



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

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

Job Name : Bank of America 10th Floor-Ordinary Hazard Area  
Building : 10th Floor Renovations  
Location : Portland, Maine  
System : WX3  
Contract : C1277  
Data File : C1277 BoA 10th Floor.WX3

Hydraulic Design Information Sheet

Name - Bank of America Date - 07-17-2015  
 Location - Portland, Maine  
 Building - 10th Floor Renovations System No. - WX3  
 Contractor - Dean & Allyn, Inc. Contract No. - C1277  
 Calculated By - T. Clarke Drawing No. - 2 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 - 112	( ) Dry	Model G5-56
E	Elevation at Highest Outlet - 135.167	( ) 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: 16.9 PSI

Calculation Flow Required - 506.5 Press Required - 124.6 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
S	Flow - 501		Proof Flow
U	Elevation - 1		

P Location -

L Source of Information - Annual Pump Test Report

Y

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.
113A	135.167	5.6	8.37	na	16.21	0.1	150	7.0
114A	135.167	5.6	9.27	na	17.05	0.1	150	7.0
114B	135.167	5.6	9.0	na	16.8	0.15	112	7.0
115A	135.167	5.6	9.31	na	17.08	0.1	150	7.0
116A	135.167	5.6	10.11	na	17.8	0.1	150	7.0
117A	135.167	5.6	14.33	na	21.2	0.1	150	7.0
118A	135.167	5.6	14.49	na	21.31	0.15	85	7.0
119A	135.167	5.6	14.88	na	21.6	0.15	85	7.0
120A	135.167	5.6	15.32	na	21.92	0.1	150	7.0
121A	135.167	5.6	15.34	na	21.93	0.1	150	7.0
122A	135.167	5.6	19.36	na	24.64	0.1	150	7.0
123A	135.167	5.6	12.5	na	19.8	0.1	150	7.0
124A	135.167	5.6	11.73	na	19.18	0.1	150	7.0
113	135.667		8.89	na				
114	135.667		9.97	na				
115	135.667		10.01	na				
116	135.667		11.14	na				
117	135.667		15.81	na				
118	135.667		15.51	na				
119	135.667		16.39	na				
120	135.667		16.33	na				
121	135.667		16.93	na				
122	135.667		20.9	na				
123	135.667		13.29	na				
124	135.667		13.8	na				
125	135.667		19.17	na				
136	135.667		20.68	na				
137	135.667		20.7	na				
138	135.667		20.88	na				
139	135.667		21.77	na				
140	135.667		23.22	na				
141	135.667		23.82	na				
FCV1	135.667		62.45	na	250.0			
PUMP	1.0		124.64	na				

The maximum velocity is 20.82 and it occurs in the pipe between nodes 117 and 137

# 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	*****
113A to 113	16.21 16.21	1.049 120.0 0.0882	3E 6.0 0.0 0.0	2.292 6.000 8.292	8.375 -0.217 0.731		K Factor = 5.60 Vel = 6.02		
	0.0 16.21				8.889		K Factor = 5.44		
114A to 114	17.05 17.05	1.049 120.0 0.0968	3E 6.0 0.0 0.0	3.458 6.000 9.458	9.270 -0.217 0.916		K Factor = 5.60 Vel = 6.33		
	0.0 17.05				9.969		K Factor = 5.40		
114B to 114	16.80 16.8	1.049 120.0 0.0943	2E 4.0 T 5.0 0.0	3.583 9.000 12.583	9.000 -0.217 1.186		K Factor = 5.60 Vel = 6.24		
	0.0 16.80				9.969		K Factor = 5.32		
115A to 115	17.08 17.08	1.049 120.0 0.0973	3E 6.0 0.0 0.0	3.458 6.000 9.458	9.306 -0.217 0.920		K Factor = 5.60 Vel = 6.34		
	0.0 17.08				10.009		K Factor = 5.40		
116A to 116	17.80 17.8	1.049 120.0 0.1049	2E 4.0 T 5.0 0.0	2.875 9.000 11.875	10.106 -0.217 1.246		K Factor = 5.60 Vel = 6.61		
	0.0 17.80				11.135		K Factor = 5.33		
117A to 117	21.20 21.2	1.049 120.0 0.1449	2E 4.0 T 5.0 0.0	2.708 9.000 11.708	14.329 -0.217 1.697		K Factor = 5.60 Vel = 7.87		
	0.0 21.20				15.809		K Factor = 5.33		
118A to 118	21.31 21.31	1.049 120.0 0.1465	3E 6.0 0.0 0.0	2.458 6.000 8.458	14.486 -0.217 1.239		K Factor = 5.60 Vel = 7.91		
	0.0 21.31				15.508		K Factor = 5.41		
119A to 119	21.60 21.6	1.049 120.0 0.1501	2E 4.0 T 5.0 0.0	2.458 9.000 11.458	14.883 -0.217 1.720		K Factor = 5.60 Vel = 8.02		
	0.0 21.60				16.386		K Factor = 5.34		
120A to 120	21.92 21.92	1.049 120.0 0.1541	3E 6.0 0.0 0.0	2.000 6.000 8.000	15.315 -0.217 1.233		K Factor = 5.60 Vel = 8.14		
	0.0 21.92				16.331		K Factor = 5.42		
121A to 121	21.93 21.93	1.049 120.0 0.1544	2E 4.0 T 5.0 0.0	2.708 9.000 11.708	15.338 -0.217 1.808		K Factor = 5.60 Vel = 8.14		

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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	*****
	0.0 21.93					16.929		K Factor = 5.33	
122A to 122	24.64	1.049 120.0 0.1915	3E 6.0 0.0 0.0	3.208 6.000 9.208	19.359 -0.217 1.763			K Factor = 5.60 Vel = 9.15	
	0.0 24.64					20.905		K Factor = 5.39	
123A to 123	19.80	1.049 120.0 0.1277	3E 6.0 0.0 0.0	1.875 6.000 7.875	12.501 -0.217 1.006			K Factor = 5.60 Vel = 7.35	
	0.0 19.80					13.290		K Factor = 5.43	
124A to 124	19.18	1.049 120.0 0.1204	2E 4.0 T 5.0 0.0	10.042 9.000 19.042	11.725 -0.217 2.293			K Factor = 5.60 Vel = 7.12	
	0.0 19.18					13.801		K Factor = 5.16	
113 to 114	16.21	1.049 120.0 0.0882	E 2.0 0.0 0.0	10.250 2.000 12.250	8.889 0.0 1.080			Vel = 6.02	
114 to 136	33.85	1.049 120.0 0.7104	T 5.0 0.0 0.0	10.083 5.000 15.083	9.969 0.0 10.715			Vel = 18.58	
	0.0 50.06					20.684		K Factor = 11.01	
115 to 116	17.08	1.049 120.0 0.0972	0.0 0.0 0.0	11.583 0.0 11.583	10.009 0.0 1.126			Vel = 6.34	
116 to 117	17.81	1.049 120.0 0.3642	2E 4.0 0.0 0.0	8.833 4.000 12.833	11.135 0.0 4.674			Vel = 12.95	
117 to 137	21.19	1.049 120.0 0.8768	T 5.0 0.0 0.0	0.583 5.000 5.583	15.809 0.0 4.895			Vel = 20.82	
	0.0 56.08					20.704		K Factor = 12.32	
118 to 119	21.31	1.049 120.0 0.1463	0.0 0.0 0.0	6.000 0.0 6.000	15.508 0.0 0.878			Vel = 7.91	
119 to 138	21.61	1.049 120.0 0.5344	E 2.0 T 5.0 0.0	1.417 7.000 8.417	16.386 0.0 4.498			Vel = 15.93	
	0.0 42.92					20.884		K Factor = 9.39	
120 to 121	21.92	1.049 120.0 0.1543	0.0 0.0 0.0	3.875 0.0 3.875	16.331 0.0 0.598			Vel = 8.14	

# 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	*****
121 to 139	21.93 43.85	1.049 120.0 0.5559	E Y	2.0 5.0 0.0	1.708 7.000 8.708	16.929 0.0 4.841				Vel = 16.28
	0.0 43.85						21.770			K Factor = 9.40
122 to 140	24.64 24.64	1.049 120.0 0.1914	T	5.0 0.0 0.0	7.083 5.000 12.083	20.905 0.0 2.313				Vel = 9.15
	0.0 24.64						23.218			K Factor = 5.11
123 to 124	19.80 19.8	1.049 120.0 0.1278		0.0 0.0 0.0	4.000 0.0 4.000	13.290 0.0 0.511				Vel = 7.35
124 to 125	19.18 38.98	1.049 120.0 0.4472		0.0 0.0 0.0	12.000 0.0 12.000	13.801 0.0 5.366				Vel = 14.47
125 to 141	0.0 38.98	1.049 120.0 0.4471	T	5.0 0.0 0.0	5.417 5.000 10.417	19.167 0.0 4.657				Vel = 14.47
	0.0 38.98						23.824			K Factor = 7.99
136 to 137	50.06 50.06	2.635 120.0 0.0080		0.0 0.0 0.0	2.500 0.0 2.500	20.684 0.0 0.020				Vel = 2.95
137 to 138	56.08 106.14	2.635 120.0 0.0320		0.0 0.0 0.0	5.625 0.0 5.625	20.704 0.0 0.180				Vel = 6.24
138 to 139	42.92 149.06	2.635 120.0 0.0603	E	8.237 0.0 0.0	6.458 8.237 14.695	20.884 0.0 0.886				Vel = 8.77
139 to 140	43.84 192.9	2.635 120.0 0.0972	E	8.237 0.0 0.0	6.667 8.237 14.904	21.770 0.0 1.448				Vel = 11.35
140 to 141	24.64 217.54	2.635 120.0 0.1212		0.0 0.0 0.0	5.000 0.0 5.000	23.218 0.0 0.606				Vel = 12.80
141 to FCV1	38.98 256.52	2.635 120.0 0.1646	3E T S B Fsp	24.711 16.474 19.22 9.61 0.0	146.500 70.015 216.515	23.824 3.000 35.630				** Fixed Loss = 3 Vel = 15.09
FCV1 to PUMP	250.00 506.52	6.357 120.0 0.0080	8E 2T B Fsp	140.822 75.44 12.573 0.0	130.500 228.835 359.335	62.454 59.324 2.857				Qa = 250 ** Fixed Loss = 1 Vel = 5.12
	0.0 506.52						124.635			K Factor = 45.37

# 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 : 58.108  
D2 - System Flow : 256.519  
D2 - System Pressure : 124.635  
Hose ( Demand ) : 250  
D3 - System Demand : 506.519  
Safety Margin : 16.894

