



... Fire Protection by Computer Design

High Tech Fire Protection
84 Hackett Mills Rd
PO Box 156
Poland, ME, 04274
207-998-2551

Job Name : BAYSIDE BOWL
Building : 1
Location : 58 Alder Street
System : 3
Contract : 033116-2
Data File : Ordinary Calc.WXF

HYDRAULIC CALCULATIONS
for

Project name: BAYSIDE BOWL
Location: 58 Alder Street
Drawing no: 1
Date: 10-7-16

Design

Remote area number: 3
Remote area location: First Floor Kitchen Area
Occupancy classification: Ordinary Group 1
Density: .15 - Gpm/SqFt
Area of application: 1015 - SqFt
Coverage per sprinkler: 130 - SqFt
Type of sprinklers calculated: QR Uprights
No. of sprinklers calculated: 14
In-rack demand: - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 546 - GPM @ 68 - Psi
Type of system: NFPA 13 Wet
Volume of dry or preaction system: - Gal

Water supply information

Date: 10-28-2014
Location: Corner of Kennebec St and Preble St
Source: Portland Water District

Name of contractor: High Tech Fire Protection
Address: 84 Hackett Mills Rd / PO Box 156 / Poland, ME, 04274
Phone number: 207-998-2551
Name of designer: Ed Pennell
Authority having jurisdiction: Portland Fire Department
Notes: (Include peaking information or gridded systems here.)

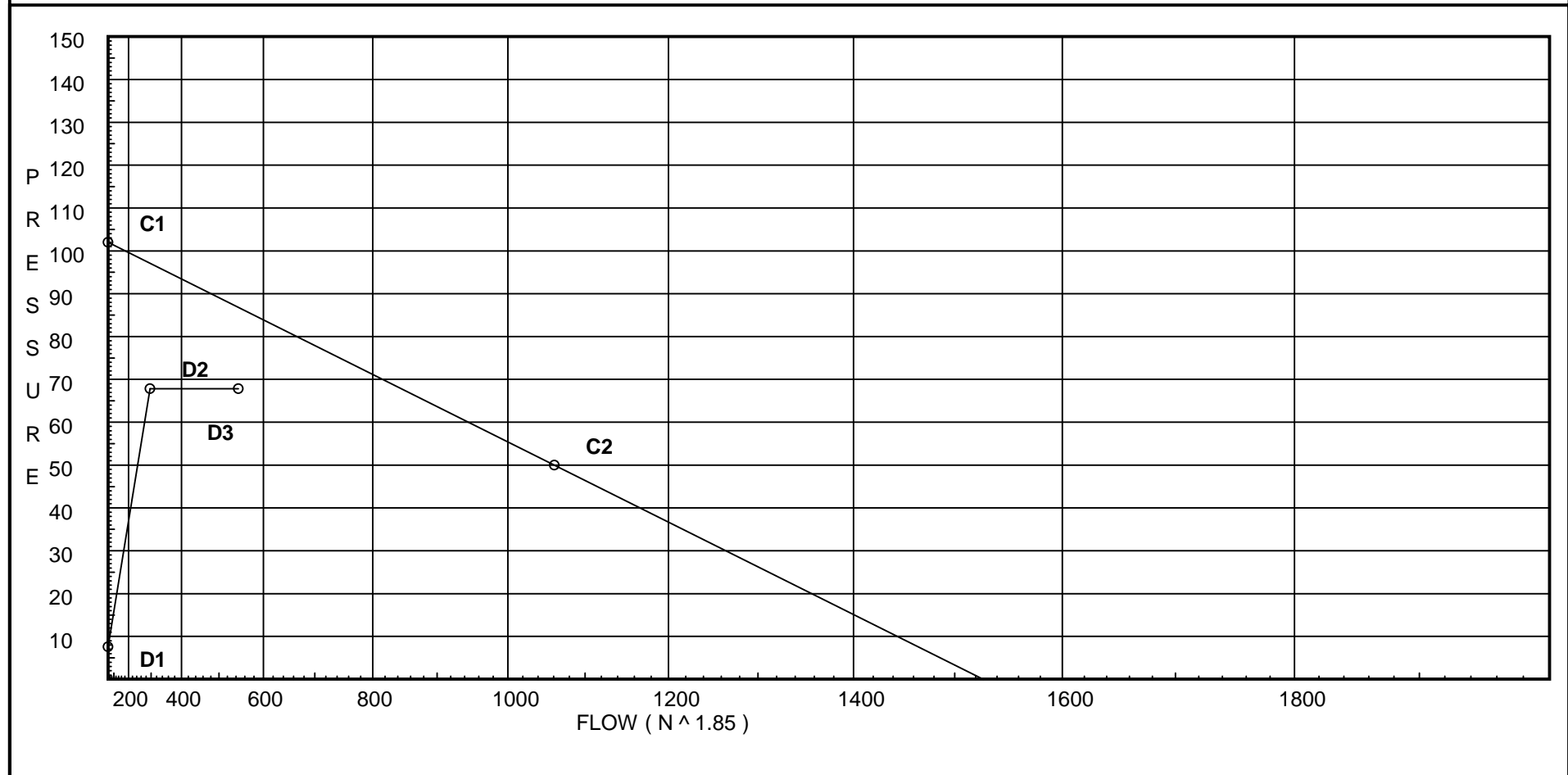
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 102
C2 - Residual Pressure: 50
C2 - Residual Flow : 1061

Demand:
D1 - Elevation : 7.579
D2 - System Flow : 295.705
D2 - System Pressure : 67.802
Hose (Demand) : 250
D3 - System Demand : 545.705
Safety Margin : 18.999



Fittings Used Summary

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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	0	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' EII 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

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

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	1.0	5.6	12.13	na	19.5	0.15	130	7.0
O1	17.5	5.6	12.13	na	19.5	0.15	130	7.0
O2	17.5	5.6	13.02	na	20.21	0.15	130	7.0
O3	16.8		14.12	na				
O4	16.8		16.76	na				
P*	0.0		19.7	na				
O5	17.5	5.6	12.17	na	19.54	0.15	130	7.0
O6	17.5	5.6	13.07	na	20.24	0.15	130	7.0
O7	16.8		14.17	na				
O8	16.8		16.82	na				
O9	17.5	5.6	12.32	na	19.66	0.15	130	7.0
O10	17.5	5.6	13.23	na	20.37	0.15	130	7.0
O11	16.8		14.34	na				
O12	16.8		17.02	na				
O13	17.5	5.6	12.78	na	20.02	0.15	130	7.0
O14	17.5	5.6	13.51	na	20.59	0.15	130	7.0
O15	16.8		14.64	na				
O16	16.8		17.39	na				
O17	17.5	5.6	16.31	na	22.61	0.15	130	7.0
O18	16.8		17.1	na				
O19	16.8		18.03	na				
O20	17.5	5.6	17.18	na	23.21	0.15	130	7.0
O21	16.8		18.0	na				
O22	16.8		18.97	na				
O23	17.5	K = K @ EQ01	15.83	na	21.79			
O24	17.5	K = K @ EQ01	16.21	na	22.05			
O25	16.8		19.85	na				
O27	17.5	K = K @ EQ01	17.38	na	22.83			
O28	17.5	K = K @ EQ01	17.79	na	23.1			
O29	16.8		21.73	na				
O31	17.4		25.19	na				
O32	17.4		26.61	na				
W19	17.4		51.61	na				
W20	6.6		56.46	na				
W21	6.6		56.53	na				
TOR	1.0		59.0	na				
BOR	-1.0		66.87	na				
UG1	-1.0		67.1	na				
UG2	-1.0		67.86	na				
UG3	-1.0		68.16	na				
TEST	0.0		67.8	na	250.0			

The maximum velocity is 17.4 and it occurs in the pipe between nodes O29 and O31

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
DP1 to EQ01	19.50 19.5	1.049 120.0 0.1250		0.0 0.0 0.0	1.000 0.0 1.000	12.125 0.433 0.125			K Factor = 5.60 Vel = 7.24	
	0.0 19.50					12.683			K Factor = 5.48	
O1 to O3	19.50 19.5	1.049 120.0 0.1242	1T	5.0 0.0 0.0	8.600 5.000 13.600	12.125 0.303 1.689			K Factor = 5.60 Vel = 7.24	
	0.0 19.50					14.117			K Factor = 5.19	
O2 to O3	20.21 20.21	1.049 120.0 0.1327	1T	5.0 0.0 0.0	1.000 5.000 6.000	13.018 0.303 0.796			K Factor = 5.60 Vel = 7.50	
O3 to O4	19.50 39.71	1.049 120.0 0.4628	1T	5.0 0.0 0.0	0.700 5.000 5.700	14.117 0.0 2.638			Vel = 14.74	
O4 to O8	0.0 39.71	2.635 120.0 0.0052		0.0 0.0 0.0	12.000 0.0 12.000	16.755 0.0 0.063			Vel = 2.34	
	0.0 39.71					16.818			K Factor = 9.68	
O5 to O7	19.54 19.54	1.049 120.0 0.1246	1T	5.0 0.0 0.0	8.600 5.000 13.600	12.172 0.303 1.695			K Factor = 5.60 Vel = 7.25	
	0.0 19.54					14.170			K Factor = 5.19	
O6 to O7	20.24 20.24	1.049 120.0 0.1330	1T	5.0 0.0 0.0	1.000 5.000 6.000	13.069 0.303 0.798			K Factor = 5.60 Vel = 7.51	
O7 to O8	19.54 39.78	1.049 120.0 0.4646	1T	5.0 0.0 0.0	0.700 5.000 5.700	14.170 0.0 2.648			Vel = 14.77	
O8 to O12	39.71 79.49	2.635 120.0 0.0188		0.0 0.0 0.0	10.700 0.0 10.700	16.818 0.0 0.201			Vel = 4.68	
	0.0 79.49					17.019			K Factor = 19.27	
O9 to O11	19.66 19.66	1.049 120.0 0.1261	1T	5.0 0.0 0.0	8.600 5.000 13.600	12.324 0.303 1.715			K Factor = 5.60 Vel = 7.30	
	0.0 19.66					14.342			K Factor = 5.19	
O10 to O11	20.37 20.37	1.049 120.0 0.1347	1T	5.0 0.0 0.0	1.000 5.000 6.000	13.231 0.303 0.808			K Factor = 5.60 Vel = 7.56	
O11 to O12	19.66 40.03	1.049 120.0 0.4696	1T	5.0 0.0 0.0	0.700 5.000 5.700	14.342 0.0 2.677			Vel = 14.86	

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
O12 to O16	79.49 119.52	2.635 120.0 0.0401		0.0 0.0 0.0	9.300 0.0 9.300	17.019 0.0 0.373		Vel = 7.03		
	0.0 119.52					17.392		K Factor = 28.66		
O13 to O15	20.02 20.02	1.097 120.0 0.1049	1T	6.217 0.0 0.0	8.600 6.217 14.817	12.785 0.303 1.554		Vel = 6.80	K Factor = 5.60	
	0.0 20.02					14.642		K Factor = 5.23		
O14 to O15	20.59 20.59	1.049 120.0 0.1373	1T	5.0 0.0 0.0	1.000 5.000 6.000	13.515 0.303 0.824		Vel = 7.64	K Factor = 5.60	
O15 to O16	20.02 40.61	1.049 120.0 0.4825	1T	5.0 0.0 0.0	0.700 5.000 5.700	14.642 0.0 2.750		Vel = 15.08		
O16 to O19	119.52 160.13	2.635 120.0 0.0688		0.0 0.0 0.0	9.300 0.0 9.300	17.392 0.0 0.640		Vel = 9.42		
	0.0 160.13					18.032		K Factor = 37.71		
O17 to O18	22.61 22.61	1.049 120.0 0.1633	1E	2.0 0.0 0.0	1.000 2.000 3.000	16.308 0.303 0.490		Vel = 8.39	K Factor = 5.60	
O18 to O19	0.0 22.61	1.049 120.0 0.1633	1T	5.0 0.0 0.0	0.700 5.000 5.700	17.101 0.0 0.931		Vel = 8.39		
O19 to O22	160.13 182.74	2.635 120.0 0.0879		0.0 0.0 0.0	10.700 0.0 10.700	18.032 0.0 0.940		Vel = 10.75		
	0.0 182.74					18.972		K Factor = 41.95		
O20 to O21	23.21 23.21	1.049 120.0 0.1713	1E	2.0 0.0 0.0	1.000 2.000 3.000	17.178 0.303 0.514		Vel = 8.62	K Factor = 5.60	
O21 to O22	0.0 23.21	1.049 120.0 0.1714	1T	5.0 0.0 0.0	0.700 5.000 5.700	17.995 0.0 0.977		Vel = 8.62		
O22 to O25	182.74 205.95	2.635 120.0 0.1096		0.0 0.0 0.0	8.000 0.0 8.000	18.972 0.0 0.877		Vel = 12.12		
	0.0 205.95					19.849		K Factor = 46.23		
O23 to O24	21.79 21.79	1.049 120.0 0.1524		0.0 0.0 0.0	2.500 0.0 2.500	15.831 0.0 0.381		Vel = 8.09	K Factor @ node EQ01	
O24 to O25	22.04 43.83	1.049 120.0 0.5557	1T	5.0 0.0 0.0	1.000 5.000 6.000	16.212 0.303 3.334		Vel = 16.27	K Factor @ node EQ01	

Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
O25 to O29	205.95 249.78	2.635 120.0 0.1567		0.0	12.000	19.849 0.0 1.880				Vel = 14.70
	0.0 249.78						21.729			K Factor = 53.58
O27 to O28	22.82 22.82	1.049 120.0 0.1664		0.0	2.500	17.376 0.0 0.416				K Factor @ node EQ01 Vel = 8.47
O28 to O29	23.10 45.92	1.049 120.0 0.6057	1T	5.0	1.000	17.792 0.0 3.634				K Factor @ node EQ01 Vel = 17.05
O29 to O31	249.78 295.7	2.635 120.0 0.2140	1V	5.903	11.500	21.729 0.0 3.725				Vel = 17.40
O31 to O32	0.0 295.7	2.635 120.0 0.2141	1V	5.903	0.700	25.194 0.0 1.414				Vel = 17.40
O32 to W19	0.0 295.7	2.635 120.0 0.2141	1T 1X	16.474 14.827	85.500	26.608 0.0				Vel = 17.40
W19 to W20	0.0 295.7	6.357 120.0 0.0029	2V	25.147	33.300	51.610 0.0 0.172				Vel = 2.99
W20 to W21	0.0 295.7	6.357 120.0 0.0030	1V	12.573	11.800	56.459 0.0 0.072				Vel = 2.99
W21 to TOR	0.0 295.7	6.357 120.0 0.0029	1V	12.573	1.000	56.531 2.425 0.040				Vel = 2.99
TOR to BOR	0.0 295.7	6.357 120.0 0.0030	1Fsp	0.0	3.000	58.996 0.0 3.000				* Fixed loss = 7 Vel = 2.99
BOR to UG1	0.0 295.7	6.16 140.0 0.0026	1E 1G 1T	20.084 4.304 43.037	22.000	66.871 0.0 0.230				Vel = 3.18
UG1 to UG2	0.0 295.7	6.16 140.0 0.0026	1T	43.037	250.000	67.101 0.0 0.755				Vel = 3.18
UG2 to UG3	0.0 295.7	6.16 140.0 0.0026	1T	43.037	75.000	67.856 0.0 0.304				Vel = 3.18
UG3 to TEST	0.0 295.7	6.16 140.0 0.0026	1E 1G	20.084 4.304	5.000	68.160 -0.433 0.075				Vel = 3.18
	250.00 545.70						67.802			Qa = 250.00 K Factor = 66.27