



... Fire Protection by Computer Design

DEAN & ALLYN, INC.
PO BOX 709
32 LEWISTON ROAD
GRAY, MAINE 04039
207-657-5646

Job Name : MMC CUP 1ST FLOOR CEILING
Building : CENTRAL UTILITY PLANT
Location : PORTLAND, MAINE
System : C643-1ST.WX2
Contract : C0609643
Data File : C643-1ST.WX2

Hydraulic Design Information Sheet

Name - MAINE MEDICAL CENTER Date - 02/07/2007
 Location - PORTLAND, MAINE
 Building - CENTRAL UTILITY PLANT System No. - C643-1ST.WX2
 Contractor - DEAN & ALLYN, INC. Contract No. - C0609643
 Calculated By - T CLARKE Drawing No. - 2 OF 2
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 24'
 Occupancy - MECHANICAL ROOM

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

M	Area of Sprinkler Operation - 1500	Density - .20	System Type (X) Wet	Sprinkler/Nozzle Make TYCO
D	Area Per Sprinkler - 115		() Dry	Model TY-B
E	Elevation at Highest Outlet - 94.7		() Deluge	Size 1/2 X 1/2
S	Hose Allowance - Inside - 100		() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance - 0		() Other	Temp.Rat.200 F
G	Hose Allowance - Outside - 150			

N Note SAFETY MARGIN: 21.4 PSI

Calculation Flow Required - 732.9 Press Required - 57.8 AT TEST
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 12/13/2002		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 85	@ Press -	
R	Residual Press - 69	Elev. -	Well
S	Flow - 1277		Proof Flow
U	Elevation - 60		

P Location - GILMAN STREET OPPOSITE "A" STREET

L Source of Information - PORTLAND WATER DISTRICT

C	Commodity N/A	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
M	() 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

G 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	
A	Generic Alarm Valve	0	0	0	0	0	0	7.7	21.5	0	17	17	27	29	0	0	0	0	0	0	0	0
B	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	0	0	0	0	0	0
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61	61
G	Generic Gate Valve	0	0	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13	13
T	90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121	121
Zaf	Ames 3000SS	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

Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
131	93.5	5.6	19.72	na	24.87	0.2	100	7.0
53	93.5		22.48	na				
132	93.5	5.6	22.49	na	26.55	0.2	80	7.0
133	93.5	5.6	22.58	na	26.61	0.2	80	7.0
134	93.5	5.6	22.78	na	26.73	0.2	80	7.0
135	94.7	5.6	14.49	na	21.32	0.2	80	7.0
136	94.7	5.6	15.67	na	22.17	0.2	80	7.0
137	94.7	5.6	17.64	na	23.52	0.2	80	7.0
138	94.7	5.6	15.8	na	22.26	0.2	90	7.0
139	94.7	5.6	17.07	na	23.13	0.2	90	7.0
140	94.7	5.6	18.31	na	23.97	0.2	90	7.0
141	94.7	5.6	16.87	na	23.0	0.2	115	7.0
142	94.7	5.6	19.18	na	24.52	0.2	115	7.0
143	94.7	5.6	16.95	na	23.05	0.2	115	7.0
144	94.7	5.6	19.27	na	24.58	0.2	115	7.0
145	94.7	5.6	17.48	na	23.41	0.2	115	7.0
146	94.7	5.6	19.86	na	24.96	0.2	115	7.0
147	94.7	5.6	17.85	na	23.66	0.2	115	7.0
148	94.7	5.6	20.28	na	25.22	0.2	115	7.0
149	94.7	5.6	18.18	na	23.88	0.2	115	7.0
150	94.7	5.6	20.66	na	25.45	0.2	115	7.0
51	92.7		22.89	na				
52	92.7		22.91	na				
15	92.7		22.99	na				
16	92.7		23.66	na				
17	92.7		23.9	na				
18	92.7		24.06	na				
19	92.7		24.15	na				
20	92.7		24.57	na				
21	92.7		24.71	na				
22	92.7		26.77	na				
23	92.7		27.27	na				
24	92.7		27.73	na				
25	92.7		28.34	na				
35	92.7		35.88	na				
TR	82.0		43.68	na				
BR	75.0		47.15	na				
FF	73.5		50.47	na	100.0			
TEST	60.0		57.83	na	150.0			

The maximum velocity is 14.37 and it occurs in the pipe between nodes 137 and 52

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	*****
131 to 53	24.87	1.049 120	1T 5.0 0.0	9.200 5.000	19.718 0.0		K Factor = 5.60		
	24.87	0.1947	0.0	14.200	2.765		Vel = 9.23		
53 to 132	0.0	2.469 120	0.0 0.0	0.750 0.0	22.483 0.0				
	24.87	0.0027	0.0	0.750	0.002		Vel = 1.67		
132 to 133	26.55	2.469 120	0.0 0.0	8.000 0.0	22.485 0.0		K Factor = 5.60		
	51.42	0.0116	0.0	8.000	0.093		Vel = 3.45		
133 to 134	26.61	2.469 120	0.0 0.0	8.000 0.0	22.578 0.0		K Factor = 5.60		
	78.03	0.0250	0.0	8.000	0.200		Vel = 5.23		
134 to 17	26.73	2.469 120	1T 12.0 0.0	6.000 12.000	22.778 0.346		K Factor = 5.60		
	104.76	0.0431	0.0	18.000	0.776		Vel = 7.02		
	0.0 104.76				23.900		K Factor = 21.43		
135 to 136	21.32	1.049 120	0.0 0.0	8.000 0.0	14.495 0.0		K Factor = 5.60		
	21.32	0.1464	0.0	8.000	1.171		Vel = 7.91		
136 to 137	22.17	1.38 120	2E 6.0 0.0	7.700 6.000	15.666 0.0		K Factor = 5.60		
	43.49	0.1440	0.0	13.700	1.973		Vel = 9.33		
137 to 52	23.51	1.38 120	1E 3.0 1T 6.0	4.750 9.000	17.639 0.866		K Factor = 5.60		
	67.0	0.3204	0.0	13.750	4.406		Vel = 14.37		
	0.0 67.00				22.911		K Factor = 14.00		
138 to 139	22.26	1.049 120	0.0 0.0	8.000 0.0	15.798 0.0		K Factor = 5.60		
	22.26	0.1586	0.0	8.000	1.269		Vel = 8.26		
139 to 140	23.13	1.38 120	0.0 0.0	8.000 0.0	17.067 0.0		K Factor = 5.60		
	45.39	0.1559	0.0	8.000	1.247		Vel = 9.74		
140 to 18	23.97	1.61 120	3E 12.0 1T 8.0	10.250 20.000	18.314 0.866		K Factor = 5.60		
	69.36	0.1613	0.0	30.250	4.878		Vel = 10.93		
	0.0 69.36				24.058		K Factor = 14.14		
141 to 142	23.00	1.049 120	0.0 0.0	13.700 0.0	16.869 0.0		K Factor = 5.60		
	23.0	0.1685	0.0	13.700	2.309		Vel = 8.54		
142 to 51	24.52	1.38 120	1E 3.0 1T 6.0	7.750 9.000	19.178 0.866		K Factor = 5.60		
	47.52	0.1697	0.0	16.750	2.842		Vel = 10.19		
	0.0 47.52				22.886		K Factor = 9.93		
143 to 144	23.05	1.049 120	0.0 0.0	13.700 0.0	16.948 0.0		K Factor = 5.60		
	23.05	0.1692	0.0	13.700	2.318		Vel = 8.56		

Final Calculations - Standard

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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	*****
144	24.58	1.38	1E	3.0	7.750	19.266			K Factor = 5.60	
to		120	1T	6.0	9.000	0.866				
15	47.63	0.1705		0.0	16.750	2.856			Vel = 10.22	
	0.0									
	47.63					22.988			K Factor = 9.93	
145	23.41	1.049		0.0	13.700	17.476			K Factor = 5.60	
to		120		0.0	0.0	0.0				
146	23.41	0.1742		0.0	13.700	2.386			Vel = 8.69	
146	24.96	1.38	1E	3.0	7.750	19.862			K Factor = 5.60	
to		120	1T	6.0	9.000	0.866				
16	48.37	0.1753		0.0	16.750	2.937			Vel = 10.38	
	0.0									
	48.37					23.665			K Factor = 9.94	
147	23.66	1.049		0.0	13.700	17.852			K Factor = 5.60	
to		120		0.0	0.0	0.0				
148	23.66	0.1776		0.0	13.700	2.433			Vel = 8.78	
148	25.22	1.38	1E	3.0	7.750	20.285			K Factor = 5.60	
to		120	1T	6.0	9.000	0.866				
19	48.88	0.1788		0.0	16.750	2.995			Vel = 10.48	
	0.0									
	48.88					24.146			K Factor = 9.95	
149	23.88	1.049		0.0	13.700	18.184			K Factor = 5.60	
to		120		0.0	0.0	0.0				
150	23.88	0.1806		0.0	13.700	2.474			Vel = 8.86	
150	25.45	1.38	1E	3.0	7.750	20.658			K Factor = 5.60	
to		120	1T	6.0	9.000	0.866				
20	49.33	0.1819		0.0	16.750	3.047			Vel = 10.58	
	0.0									
	49.33					24.571			K Factor = 9.95	
51	47.52	2.469		0.0	2.500	22.886				
to		120		0.0	0.0	0.0				
52	47.52	0.0100		0.0	2.500	0.025			Vel = 3.18	
52	67.01	2.469		0.0	1.500	22.911				
to		120		0.0	0.0	0.0				
15	114.53	0.0513		0.0	1.500	0.077			Vel = 7.67	
15	47.63	2.469		0.0	7.000	22.988				
to		120		0.0	0.0	0.0				
16	162.16	0.0967		0.0	7.000	0.677			Vel = 10.87	
16	48.37	2.469		0.0	1.500	23.665				
to		120		0.0	0.0	0.0				
17	210.53	0.1567		0.0	1.500	0.235			Vel = 14.11	
17	104.76	4.026		0.0	5.167	23.900				
to		120		0.0	0.0	0.0				
18	315.29	0.0306		0.0	5.167	0.158			Vel = 7.95	
18	69.35	4.026		0.0	2.000	24.058				
to		120		0.0	0.0	0.0				
19	384.64	0.0440		0.0	2.000	0.088			Vel = 9.69	

Final Calculations - Standard

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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	*****
19	48.89	4.026			7.700		24.146			
to		120			0.0		0.0			
20	433.53	0.0552			7.700		0.425		Vel = 10.93	
20	49.33	4.026			2.000		24.571			
to		120			0.0		0.0			
21	482.86	0.0670			2.000		0.134		Vel = 12.17	
21	0.0	4.026	2E	20.0	10.750		24.705			
to		120			20.000		0.0			
22	482.86	0.0673			30.750		2.070		Vel = 12.17	
22	0.0	4.026			7.330		26.775			
to		120			0.0		0.0			
23	482.86	0.0673			7.330		0.493		Vel = 12.17	
23	0.0	4.026			6.900		27.268			
to		120			0.0		0.0			
24	482.86	0.0672			6.900		0.464		Vel = 12.17	
24	0.0	4.026			9.100		27.732			
to		120			0.0		0.0			
25	482.86	0.0674			9.100		0.613		Vel = 12.17	
25	0.0	4.026	2E	20.0	92.000		28.345			
to		120			20.000		0.0			
35	482.86	0.0673			112.000		7.537		Vel = 12.17	
35	0.0	4.026	2E	20.0	15.000		35.882			
to		120	1B	12.0	32.000		4.634			
TR	482.86	0.0673			47.000		3.163		Vel = 12.17	
TR	0.0	6.065	1A	27.0	7.000		43.679			
to		120	1E	14.0	41.000		3.032			
BR	482.86	0.0091			48.000		0.439		Vel = 5.36	
BR	0.0	6.065	1Zaf	0.0	6.000		47.150			
to		120			0.0		3.270		* Fixed loss = 2.62	
FF	482.86	0.0090			6.000		0.054		Vel = 5.36	
FF	100.00	6.16	1E	20.084	100.000		50.474		Qa = 100	
to		140	1T	43.037	67.425		5.847			
TEST	582.86	0.0090	1G	4.304	167.425		1.512		Vel = 6.27	
	150.00								Qa = 150.00	
	732.86						57.833		K Factor = 96.37	

Water Supply Curve (C)

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City Water Supply:
 C1 - Static Pressure : 85
 C2 - Residual Pressure: 69
 C2 - Residual Flow : 1277

Demand:
 D1 - Elevation : 15.029
 D2 - System Flow : 482.86
 D2 - System Pressure : 57.833
 Hose (Adj City) : _____
 Hose (Demand) : 250
 D3 - System Demand : 732.86
 Safety Margin : 21.439

