



. . . Fire Protection by Computer Design

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

Job Name : UNUM HO1 ZONE 1 GROUND FLOOR PRINT DISTRIBUTION
Building : HO1 ZONE 1 GROUND FLOOR PRINTDISTRIBUTION
Location : PORTLAND, MAINE
System : Z1-OH.WX2
Contract : C121125
Data File : UNUM HO1 GROUND Z1-OH.WX2

Hydraulic Design Information Sheet

Name - UNUM HO1 IMPROVEMENTS/RENOVATIONS Date - 02/08/2013
 Location - PORTLAND, MAINE
 Building - HO1 ZONE 1 GROUND FLOOR PRINTDISTRIBUTION System No. - Z1-OH.WX2
 Contractor - DEAN & ALLYN, INC. Contract No. - C121125
 Calculated By - T. CLARKE Drawing No. -
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 9'-1"
 Occupancy - PRINT DISTRIBUTION

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

E

M	Area of Sprinkler Operation - 1500	System Type	Sprinkler/Nozzle
	Density - 0.20	(X) Wet	Make VIKING
D	Area Per Sprinkler - 16X16	() Dry	Model VK572
E	Elevation at Highest Outlet - 9'-1"	() Deluge	Size 3/4 X 3/4
S	Hose Allowance - Inside - 0	() Preaction	K-Factor 14.0
I	Rack Sprinkler Allowance - 0	() Other	Temp.Rat.155F
G	Hose Allowance - Outside - 250		

N

Note CALC WITH BOOSTER PUMP-15.3 PSI CUSHION

Calculation Flow Required - 824.2 Press Required - 48.7 AT TEST
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - SEPT. 2012		Cap. -
T	Time of Test -	Rated Cap.- 750	Elev.-
E	Static Press - 67	@ Press - 50	
R	Residual Press - 60	Elev. - 2	Well
	Flow - 1316		Proof Flow
S	Elevation - 2		

U

P Location - HYDRANT #5

P

L Source of Information - BY OWNER

Y

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

O

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

G

E Horizontal Barriers Provided:

Fittings Used Summary

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Fitting Legend		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	
Abbrev.	Name																					
Bvca	B Fly Vic 705						6	6	7		8	12	14	16	18	19						
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	
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28	
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																				
G	NFPA 13 Gate Valve	0	0	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13	
I	90' Grvd-Vic Elbow #10	0	0	2	3	4	3.5	6	5	8	7	8.5	10	13	17	20	23	25	33	36	40	
J	90'Tee-Branch Grv Vic #20	0	0	4.5	6	8	8.5	10.8	13	17	16	21	25	33	41	50	65	78	88	98	120	
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	
Zac	Ames 2000SS	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

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.
711B	9.083	14	13.38	na	51.2	0.2	256	13.3
711A	9.75		17.28	na				
714B	9.083	14	13.38	na	51.2	0.2	256	13.3
714A	9.75		19.81	na				
711	9.75	K = K @ 711A	24.4	na	60.83			
712	9.75	K = K @ 711A	26.03	na	62.83			
713	9.75	K = K @ 711A	32.11	na	69.78			
714	9.75	K = K @ 714A	19.81	na	51.2			
715	9.75	K = K @ 714A	20.7	na	52.34			
716	9.75	K = K @ 714A	22.89	na	55.03			
717	9.75	K = K @ 714A	30.11	na	63.12			
718	9.75		40.24	na				
719	9.75	K = K @ 711A	40.24	na	78.13			
720	9.75	K = K @ 711A	43.17	na	80.92			
730	9.75		44.31	na				
731	9.75		44.31	na				
732	9.75		44.31	na				
733	9.75		44.31	na				
734	9.75		44.31	na				
735	9.75		44.31	na				
736	9.75		44.31	na				
737	9.75		44.31	na				
754	9.75		44.31	na				
755	9.75		44.38	na				
756	9.75		45.82	na				
757	9.75		47.12	na				
758	9.75		51.66	na				
679	9.5		84.26	na				
680	9.75		86.18	na				
TR1	5.833		91.66	na				
BR1	2.0		94.91	na				
PO	2.0		95.36	na				
PI	2.0		57.43	na				
FF	1.0		61.14	na				
UG1	-7.0		66.14	na	250.0			
UG2	-7.0		67.22	na				
UG3	-7.0		67.65	na				
TEST	2.0		64.06	na				

The maximum velocity is 33.78 and it occurs in the pipe between nodes 758 and 679

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	*****
711B to 711A	51.20 51.2	1.049 120.0 0.7406	1T	5.0 0.0 0.0	0.667 5.000 5.667	13.375 -0.289 4.197			K Factor = 14.00 Vel = 19.01	
	0.0 51.20						17.283		K Factor = 12.32	
714B to 714A	51.20 51.2	1.049 120.0 0.7406	1E 1T	2.0 5.0 0.0	2.083 7.000 9.083	13.375 -0.289 6.727			K Factor = 14.00 Vel = 19.01	
	0.0 51.20						19.813		K Factor = 11.50	
711 to 712	60.83 60.83	1.682 120.0 0.1022		0.0 0.0 0.0	16.000 0.0 16.000	24.395 0.0 1.635			K Factor @ node 711A Vel = 8.78	
712 to 713	62.83 123.66	1.682 120.0 0.3798		0.0 0.0 0.0	16.000 0.0 16.000	26.030 0.0 6.077			K Factor @ node 711A Vel = 17.86	
713 to 754	69.79 193.45	1.682 120.0 0.8690	1T	9.9 0.0 0.0	4.146 9.900 14.046	32.107 0.0 12.206			K Factor @ node 711A Vel = 27.93	
	0.0 193.45						44.313		K Factor = 29.06	
714 to 715	51.20 51.2	1.682 120.0 0.0743		0.0 0.0 0.0	12.000 0.0 12.000	19.813 0.0 0.892			K Factor @ node 714A Vel = 7.39	
715 to 716	52.34 103.54	1.682 120.0 0.2734		0.0 0.0 0.0	8.000 0.0 8.000	20.705 0.0 2.187			K Factor @ node 714A Vel = 14.95	
716 to 717	55.03 158.57	1.682 120.0 0.6017		0.0 0.0 0.0	12.000 0.0 12.000	22.892 0.0 7.220			K Factor @ node 714A Vel = 22.90	
717 to 756	63.12 221.69	1.682 120.0 1.1182	1T	9.9 0.0 0.0	4.146 9.900 14.046	30.112 0.0 15.706			K Factor @ node 714A Vel = 32.01	
	0.0 221.69						45.818		K Factor = 32.75	
718 to 719	0.0 0.0	1.682 120.0 0.0		0.0 0.0 0.0	18.000 0.0 18.000	40.245 0.0 0.0	0.0 0.0		Vel = 0	
719 to 720	78.13 78.13	1.682 120.0 0.1624		0.0 0.0 0.0	18.000 0.0 18.000	40.245 0.0 2.923			K Factor @ node 711A Vel = 11.28	

Final Calculations - Hazen-Williams

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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	*****
720 to 758	80.92 159.05	1.682 120.0 0.6049	1T 9.9 0.0 0.0	4.146 9.900 14.046	43.168 0.0 8.497			K Factor @ node 711A Vel = 22.97	
	0.0 159.05					51.665		K Factor = 22.13	
730 to 731	0.0	2.635 120.0 0.0	0.0 0.0 0.0	2.771 0.0 2.771	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
731 to 732	0.0	2.635 120.0 0.0	0.0 0.0 0.0	1.250 0.0 1.250	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
732 to 733	0.0	2.635 120.0 0.0	0.0 0.0 0.0	13.979 0.0 13.979	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
733 to 734	0.0	2.635 120.0 0.0	0.0 0.0 0.0	4.021 0.0 4.021	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
734 to 735	0.0	2.635 120.0 0.0	0.0 0.0 0.0	1.250 0.0 1.250	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
735 to 736	0.0	2.635 120.0 0.0	0.0 0.0 0.0	6.583 0.0 6.583	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
736 to 737	0.0	2.635 120.0 0.0	0.0 0.0 0.0	6.167 0.0 6.167	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
737 to 754	0.0	2.635 120.0 0.0	2I 16.474 0.0 0.0	107.417 16.474 123.891	44.313 0.0 0.0	0.0 0.0 0.0		Vel = 0	
754 to 755	193.45 193.45	2.635 120.0 0.0975	0.0 0.0 0.0	0.667 0.0 0.667	44.313 0.0 0.065			Vel = 11.38	
755 to 756	0.0 193.45	2.635 120.0 0.0976	0.0 0.0 0.0	14.750 0.0 14.750	44.378 0.0 1.440			Vel = 11.38	
756 to 757	221.69 415.14	2.635 120.0 0.4009	0.0 0.0 0.0	3.250 0.0 3.250	45.818 0.0 1.303			Vel = 24.42	
757 to 758	0.0 415.14	2.635 120.0 0.4010	0.0 0.0 0.0	11.333 0.0 11.333	47.121 0.0 4.544			Vel = 24.42	
758 to 679	159.05 574.19	2.635 120.0 0.7306	0.0 0.0 0.0	44.458 0.0 44.458	51.665 0.108 32.483			Vel = 33.78	

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	*****
679 to 680	0.0 574.19	6.357 120.0 0.0100	1J 31.433 1Bvca 17.603 1Fsp 0.0 1S 40.235	14.229 89.271 103.500	84.256 0.892 1.037			* Fixed loss = 1 Vel = 5.80	
680 to TR1	0.0 574.19	6.357 120.0 0.0100	12I 150.881 0.0 0.0	225.833 150.881 376.714	86.185 1.696 3.777			Vel = 5.80	
TR1 to BR1	0.0 574.19	6.357 120.0 0.0100	1Fsp 0.0 1Bvca 17.603 1T 37.72	3.833 55.323 59.156	91.658 2.660 0.593			* Fixed loss = 1 Vel = 5.80	
BR1 to PO	0.0 574.19	6.357 120.0 0.0100	2I 25.147 0.0 0.0	19.479 25.147 44.626	94.911 0.0 0.447			Vel = 5.80	
	0.0 574.19				95.358			K Factor = 58.80	
System Demand Pressure					95.358				
Safety Margin					15.307				
Continuation Pressure					110.665				
Pressure @ Pump Outlet					110.665				
Pressure From Pump Curve					-53.232				
Pressure @ Pump Inlet					57.433				
PI to FF	0.0 574.19	6.357 120.0 0.0100	2I 25.147 1Zac 0.0 0.0	7.250 25.147 32.397	57.433 3.384 0.325			* Fixed loss = 2.951 Vel = 5.80	
FF to UG1	0.0 574.19	6.16 140.0 0.0088	2E 40.168 1T 43.037 0.0	90.667 83.205 173.872	61.142 3.465 1.528			Vel = 6.18	
UG1 to UG2	250.00 824.19	8.27 140.0 0.0041	2F 28.468 1G 6.326 1T 55.354	174.667 90.148 264.815	66.135 0.0 1.081			Qa = 250 Vel = 4.92	
UG2 to UG3	0.0 824.19	8.27 140.0 0.0041	1T 55.354 0.0 0.0	50.000 55.354 105.354	67.216 0.0 0.431			Vel = 4.92	
UG3 to TEST	0.0 824.19	8.27 140.0 0.0041	1T 55.354 1G 6.326 0.0	13.167 61.680 74.847	67.647 -3.898 0.306			Vel = 4.92	
	0.0 824.19				64.055			K Factor = 102.98	

Water Supply Curve (C)

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City Water Supply:		Pump Data:		Demand:	
C1 - Static Pressure	: 67	P1 - Pump Churn Pressure	: 56	D1 - Elevation	: 3.357
C2 - Residual Pressure	: 60	P2 - Pump Rated Pressure	: 50	D2 - System Flow	: 574.187
C2 - Residual Flow	: 1316	P2 - Pump Rated Flow	: 750	D2 - System Pressure	: 95.358
City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow		P3 - Pump Pressure @ Max Flow	: 32.5	Hose (Demand)	:
A1 - Adjusted Static	: 62.476	P3 - Pump Max Flow	: 1125	D3 - System Demand	: 574.187
A2 - Adj Resid	: 53.561 @ 750	City Residual Flow @ 0	= 4461.84	Hose (Adj City)	: 250
A3 - Adj Resid	: 42.669 @ 1125	City Residual Flow @ 20	= 3683.69	Safety Margin	: 15.307
		City Water @ 150% of Pump	= 61.76		

