



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

High Tech Fire Protection  
PO Box 156  
Minot, ME 04258  
(207) 998-2551

Job Name : Second Floor Calc.  
Building : Maine Wharf  
Location : 68 Commercial Street  
System : NFPA 13  
Contract : 021414-1  
Data File : Second Floor Calc.wxf

Hydraulic Design Information Sheet

Name - Second Floor Calc. Date - 03/26/2014  
 Location - 68 Commercial Street  
 Building - Maine Wharf System No. - NFPA 13  
 Contractor - High Tech Fire Protection Contract No. - 021414-1  
 Calculated By - Jeremy A Foss Drawing No. - FP-1.1  
 Construction: ( ) Combustible (X) Non-Combustible Ceiling Height - TBD  
 Occupancy - TBD - Future Tenant

S (X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. ( ) 1 (X) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

	Area	System Type	Make
M	Area of Sprinkler Operation - 1050	(X) Wet	Sprinkler/Nozzle
	Density - .2	( ) Dry	Make Globe
D	Area Per Sprinkler - 130	( ) Deluge	Model GL5615
E	Elevation at Highest Outlet - 27	( ) Preaction	Size 1/2"
S	Hose Allowance - Inside -	( ) Other	K-Factor 5.6
I	Rack Sprinkler Allowance -		Temp.Rat.155
G	Hose Allowance - Outside - 250		

N Note

Calculation Flow Required - 616 Press Required - 92  
 Summary C-Factor Used: 120 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
A Date of Test - 05/11/2013		Cap. -
T Time of Test -	Rated Cap.-	Elev.-
E Static Press - 108	@ Press -	
R Residual Press - 102	Elev. -	Well
Flow - 1537		Proof Flow
S Elevation - -3		

P Location - Test Hydrant Located at Corner of Commercial and Maple Streets

P Source of Information - Brian Johnson of the Portland Water District

Commodity	Class	Location
Storage Ht.	Area	Aisle W.
M Storage Method: Solid Piled	% Palletized	% Rack
( ) Single Row	( ) Conven. Pallet	( ) Auto. Storage
S R ( ) Double Row	( ) Slave Pallet	( ) Solid Shelf
T A ( ) Mult. Row		( ) Non
O C ( ) Open Shelf		

R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

E Horizontal Barriers Provided:

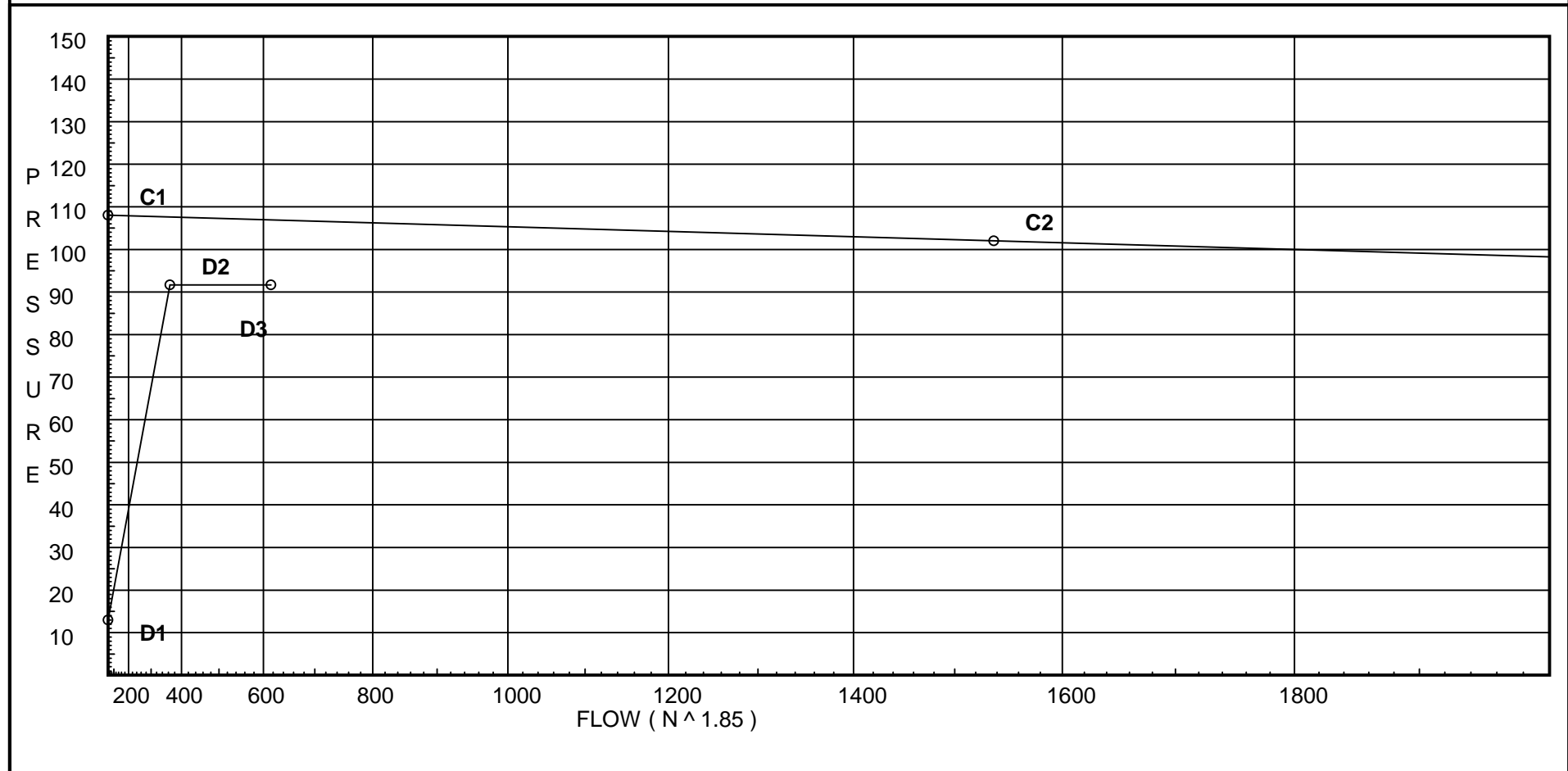
# Water Supply Curve (C)

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City Water Supply:  
C1 - Static Pressure : 108  
C2 - Residual Pressure: 102  
C2 - Residual Flow : 1537

Demand:  
D1 - Elevation : 12.993  
D2 - System Flow : 365.236  
D2 - System Pressure : 91.703  
Hose ( Demand ) : 250  
D3 - System Demand : 615.236  
Safety Margin : 15.194



# Fittings Used Summary

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Fitting Legend		½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Abbrev.	Name																				
B	NFPA 13 Butterfly Valve	0	0	0	0	5	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
F	NFPA 13 45° Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
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
V	90° EII Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	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	21.56	na	26.0	0.2	130	7.0
401	27.0	K = K @ EQ01	28.08	na	28.57			
402	27.0	K = K @ EQ01	28.31	na	28.69			
403	27.0	K = K @ EQ01	29.23	na	29.15			
404	27.0	K = K @ EQ01	31.18	na	30.11			
405	27.0	K = K @ EQ01	23.26	na	26.0			
C2	27.0		24.23	na				
406	27.0	K = K @ EQ01	24.28	na	26.57			
407	27.0	K = K @ EQ01	24.99	na	26.95			
408	27.0	K = K @ EQ01	26.66	na	27.84			
409	27.0	K = K @ EQ01	29.59	na	29.33			
410	27.0	K = K @ EQ01	25.33	na	27.13			
C4	27.0		26.41	na				
411	27.0	K = K @ EQ01	26.46	na	27.73			
412	27.0	K = K @ EQ01	27.22	na	28.13			
413	27.0	K = K @ EQ01	29.04	na	29.05			
C1	27.0		36.22	na				
C3	27.0		36.35	na				
C5	27.0		36.89	na				
C6	27.0		39.04	na				
C7	27.0		65.93	na				
BF1	27.0		66.39	na				
BF2	18.0		80.56	na				
BF3	-2.0		89.38	na				
BF4	-2.0		90.32	na				
BF5	-3.0		91.39	na				
TEST	-3.0		91.7	na	250.0			

The maximum velocity is 19.74 and it occurs in the pipe between nodes 409 and C3

# 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	26.00 26.0	1.049 120.0 0.2115	1T	5.0 0.0 0.0	1.000 5.000 6.000	21.556 0.433 1.269			K Factor = 5.60 Vel = 9.65	
	0.0 26.00						23.258		K Factor = 5.39	
401 to 402	28.57 28.57	1.682 120.0 0.0253		0.0 0.0 0.0	9.000 0.0 9.000	28.084 0.0 0.228			K Factor @ node EQ01 Vel = 4.13	
402 to 403	28.69 57.26	1.682 120.0 0.0914		0.0 0.0 0.0	10.000 0.0 10.000	28.312 0.0 0.914			K Factor @ node EQ01 Vel = 8.27	
403 to 404	29.14 86.4	1.682 120.0 0.1956		0.0 0.0 0.0	10.000 0.0 10.000	29.226 0.0 1.956			K Factor @ node EQ01 Vel = 12.48	
404 to C1	30.11 116.51	1.682 120.0 0.3401	1T	9.9 0.0 0.0	4.900 9.900 14.800	31.182 0.0 5.034			K Factor @ node EQ01 Vel = 16.82	
	0.0 116.51						36.216		K Factor = 19.36	
405 to C2	26.00 26.0	1.38 120.0 0.0556	1E 1T	3.0 6.0 0.0	8.500 9.000 17.500	23.258 0.0 0.973			K Factor @ node EQ01 Vel = 5.58	
C2 to 406	0.0 26.0	1.682 120.0 0.0212		0.0 0.0 0.0	2.500 0.0 2.500	24.231 0.0 0.053			Vel = 3.75	
406 to 407	26.57 52.57	1.682 120.0 0.0780		0.0 0.0 0.0	9.000 0.0 9.000	24.284 0.0 0.702			K Factor @ node EQ01 Vel = 7.59	
407 to 408	26.95 79.52	1.682 120.0 0.1678		0.0 0.0 0.0	10.000 0.0 10.000	24.986 0.0 1.678			K Factor @ node EQ01 Vel = 11.48	
408 to 409	27.84 107.36	1.682 120.0 0.2923		0.0 0.0 0.0	10.000 0.0 10.000	26.664 0.0 2.923			K Factor @ node EQ01 Vel = 15.50	
409 to C3	29.32 136.68	1.682 120.0 0.4570	1T	9.9 0.0 0.0	4.900 9.900 14.800	29.587 0.0 6.764			K Factor @ node EQ01 Vel = 19.74	
	0.0 136.68						36.351		K Factor = 22.67	
410 to C4	27.13 27.13	1.38 120.0 0.0602	1E 1T	3.0 6.0 0.0	8.900 9.000 17.900	25.329 0.0 1.077			K Factor @ node EQ01 Vel = 5.82	
C4 to 411	0.0 27.13	1.682 120.0 0.0228		0.0 0.0 0.0	2.500 0.0 2.500	26.406 0.0 0.057			Vel = 3.92	

# 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	*****
411 to 412	27.74 54.87	1.682 120.0 0.0844		0.0 0.0 0.0	9.000 0.0 9.000	26.463 0.0 0.760		K Factor @ node EQ01 Vel = 7.92		
412 to 413	28.13 83.0	1.682 120.0 0.1816		0.0 0.0 0.0	10.000 0.0 10.000	27.223 0.0 1.816		K Factor @ node EQ01 Vel = 11.98		
413 to C5	29.05 112.05	1.682 120.0 0.3165	1T	9.9 0.0 0.0	14.900 9.900 24.800	29.039 0.0 7.848		K Factor @ node EQ01 Vel = 16.18		
	0.0 112.05					36.887		K Factor = 18.45		
C1 to C3	116.51 116.51	3.26 120.0 0.0135		0.0 0.0 0.0	10.000 0.0 10.000	36.216 0.0 0.135		Vel = 4.48		
C3 to C5	136.68 253.19	3.26 120.0 0.0570		0.0 0.0 0.0	9.400 0.0 9.400	36.351 0.0 0.536		Vel = 9.73		
C5 to C6	112.05 365.24	3.26 120.0 0.1122	1V	6.72 0.0 0.0	12.500 6.720 19.220	36.887 0.0 2.157		Vel = 14.04		
C6 to C7	0.0 365.24	3.26 120.0 0.1122	3V 1S 1Fsp 1B	20.159 21.503 0.0 13.44	157.800 55.102 212.902	39.044 3.000 23.890		* Fixed loss = 3 Vel = 14.04		
C7 to BF1	0.0 365.24	4.26 120.0 0.0305	1V	8.954 0.0 0.0	6.000 8.954 14.954	65.934 0.0 0.456		Vel = 8.22		
BF1 to BF2	0.0 365.24	4.26 120.0 0.0304	1Fsp	0.0 0.0 0.0	9.000 0.0 9.000	66.390 13.898 0.274		* Fixed loss = 10 Vel = 8.22		
BF2 to BF3	0.0 365.24	6.16 140.0 0.0038	1E	20.084 0.0 0.0	20.000 20.084 40.084	80.562 8.662 0.153		Vel = 3.93		
BF3 to BF4	0.0 365.24	6.16 140.0 0.0038	1G 1T	4.304 43.037 0.0	200.000 47.341 247.341	89.377 0.0 0.941		Vel = 3.93		
BF4 to BF5	0.0 365.24	12.24 100.0 0.0003	5F	52.392 0.0 0.0	2500.000 52.392 2552.392	90.318 0.433 0.639		Vel = 1.00		
BF5 to TEST	0.0 365.24	6.16 140.0 0.0038	1E 1G 1T	20.084 4.304 43.037	15.000 67.425 82.425	91.390 0.0 0.313		Vel = 3.93		
	250.00 615.24					91.703		Qa = 250.00 K Factor = 64.25		