

... Fire Protection by Computer Design

ABL FIRE PROTECTION
300 HOKE STREET
RALEIGH, NC
919-835-2225

Job Name : SOLEIL CENTER: 8TH FLOOR
Building : TOWER
Location : 4501 CREEDMOOR ROAD, RALEIGH, NORTH CAROLINA
System : 8TH FLOOR
Contract :
Data File : SOLEIL 8TH.WXF

Hydraulic Design Information Sheet

Name - SOLEIL CENTER Date - 11-25-07
 Location - 4501 CREEDMOOR ROAD, RALEIGH, NORTH CAROLINA
 Building - TOWER System No. - 8TH FLOOR
 Contractor - Contract No. -
 Calculated By - JSB Drawing No. - FP39
 Construction: () Combustible (X) Non-Combustible Ceiling Height - VARIES
 Occupancy - MECHANICAL

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 - 1100	System Type	Sprinkler/Nozzle
	Density - .2	(X) Wet	Make VIKING
D	Area Per Sprinkler - 130	() Dry	Model M
E	Elevation at Highest Outlet - 86.5	() Deluge	Size 1/2
S	Hose Allowance - Inside - 100	() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance -	() Other	Temp.Rat.155
G	Hose Allowance - Outside - 150		

N Note 720 GALLONS ADDED FOR DOMESTIC WATER

Calculation Flow Required - 526.48 Press Required - 212.027 AT PUMP DISCHARGE
 Summary C-Factor Used: 150 Overhead 150 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test -		Cap. -
T	Time of Test -	Rated Cap.- 1000	Elev.-
E	Static Press - 106	@ Press - 180	
R	Residual Press - 92	Elev. - 0	Well
	Flow - 1470		Proof Flow
S	Elevation - 0		

U Location -

P Source of Information -

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	Solid Piled %	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

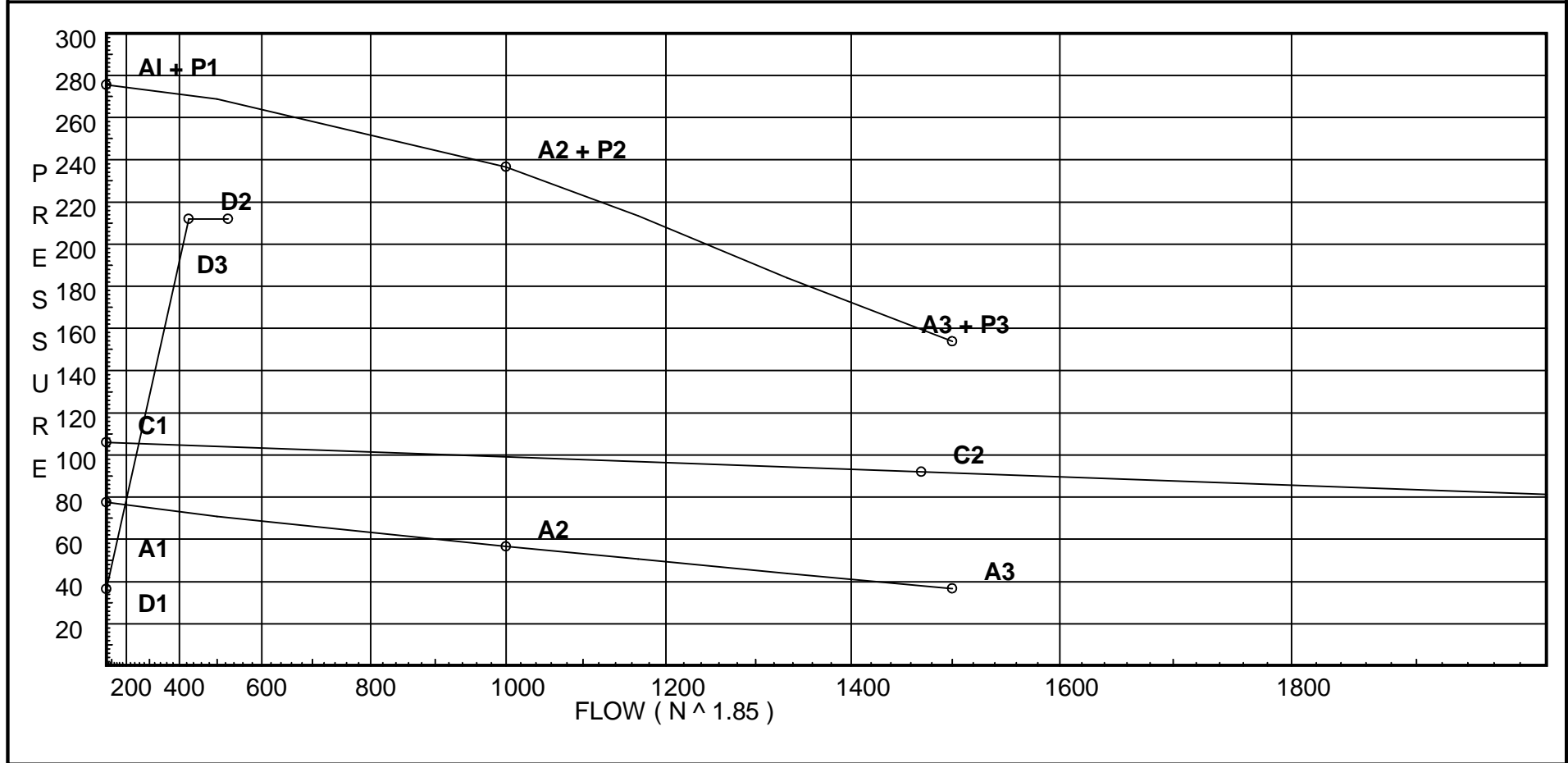
E Horizontal Barriers Provided:

Water Supply Curve (C)

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City Water Supply: C1 - Static Pressure : 106 C2 - Residual Pressure: 92 C2 - Residual Flow : 1470 City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow A1 - Adjusted Static: 77.600 A2 - Adj Resid : 56.715 @ 1000 A3 - Adj Resid : 36.703 @ 1500	Pump Data: P1 - Pump Churn Pressure : 198 P2 - Pump Rated Pressure : 180 P2 - Pump Rated Flow : 1000 P3 - Pump Pressure @ Max Flow : 117 P3 - Pump Max Flow : 1500 City Residual Flow @ 0 = 4390.85 City Residual Flow @ 20 = 3921.60 City Water @ 150% of Pump = 91.47	Demand: D1 - Elevation : 36.380 D2 - System Flow : 426.48 D2 - System Pressure : 212.027 Hose (Adj City) : 870 Hose (Demand) : 100 D3 - System Demand : 526.48 Safety Margin : 55.718
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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	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	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
F	45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
G	Generic Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
S	Generic Swing Check Valve	4	5	5	7	9	11	14	16	19	22	27	32	45	55	65	76	87	98	109	130
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
Zaf	Ames 3000SS	Fitting generates a Fixed Loss Based on Flow																			
Zai	Ames 4000SS	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.
1	86.5	5.6	24.13	na	27.51	0.2	60	7.0
2	86.5	5.6	24.41	na	27.67	0.2	60	7.0
3	86.5	5.6	24.85	na	27.92	0.2	60	7.0
4	86.5	5.6	25.14	na	28.08	0.2	60	7.0
5	86.5		26.14	na				
7	86.5	5.6	20.39	na	25.29	0.2	60	7.0
8	86.5	5.6	20.25	na	25.2	0.2	60	7.0
9	86.5		22.34	na				
10H	85.0	5.6	21.56	na	26.0	0.2	130	7.0
10	86.5		23.02	na				
11H	85.0	5.6	24.43	na	27.68	0.2	130	7.0
11	86.5		25.32	na				
12H	85.0	5.6	27.34	na	29.28	0.2	130	7.0
12	86.5		28.4	na				
13H	85.0	5.6	27.54	na	29.39	0.2	130	7.0
13	86.5		28.62	na				
15H	85.0	5.6	27.4	na	29.31	0.2	130	7.0
15	86.5		28.46	na				
16H	85.0	5.6	26.79	na	28.98	0.2	130	7.0
16	86.5		28.85	na				
18H	85.0	5.6	31.45	na	31.41	0.1	130	7.0
18	86.5		32.75	na				
19H	85.0	5.6	31.37	na	31.37	0.1	130	7.0
19	86.5		32.67	na				
20H	85.0	5.6	31.48	na	31.42	0.1	130	7.0
20	86.5		32.78	na				
6	86.5		29.38	na				
11A	86.5		29.49	na				
14	86.5		30.21	na				
17	86.5		30.28	na				
21	86.5		33.74	na				
22	86.5		113.83	na				
23	86.5		144.51	na				
8TH	86.5		168.62	na	100.0			
LZT	24.5		197.84	na				
CON	17.5		201.38	na				
LZD	17.5		212.03	na				
LZS	17.5		70.45	na				
RED	17.5		70.99	na				
MF4	3.0		77.44	na				
DI	1.0		88.76	na				
HDI	-3.0		90.76	na	150.0			
HD2	-3.0		91.29	na	720.0			
POC	1.0		93.27	na				

The maximum velocity is 25.09 and it occurs in the pipe between nodes 21 and 22

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	*****
1	27.51	1.682		0.0	11.880	24.126			K Factor = 5.60	
to		120		0.0	0.0	0.0				
2	27.51	0.0236		0.0	11.880	0.280			Vel = 3.97	
2	27.66	1.682	1T	9.9	10.380	24.406			K Factor = 5.60	
to		120		0.0	9.900	0.0				
5	55.17	0.0853		0.0	20.280	1.730			Vel = 7.97	
	0.0									
	55.17					26.136			K Factor = 10.79	
3	27.92	1.682		0.0	11.880	24.849			K Factor = 5.60	
to		120		0.0	0.0	0.0				
4	27.92	0.0242		0.0	11.880	0.288			Vel = 4.03	
4	28.07	1.682	1T	9.9	1.500	25.137			K Factor = 5.60	
to		120		0.0	9.900	0.0				
5	55.99	0.0876		0.0	11.400	0.999			Vel = 8.08	
5	55.17	1.682	1T	9.9	0.500	26.136				
to		120		0.0	9.900	0.0				
6	111.16	0.3118		0.0	10.400	3.243			Vel = 16.05	
	0.0									
	111.16					29.379			K Factor = 20.51	
7	25.29	1.049	1T	5.0	4.710	20.392			K Factor = 5.60	
to		120		0.0	5.000	0.0				
9	25.29	0.2008		0.0	9.710	1.950			Vel = 9.39	
	0.0									
	25.29					22.342			K Factor = 5.35	
8	25.20	1.049	1T	5.0	5.500	20.247			K Factor = 5.60	
to		120		0.0	5.000	0.0				
9	25.2	0.1995		0.0	10.500	2.095			Vel = 9.35	
9	25.29	1.682		0.0	9.380	22.342				
to		120		0.0	0.0	0.0				
10	50.49	0.0724		0.0	9.380	0.679			Vel = 7.29	
	0.0									
	50.49					23.021			K Factor = 10.52	
10H	26.00	1.049	1E	2.0	3.000	21.556			K Factor = 5.60	
to		120	1T	5.0	7.000	-0.650				
10	26.0	0.2115		0.0	10.000	2.115			Vel = 9.65	
10	50.49	1.682		0.0	14.750	23.021				
to		120		0.0	0.0	0.0				
11	76.49	0.1561		0.0	14.750	2.303			Vel = 11.04	
	0.0									
	76.49					25.324			K Factor = 15.20	

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	***** Notes *****
11H to 11	27.68	1.049 120	1T 5.0 0.0	1.500 5.000	24.430 -0.650		K Factor = 5.60
11 to 11A	27.68	0.2375	0.0	6.500	1.544		Vel = 10.28
11 to 11A	76.48	1.682 120	1T 9.9 0.0	5.170 9.900	25.324 0.0		
	104.16	0.2764	0.0	15.070	4.166		Vel = 15.04
	0.0 104.16				29.490		K Factor = 19.18
12H to 12	29.28	1.049 120	1T 5.0 0.0	1.500 5.000	27.340 -0.650		K Factor = 5.60
12 to 13	29.28	0.2635	0.0	6.500	1.713		Vel = 10.87
12 to 13	0.0	1.682 120	0.0 0.0	8.170 0.0	28.403 0.0		
	29.28	0.0264	0.0	8.170	0.216		Vel = 4.23
	0.0 29.28				28.619		K Factor = 5.47
13H to 13	29.39	1.049 120	1T 5.0 0.0	1.500 5.000	27.544 -0.650		K Factor = 5.60
13 to 14	29.39	0.2654	0.0	6.500	1.725		Vel = 10.91
13 to 14	29.28	1.682 120	1T 9.9 0.0	6.790 9.900	28.619 0.0		
	58.67	0.0956	0.0	16.690	1.595		Vel = 8.47
	0.0 58.67				30.214		K Factor = 10.67
15H to 15	29.31	1.049 120	1T 5.0 0.0	1.500 5.000	27.396 -0.650		K Factor = 5.60
15 to 16	29.31	0.2638	0.0	6.500	1.715		Vel = 10.88
15 to 16	0.0	1.682 120	0.0 0.0	14.750 0.0	28.461 0.0		
	29.31	0.0265	0.0	14.750	0.391		Vel = 4.23
	0.0 29.31				28.852		K Factor = 5.46
16H to 16	28.98	1.049 120	1E 2.0 1T 5.0	3.500 7.000	26.787 -0.650		K Factor = 5.60
16 to 17	28.98	0.2586	0.0	10.500	2.715		Vel = 10.76
16 to 17	29.31	1.682 120	1T 9.9 0.0	5.170 9.900	28.852 0.0		
	58.29	0.0945	0.0	15.070	1.424		Vel = 8.42
	0.0 58.29				30.276		K Factor = 10.59

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
18H	31.41	1.049	1T	5.0	1.500	31.454			K Factor = 5.60	
to		120		0.0	5.000	-0.650				
18	31.41	0.3000		0.0	6.500	1.950			Vel = 11.66	
18	-49.46	1.682		0.0	8.210	32.754				
to		120		0.0	0.0	0.0				
19	-18.05	-0.0108		0.0	8.210	-0.089			Vel = 2.61	
	0.0									
	-18.05					32.665			K Factor = -3.16	
19H	31.37	1.049	1T	5.0	1.500	31.370			K Factor = 5.60	
to		120		0.0	5.000	-0.650				
19	31.37	0.2992		0.0	6.500	1.945			Vel = 11.65	
19	-18.05	1.682	1T	9.9	8.210	32.665				
to		120		0.0	9.900	0.0				
20	13.32	0.0062		0.0	18.110	0.112			Vel = 1.92	
	0.0									
	13.32					32.777			K Factor = 2.33	
20H	31.42	1.049	1T	5.0	1.500	31.476			K Factor = 5.60	
to		120		0.0	5.000	-0.650				
20	31.42	0.3002		0.0	6.500	1.951			Vel = 11.66	
20	13.31	1.682	1T	9.9	6.790	32.777				
to		120		0.0	9.900	0.0				
21	44.73	0.0579		0.0	16.690	0.966			Vel = 6.46	
	0.0									
	44.73					33.743			K Factor = 7.70	
6	111.16	2.635		0.0	3.170	29.379				
to		120		0.0	0.0	0.0				
11A	111.16	0.0350		0.0	3.170	0.111			Vel = 6.54	
11A	104.17	2.635		0.0	6.080	29.490				
to		120		0.0	0.0	0.0				
14	215.33	0.1191		0.0	6.080	0.724			Vel = 12.67	
14	58.67	2.635		0.0	0.330	30.214				
to		120		0.0	0.0	0.0				
17	274.0	0.1879		0.0	0.330	0.062			Vel = 16.12	
17	58.30	2.635		0.0	9.330	30.276				
to		120		0.0	0.0	0.0				
18	332.3	0.2656		0.0	9.330	2.478			Vel = 19.55	
18	49.45	2.635		0.0	2.880	32.754				
to		120		0.0	0.0	0.0				
21	381.75	0.3434		0.0	2.880	0.989			Vel = 22.46	
21	44.73	2.635	1F	4.119	169.420	33.743				
to		120	2E	16.474	20.593	0.0				
22	426.48	0.4215		0.0	190.013	80.086			Vel = 25.09	

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
22	0.0	2.635	1T	16.474	56.330	113.829				
to		120		0.0	16.474	0.0				
23	426.48	0.4215		0.0	72.804	30.685		Vel = 25.09		
23	0.0	2.635	1B	9.61	12.000	144.514				
to		120		0.0	9.610	15.000		* Fixed loss = 15		
8TH	426.48	0.4215		0.0	21.610	9.108		Vel = 25.09		
8TH	100.00	6.357	4E	70.411	156.000	168.622		Qa = 100		
to		120	1T	37.72	120.704	26.852				
LZT	526.48	0.0085	1B	12.573	276.704	2.363		Vel = 5.32		
LZT	0.0	6.357	1T	37.72	10.000	197.837				
to		120	1B	12.573	50.293	3.032				
CON	526.48	0.0085		0.0	60.293	0.514		Vel = 5.32		
CON	0.0	6.357	1S	40.235	5.000	201.383				
to		120	1E	17.603	70.411	10.000		* Fixed loss = 10		
LZD	526.48	0.0085	1B	12.573	75.411	0.644		Vel = 5.32		
	0.0									
	526.48					212.027		K Factor = 36.16		
System Demand Pressure						212.027				
Safety Margin						55.718				
Continuation Pressure						267.745				
Pressure @ Pump Outlet						267.745				
Pressure From Pump Curve						-197.298				
Pressure @ Pump Inlet						70.447				
LZS	0.0	6.357	1E	17.603	5.000	70.447				
to		120	1G	3.772	59.095	0.0				
RED	526.48	0.0085	1T	37.72	64.095	0.547		Vel = 5.32		
RED	0.0	8.249	1B	14.094	12.500	70.994				
to		120	1T	41.108	55.202	6.280				
MF4	526.48	0.0024		0.0	67.702	0.163		Vel = 3.16		
MF4	0.0	8.249	1Zai	0.0	1.000	77.437				
to		120	1E	21.141	21.141	11.270		* Fixed loss = 10.404		
DI	526.48	0.0024		0.0	22.141	0.053		Vel = 3.16		
DI	0.0	8.27	1F	14.234	45.000	88.760				
to		140	1G	6.326	104.382	1.732				
HDI	526.48	0.0018	1T	55.354	149.382	0.266		Vel = 3.14		
			1E	28.468						
HDI	150.00	10.28	2F	33.148	420.000	90.758		Qa = 150		
to		140	1T	75.336	116.018	0.0				
HD2	676.48	0.0010	1G	7.534	536.018	0.527		Vel = 2.61		
HD2	720.00	10.28	1F	16.574	131.000	91.285		Qa = 720		
to		140	2G	15.067	31.641	1.372		* Fixed loss = 3.104		
POC	1396.48	0.0038	1Zaf	0.0	162.641	0.611		Vel = 5.40		

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	*****
	0.0 1396.48				93.268			K Factor = 144.60	