



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

DEAN & ALLYN, INC.  
116 LEWISTON ROAD  
GRAY, MAINE 04039  
207-657-5646

Job Name : Bank of America 9th Floor-Ordinary Hazard Area  
Building : 9th Floor Renovations  
Location : Portland, Maine  
System : WX2  
Contract : C1277  
Data File : C1277 BoA 9th Floor.WX2

Hydraulic Design Information Sheet

Name - Bank of America Date - 07-17-2015  
 Location - Portland, Maine  
 Building - 9th Floor Renovations System No. - WX2  
 Contractor - Dean & Allyn, Inc. Contract No. - C1277  
 Calculated By - T. Clarke Drawing No. - 1 of 2  
 Construction: ( ) Combustible (X) Non-Combustible Ceiling Height - 8'-6"  
 Occupancy - Offices

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

S Other

T Specific Ruling Made By Date

M	Area of Sprinkler Operation	- 900	System Type	Sprinkler/Nozzle
	Density	- 0.15	(X) Wet	Make Reliable
D	Area Per Sprinkler	- 130	( ) Dry	Model G5-56
E	Elevation at Highest Outlet	- 122.500	( ) Deluge	Size 1/2x1/2
S	Hose Allowance - Inside	- 250	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155F
G	Hose Allowance - Outside	- 0		

N Note Safety Margin: 32.3 PSI

Calculation Flow Required - 462.3 Press Required - 112.9 At Pump  
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 04-17-2014		Cap. -
T	Time of Test -	Rated Cap.- 500	Elev.-
E	Static Press - 165	@ Press - 71	
R	Residual Press - 142	Elev. - 1	Well
	Flow - 501		Proof Flow
S	Elevation - 1		

U Location -

P Source of Information - Annual Pump Test Report

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

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

E Horizontal Barriers Provided:

# Fittings Used Summary

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## Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
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
Y	Mechanical Tee	2	4	5	6	8	10.5	12.5	15.5	0	22	0	0	0	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.
907A	122.5	5.6	12.71	na	19.96	0.1	196	7.0
908A	122.5	5.6	19.87	na	24.96	0.1	196	7.0
909A	122.5	5.6	23.7	na	27.26	0.15	130	7.0
910A	122.5	5.6	12.25	na	19.6	0.1	196	7.0
921A	122.5	5.6	15.48	na	22.03	0.1	196	7.0
922A	122.5	5.6	16.05	na	22.43	0.1	196	7.0
923A	122.5	5.6	19.05	na	24.44	0.15	130	7.0
924A	122.5	5.6	23.42	na	27.1	0.15	130	7.0
925A	122.5	5.6	19.09	na	24.46	0.15	130	7.0
910	123.0		13.44	na				
907	123.0		14.69	na				
908	123.0		22.12	na				
909	123.0		26.25	na				
921	123.0		16.63	na				
922	123.0		17.65	na				
923	123.0		21.41	na				
924	123.0		26.25	na				
925	123.0		27.37	na				
911	123.0		29.7	na				
912	123.0		29.7	na				
913	123.0		29.79	na				
914	123.0		29.96	na				
915	123.0		30.2	na				
916	123.0		30.55	na				
917	123.0		31.19	na				
FCV	123.0		56.65	na	250.0			
PUMP	1.0		112.9	na				

The maximum velocity is 25.58 and it occurs in the pipe between nodes 923 and 914

# Final Calculations - Hazen-Williams - 2007

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftnng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
907A to 907	19.96	1.049 120.0	2E T	4.0 5.0 0.0	7.958 9.000 16.958	12.709 -0.217 2.200			K Factor = 5.60	
	0.0 19.96						14.692		K Factor = 5.21	
908A to 908	24.96	1.049 120.0	2E T	4.0 5.0 0.0	3.625 9.000 12.625	19.866 -0.217 2.475			K Factor = 5.60	
	0.0 24.96						22.124		K Factor = 5.31	
909A to 909	27.26	1.049 120.0	2E T	4.0 5.0 0.0	2.958 9.000 11.958	23.704 -0.217 2.761			K Factor = 5.60	
	0.0 27.26						26.248		K Factor = 5.32	
910A to 910	19.60	1.049 120.0	3E	6.0 0.0 0.0	5.208 6.000 11.208	12.250 -0.217 1.405			K Factor = 5.60	
	0.0 19.60						13.438		K Factor = 5.35	
921A to 921	22.03	1.049 120.0	3E	6.0 0.0 0.0	2.792 6.000 8.792	15.476 -0.217 1.369			K Factor = 5.60	
	0.0 22.03						16.628		K Factor = 5.40	
922A to 922	22.43	1.049 120.0	2E T	4.0 5.0 0.0	2.333 9.000 11.333	16.045 -0.217 1.824			K Factor = 5.60	
	0.0 22.43						17.652		K Factor = 5.34	
923A to 923	24.44	1.049 120.0	2E T	4.0 5.0 0.0	4.625 9.000 13.625	19.054 -0.217 2.571			K Factor = 5.60	
	0.0 24.44						21.408		K Factor = 5.28	
924A to 924	27.10	1.049 120.0	2E T	4.0 5.0 0.0	4.333 9.000 13.333	23.420 -0.217 3.044			K Factor = 5.60	
	0.0 27.10						26.247		K Factor = 5.29	
925A to 925	24.46	1.049 120.0	2E T	4.0 5.0 0.0	36.000 9.000 45.000	19.086 -0.217 8.502			K Factor = 5.60	
	0.0 24.46						27.371		K Factor = 4.68	
910 to 907	19.60	1.049 120.0		0.0 0.0 0.0	10.000 0.0 10.000	13.438 0.0 1.254				Vel = 7.28

# Final Calculations - Hazen-Williams

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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	*****
907 to 908	19.96 39.56	1.049 120.0 0.4597	2E	4.0 0.0 0.0	12.167 4.000 16.167	14.692 0.0 7.432				Vel = 14.69
908 to 912	24.96 64.52	1.049 120.0 1.1362	T	5.0 0.0 0.0	1.667 5.000 6.667	22.124 0.0 7.575				Vel = 23.95
	0.0 64.52					29.699				K Factor = 11.84
909 to 913	27.26 27.26	1.049 120.0 0.2309	T	5.0 0.0 0.0	10.333 5.000 15.333	26.248 0.0 3.540				Vel = 10.12
	0.0 27.26					29.788				K Factor = 4.99
921 to 922	22.03 22.03	1.049 120.0 0.1556		0.0 0.0 0.0	6.583 0.0 6.583	16.628 0.0 1.024				Vel = 8.18
922 to 923	22.43 44.46	1.049 120.0 0.5706		0.0 0.0 0.0	6.583 0.0 6.583	17.652 0.0 3.756				Vel = 16.50
923 to 914	24.45 68.91	1.049 120.0 1.2830	T	5.0 0.0 0.0	1.667 5.000 6.667	21.408 0.0 8.554				Vel = 25.58
	0.0 68.91					29.962				K Factor = 12.59
924 to 915	27.10 27.1	1.049 120.0 0.2283	T	5.0 0.0 0.0	12.333 5.000 17.333	26.247 0.0 3.957				Vel = 10.06
	0.0 27.10					30.204				K Factor = 4.93
925 to 916	24.46 24.46	1.049 120.0 0.1889	Y	5.0 0.0 0.0	11.833 5.000 16.833	27.371 0.0 3.180				Vel = 9.08
	0.0 24.46					30.551				K Factor = 4.43
911 to 912	0.0 0.0	2.635 120.0 0.0	2E	16.474 0.0 0.0	10.625 16.474 27.099	29.699 0.0 0.0				Vel = 0
912 to 913	64.52 64.52	2.635 120.0 0.0129		0.0 0.0 0.0	6.917 0.0 6.917	29.699 0.0 0.089				Vel = 3.80
913 to 914	27.27 91.79	2.635 120.0 0.0246		0.0 0.0 0.0	7.083 0.0 7.083	29.788 0.0 0.174				Vel = 5.40
914 to 915	68.90 160.69	2.635 120.0 0.0691		0.0 0.0 0.0	3.500 0.0 3.500	29.962 0.0 0.242				Vel = 9.45
915 to 916	27.11 187.8	2.635 120.0 0.0925		0.0 0.0 0.0	3.750 0.0 3.750	30.204 0.0 0.347				Vel = 11.05

# 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	*****
916 to 917	24.46 212.26	2.635 120.0 0.1158	0.0 0.0 0.0	5.500 0.0 5.500	30.551 0.0 0.637		Vel = 12.49		
917 to FCV	0.0 212.26	2.635 120.0 0.1159	3E 24.711 T 16.474 S 19.22 B 9.61 Fsp 0.0	123.750 70.015 193.765	31.188 3.000 22.462		** Fixed Loss = 3 Vel = 12.49		
FCV to PUMP	250.00 462.26	6.357 120.0 0.0067	8E 140.822 2T 75.44 B 12.573 Fsp 0.0	130.500 228.835 359.335	56.650 53.838 2.412		Qa = 250 ** Fixed Loss = 1 Vel = 4.67		
	0.0 462.26				112.900		K Factor = 43.51		

# Water Supply Curve C

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City Water Supply:  
C1 - Static Pressure : 165  
C2 - Residual Pressure: 142  
C2 - Residual Flow : 501

Demand:  
D1 - Elevation : 52.622  
D2 - System Flow : 212.26  
D2 - System Pressure : 112.900  
Hose ( Demand ) : 250  
D3 - System Demand : 462.26  
Safety Margin : 32.282

