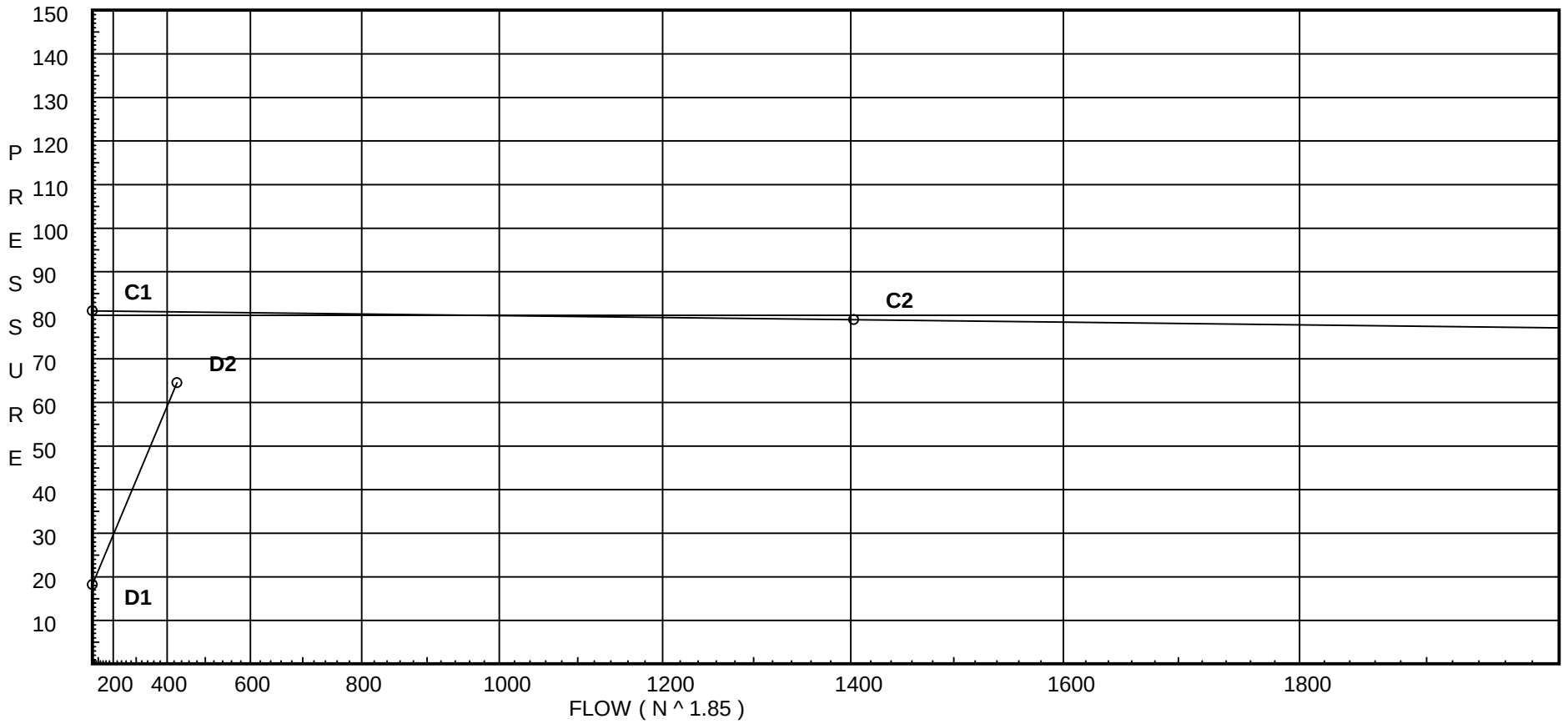
HIGH TECH FIRE PROTECTION
Asylum Stage Open area calc #1

Date 9/22/16

City Water Supply:
- C1 - Static Pressure : 81
- C2 - Residual Pressure: 79
- C2 - Residual Flow : 1403

Demand:

D1 - Elevation	:	18.190
D2 - System Flow	:	427.555
D2 - System Pressure	:	64.513
Hose (Demand)	:	
D3 - System Demand	:	427.555
Safety Margin	:	16.265



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
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

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
300	44.0	5.6	18.54	na	24.11	0.2	113	7.0
301	44.0	5.6	18.59	na	24.14	0.2	113	7.0
302	44.0	5.6	18.74	na	24.25	0.2	113	7.0
303	44.0	5.6	19.08	na	24.46	0.2	113	7.0
310	44.0	5.6	16.29	na	22.6	0.2	113	7.0
311	44.0	5.6	16.37	na	22.66	0.2	113	7.0
312	44.0		16.37	na				
313	44.0	5.6	16.52	na	22.76	0.2	113	7.0
314	44.0	5.6	16.86	na	22.99	0.2	113	7.0
315	44.0	5.6	17.6	na	23.49	0.2	113	7.0
316	44.0	5.6	18.29	na	23.95	0.2	113	7.0
320	44.0	5.6	16.74	na	22.91	0.2	113	7.0
321	44.0	5.6	16.83	na	22.97	0.2	113	7.0
322	44.0		16.83	na				
323	44.0	5.6	16.98	na	23.08	0.2	113	7.0
324	44.0	5.6	17.33	na	23.31	0.2	113	7.0
325	44.0	5.6	18.09	na	23.82	0.2	113	7.0
326	44.0	5.6	18.79	na	24.27	0.2	113	7.0
330	44.0	5.6	21.34	na	25.87	0.2	113	7.0
331	44.0	5.6	21.39	na	25.9	0.2	113	7.0
AA	44.0		20.44	na				
AB	44.0		20.56	na				
AC	44.0		21.12	na				
AD	44.0		22.11	na				
AE	44.0		24.23	na				
AF	28.0		32.18	na				
AG	28.0		35.56	na				
AH	28.0		35.89	na				
AI	8.0		45.49	na				
AJ	8.0		46.48	na				
AK	8.0		52.16	na				
TOR	6.0		54.21	na				
BOR	2.0		59.35	na				
BASE	-2.0		65.79	na				
H1	-2.0		66.08	na				
H2	-2.0		66.1	na				
TEST	2.0		64.51	na				

The maximum velocity is 14.44 and it occurs in the pipe between nodes AC and AD

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
300	24.11	2.157		0.0	9.000	18.537		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
301	24.11	0.0054		0.0	9.000	0.049		Vel = 2.12
301	24.14	2.157		0.0	8.000	18.586		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
302	48.25	0.0199		0.0	8.000	0.159		Vel = 4.24
302	24.25	2.157		0.0	8.000	18.745		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
303	72.5	0.0421		0.0	8.000	0.337		Vel = 6.37
303	24.46	2.157	1T	12.307	6.500	19.082		K Factor = 5.60
to		120.0		0.0	12.307	0.0		
AA	96.96	0.0721		0.0	18.807	1.356		Vel = 8.51
	0.0							
	96.96					20.438		K Factor = 21.45
310	22.60	2.157	1X	10.461	7.500	16.287		K Factor = 5.60
to		120.0		0.0	10.461	0.0		
312	22.6	0.0049		0.0	17.961	0.088		Vel = 1.98
	0.0							
	22.60					16.375		K Factor = 5.58
311	22.66	2.157		0.0	0.500	16.372		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
312	22.66	0.0060		0.0	0.500	0.003		Vel = 1.99
312	22.60	2.157		0.0	8.500	16.375		
to		120.0		0.0	0.0	0.0		
313	45.26	0.0175		0.0	8.500	0.149		Vel = 3.97
313	22.76	2.157		0.0	9.000	16.524		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
314	68.02	0.0374		0.0	9.000	0.337		Vel = 5.97
314	23.00	2.157		0.0	11.500	16.861		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
315	91.02	0.0642		0.0	11.500	0.738		Vel = 7.99
315	23.49	2.157		0.0	7.000	17.599		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
316	114.51	0.0981		0.0	7.000	0.687		Vel = 10.05
316	23.95	2.157	1T	12.307	4.000	18.286		K Factor = 5.60
to		120.0		0.0	12.307	0.0		
AB	138.46	0.1394		0.0	16.307	2.273		Vel = 12.16
	0.0							
	138.46					20.559		K Factor = 30.54
320	22.91	2.157	1X	10.461	7.500	16.740		K Factor = 5.60
to		120.0		0.0	10.461	0.0		
322	22.91	0.0050		0.0	17.961	0.090		Vel = 2.01
	0.0							
	22.91					16.830		K Factor = 5.58
321	22.97	2.157		0.0	0.500	16.827		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
322	22.97	0.0060		0.0	0.500	0.003		Vel = 2.02
322	22.91	2.157		0.0	8.500	16.830		
to		120.0		0.0	0.0	0.0		
323	45.88	0.0181		0.0	8.500	0.154		Vel = 4.03

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
323	23.08	2.157		0.0	9.000	16.984		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
324	68.96	0.0383		0.0	9.000	0.345		Vel = 6.05
324	23.31	2.157		0.0	11.500	17.329		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
325	92.27	0.0658		0.0	11.500	0.757		Vel = 8.10
325	23.82	2.157		0.0	7.000	18.086		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
326	116.09	0.1006		0.0	7.000	0.704		Vel = 10.19
326	24.27	2.157	1T	12.307	4.000	18.790		K Factor = 5.60
to		120.0		0.0	12.307	0.0		
AC	140.36	0.1429		0.0	16.307	2.331		Vel = 12.32
	0.0							
	140.36					21.121		K Factor = 30.54
330	25.87	2.157		0.0	8.000	21.344		K Factor = 5.60
to		120.0		0.0	0.0	0.0		
331	25.87	0.0062		0.0	8.000	0.050		Vel = 2.27
331	25.90	2.157	2V	8.615	11.000	21.394		K Factor = 5.60
to		120.0	1T	12.307	20.922	0.0		
AD	51.77	0.0226		0.0	31.922	0.721		Vel = 4.55
	0.0							
	51.77					22.115		K Factor = 11.01
AA	96.96	3.26		0.0	12.500	20.438		
to		120.0		0.0	0.0	0.0		
AB	96.96	0.0097		0.0	12.500	0.121		Vel = 3.73
AB	138.46	3.26		0.0	11.300	20.559		
to		120.0		0.0	0.0	0.0		
AC	235.42	0.0497		0.0	11.300	0.562		Vel = 9.05
AC	140.36	3.26		0.0	8.400	21.121		
to		120.0		0.0	0.0	0.0		
AD	375.78	0.1183		0.0	8.400	0.994		Vel = 14.44
AD	51.78	4.26	3V	26.861	25.000	22.115		
to		120.0		0.0	26.861	0.0		
AE	427.56	0.0408		0.0	51.861	2.116		Vel = 9.62
AE	0.0	4.26	1V	8.954	16.000	24.231		
to		120.0		0.0	8.954	6.930		
AF	427.56	0.0408		0.0	24.954	1.018		Vel = 9.62
AF	0.0	4.26	3V	26.861	56.000	32.179		
to		120.0		0.0	26.861	0.0		
AG	427.56	0.0408		0.0	82.861	3.382		Vel = 9.62
AG	0.0	4.26		0.0	8.000	35.561		
to		120.0		0.0	0.0	0.0		
AH	427.56	0.0408		0.0	8.000	0.326		Vel = 9.62
AH	0.0	4.26	1V	8.954	14.000	35.887		
to		120.0		0.0	8.954	8.662		
AI	427.56	0.0408		0.0	22.954	0.937		Vel = 9.62
AI	0.0	4.26	1X	21.067	3.300	45.486		
to		120.0		0.0	21.067	0.0		
AJ	427.56	0.0408		0.0	24.367	0.994		Vel = 9.62

Final Calculations - Hazen-Williams

HIGH TECH FIRE PROTECTION
Asylum Stage Open area calc #1

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
AJ	0.0	4.26	4V	35.814	77.000	46.480		
to		120.0	1T	26.334	62.148	0.0		
AK	427.56	0.0408		0.0	139.148	5.679		Vel = 9.62
AK	0.0	4.026	1T	20.0	2.000	52.159		
to		120.0		0.0	20.000	0.866		
TOR	427.56	0.0537		0.0	22.000	1.182		Vel = 10.78
TOR	0.0	4.26	1Fsp	0.0	1.000	54.207		
to		120.0	1V	8.954	8.954	4.732		* Fixed loss = 3
BOR	427.56	0.0409		0.0	9.954	0.407		Vel = 9.62
BOR	0.0	4.26	1Zib	0.0	1.000	59.346		
to		120.0	1E	13.167	13.167	5.862		* Fixed loss = 4.13
BASE	427.56	0.0408		0.0	14.167	0.578		Vel = 9.62
BASE	0.0	6.16	1G	4.304	10.000	65.786		
to		140.0	1T	43.037	47.341	0.0		
H1	427.56	0.0051		0.0	57.341	0.292		Vel = 4.60
H1	0.0	12.24	1T	48.362	5.000	66.078		
to		100.0		0.0	48.362	0.0		
H2	427.56	0.0003		0.0	53.362	0.018		Vel = 1.17
H2	0.0	6.16	1G	4.304	5.000	66.096		
to		140.0	1E	20.084	24.388	-1.732		
TEST	427.56	0.0051		0.0	29.388	0.149		Vel = 4.60
	0.0							
	427.56					64.513		K Factor = 53.23