



... Fire Protection by Computer Design

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

Job Name : MMC CUP 2ND FLOOR
Building : CENTRAL UTILITY PLANT
Location : PORTLAND, MAINE
System : C643-2ND.WX9
Contract : C0609643
Data File : C643-2ND.WX9

Hydraulic Design Information Sheet

Name - MAINE MEDICAL CENTER Date - 02/07/2007
 Location - PORTLAND, MAINE
 Building - CENTRAL UTILITY PLANT System No. - C643-2ND.WX9
 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	System Type	Sprinkler/Nozzle
	Density	- .20	(X) Wet	Make TYCO
D	Area Per Sprinkler	- 115	() Dry	Model TY-B
E	Elevation at Highest Outlet	- 118.7	() 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: 8.8 PSI

Calculation Flow Required - 728.6 Press Required - 70.5 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
	Flow - 1277		Proof Flow
S	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
	() 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	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	
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.
S001	118.7	5.6	8.16	na	16.0	0.2	80	7.0
S003	118.7	5.6	7.17	na	15.0	0.2	75	7.0
201	118.7	5.6	16.91	na	23.03	0.2	80	7.0
202	118.7	5.6	19.14	na	24.5	0.2	80	7.0
203	118.7	5.6	16.95	na	23.06	0.2	80	7.0
204	118.7	5.6	19.18	na	24.53	0.2	80	7.0
205	118.7	5.6	16.87	na	23.0	0.2	115	7.0
206	118.7	5.6	19.42	na	24.68	0.2	115	7.0
207	118.7	5.6	14.33	na	21.2	0.2	80	7.0
208	118.7	K = K @ 211	16.32	na	21.83			
209A	118.7	5.6	15.32	na	21.92	0.2	92	7.0
209	118.7		17.03	na				
210	118.7	K = K @ 211	17.45	na	22.58			
211	118.7	K = K @ 211	8.77	na	16.0			
212	118.7	5.6	17.86	na	23.67	0.2	92	7.0
213	118.7		19.83	na				
214	118.7	5.6	16.59	na	22.81	0.2	80	7.0
215	118.7	5.6	18.42	na	24.03	0.2	95	7.0
216	118.7	5.6	20.24	na	25.19	0.2	95	7.0
217	118.7	K = K @ 217	7.71	na	15.0			
218	118.7	5.6	18.62	na	24.17	0.2	115	7.0
219	118.7	5.6	21.42	na	25.92	0.2	115	7.0
224	118.7	5.6	23.65	na	27.24	0.2	110	7.0
225	118.7	K = K @ 217	23.97	na	26.45			
51	116.7		22.8	na				
52	116.7		22.85	na				
53	116.7		23.11	na				
54	116.7		25.37	na				
55	116.7		25.83	na				
56	116.7		25.89	na				
57	116.7		26.35	na				
58	116.7		26.48	na				
59	116.7		26.84	na				
101	116.7		27.63	na				
70	116.7		36.44	na				
TR	82.0		56.43	na				
BR	75.0		59.89	na				
FF	73.5		63.2	na	100.0			
TEST	60.0		70.54	na	150.0			

The maximum velocity is 18.62 and it occurs in the pipe between nodes 53 and 54

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	*****
S001 to 211	16.00 16.0 0.0 16.00	1.049 120 0.0861	1T	5.0 0.0 0.0	2.000 5.000 7.000	8.163 0.0 0.603			K Factor = 5.60 Vel = 5.94	
						8.766			K Factor = 5.40	
S003 to 217	15.00 15.0 0.0 15.00	1.049 120 0.0764	1T	5.0 0.0 0.0	2.000 5.000 7.000	7.175 0.0 0.535			K Factor = 5.60 Vel = 5.57	
						7.710			K Factor = 5.40	
201 to 202	23.03 23.03	1.049 120 0.1690		0.0 0.0 0.0	13.160 0.0 13.160	16.914 0.0 2.224			K Factor = 5.60 Vel = 8.55	
202 to 51	24.50 47.53 0.0 47.53	1.38 120 0.1698	1E 1T	3.0 6.0 0.0	7.500 9.000 16.500	19.138 0.866 2.801			K Factor = 5.60 Vel = 10.20	
						22.805			K Factor = 9.95	
203 to 204	23.06 23.06	1.049 120 0.1693		0.0 0.0 0.0	13.160 0.0 13.160	16.954 0.0 2.228			K Factor = 5.60 Vel = 8.56	
204 to 52	24.52 47.58 0.0 47.58	1.38 120 0.1701	1E 1T	3.0 6.0 0.0	7.500 9.000 16.500	19.182 0.866 2.807			K Factor = 5.60 Vel = 10.21	
						22.855			K Factor = 9.95	
205 to 206	23.00 23.0	1.049 120 0.1685	1E	2.0 0.0 0.0	13.160 2.000 15.160	16.869 0.0 2.555			K Factor = 5.60 Vel = 8.54	
206 to 53	24.68 47.68 0.0 47.68	1.38 120 0.1707	1E 1T	3.0 6.0 0.0	7.500 9.000 16.500	19.424 0.866 2.817			K Factor = 5.60 Vel = 10.23	
						23.107			K Factor = 9.92	
207 to 208	21.20 21.2	1.049 120 0.1449	1E	2.0 0.0 0.0	11.750 2.000 13.750	14.328 0.0 1.992			K Factor = 5.60 Vel = 7.87	
208 to 209	21.83 43.03 0.0 43.03	1.38 120 0.1412		0.0 0.0 0.0	5.000 0.0 5.000	16.320 0.0 0.706			K Factor @ node 211 Vel = 9.23	
						17.026			K Factor = 10.43	
209A to 209	21.92 21.92	1.049 120 0.1542	1T	5.0 0.0 0.0	6.040 5.000 11.040	15.324 0.0 1.702			K Factor = 5.60 Vel = 8.14	
209 to 210	43.03 64.95	1.61 120 0.1430		0.0 0.0 0.0	3.000 0.0 3.000	17.026 0.0 0.429			Vel = 10.24	

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	*****
210 to 211	22.58 87.53	1.61 120 -1.0861		0.0 0.0 0.0	8.000 0.0 8.000	17.455 0.0 -8.689			K Factor @ node 211 Vel = 13.79	
211 to 213	23.82 111.35	1.61 120 11.0600		0.0 0.0 0.0	1.000 0.0 1.000	8.766 0.0 11.060			K Factor @ node 211 Vel = 17.55	
	0.0 111.35					19.826			K Factor = 25.01	
212 to 213	23.67 23.67	1.049 120 0.1777	1T	5.0 0.0 0.0	6.040 5.000 11.040	17.864 0.0 1.962			K Factor = 5.60 Vel = 8.79	
213 to 53	111.35 135.02	2.067 120 0.1637	1T	10.0 0.0 0.0	4.750 10.000 14.750	19.826 0.866 2.415			Vel = 12.91	
	0.0 135.02					23.107			K Factor = 28.09	
214 to 215	22.81 22.81	1.049 120 0.1660	1E	2.0 0.0 0.0	9.000 2.000 11.000	16.592 0.0 1.826			K Factor = 5.60 Vel = 8.47	
215 to 216	24.03 46.84	1.38 120 0.1653		0.0 0.0 0.0	11.000 0.0 11.000	18.418 0.0 1.818			K Factor = 5.60 Vel = 10.05	
216 to 217	25.19 72.03	1.61 120 -1.9271		0.0 0.0 0.0	6.500 0.0 6.500	20.236 0.0 -12.526			K Factor = 5.60 Vel = 11.35	
217 to 54	24.97 97.0	1.61 120 1.5999	1T	8.0 0.0 0.0	2.500 8.000 10.500	7.710 0.866 16.799			K Factor @ node 217 Vel = 15.29	
	0.0 97.00					25.375			K Factor = 19.26	
218 to 219	24.17 24.17	1.049 120 0.1846	1E	2.0 0.0 0.0	13.160 2.000 15.160	18.623 0.0 2.799			K Factor = 5.60 Vel = 8.97	
219 to 54	25.92 50.09	1.38 120 0.1871	1E 1T	3.0 6.0 0.0	7.500 9.000 16.500	21.422 0.866 3.087			K Factor = 5.60 Vel = 10.74	
	0.0 50.09					25.375			K Factor = 9.94	
224 to 225	27.24 27.24	1.61 120 0.0286	1E	4.0 0.0 0.0	7.000 4.000 11.000	23.653 0.0 0.315			K Factor = 5.60 Vel = 4.29	
225 to 56	26.44 53.68	1.61 120 0.1004	1T	8.0 0.0 0.0	2.500 8.000 10.500	23.968 0.866 1.054			K Factor @ node 217 Vel = 8.46	
	0.0 53.68					25.888			K Factor = 10.55	
51 to 52	47.53 47.53	2.469 120 0.0100		0.0 0.0 0.0	5.000 0.0 5.000	22.805 0.0 0.050			Vel = 3.19	

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	*****
52	47.58	2.469	0.0	7.000	22.855				
to		120	0.0	0.0	0.0				
53	95.11	0.0360	0.0	7.000	0.252		Vel = 6.37		
53	182.71	2.469	0.0	8.660	23.107				
to		120	0.0	0.0	0.0				
54	277.82	0.2619	0.0	8.660	2.268		Vel = 18.62		
54	147.08	4.026	0.0	8.660	25.375				
to		120	0.0	0.0	0.0				
55	424.9	0.0531	0.0	8.660	0.460		Vel = 10.71		
55	0.0	4.026	0.0	1.000	25.835				
to		120	0.0	0.0	0.0				
56	424.9	0.0530	0.0	1.000	0.053		Vel = 10.71		
56	53.69	4.026	0.0	7.000	25.888				
to		120	0.0	0.0	0.0				
57	478.59	0.0661	0.0	7.000	0.463		Vel = 12.06		
57	0.0	4.026	0.0	2.000	26.351				
to		120	0.0	0.0	0.0				
58	478.59	0.0665	0.0	2.000	0.133		Vel = 12.06		
58	0.0	4.026	0.0	5.330	26.484				
to		120	0.0	0.0	0.0				
59	478.59	0.0660	0.0	5.330	0.352		Vel = 12.06		
59	0.0	4.026	1E 10.0	1.990	26.836				
to		120	0.0	10.000	0.0				
101	478.59	0.0662	0.0	11.990	0.794		Vel = 12.06		
101	0.0	4.026	3E 30.0	103.040	27.630				
to		120	0.0	30.000	0.0				
70	478.59	0.0662	0.0	133.040	8.807		Vel = 12.06		
70	0.0	4.026	2E 20.0	43.000	36.437				
to		120	1B 12.0	32.000	15.029				
TR	478.59	0.0662	0.0	75.000	4.964		Vel = 12.06		
TR	0.0	6.065	1A 27.0	7.000	56.430				
to		120	1E 14.0	41.000	3.032				
BR	478.59	0.0090	0.0	48.000	0.432		Vel = 5.31		
BR	0.0	6.065	1Zaf 0.0	6.000	59.894				
to		120	0.0	0.0	3.255			* Fixed loss = 2.605	
FF	478.59	0.0090	0.0	6.000	0.054		Vel = 5.31		
FF	100.00	6.16	1E 20.084	100.000	63.203		Qa = 100		
to		140	1T 43.037	67.425	5.847				
TEST	578.59	0.0089	1G 4.304	167.425	1.492		Vel = 6.23		
	150.00						Qa = 150.00		
	728.59				70.542		K Factor = 86.75		

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 : 25.423
D2 - System Flow : 478.586
D2 - System Pressure : 70.542
Hose (Adj City) : _____
Hose (Demand) : 250
D3 - System Demand : 728.586
Safety Margin : 8.792

