



. . . 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 GROUND FLOOR OPEN OFFICE
Building : HO1 ZONE 1 GROUND FLOOR OPEN OFFICE
Location : PORTLAND, MAINE
System : GRD Z1-LH.WX3
Contract : C121125
Data File : UNUM HO1 GROUND Z1-LH.WX3

Hydraulic Design Information Sheet

Name - UNUM HO1 IMPROVEMENTS/RENOVATIONS Date - 02/08/2013
 Location - PORTLAND, MAINE
 Building - HO1 ZONE 1 GROUND FLOOR OPEN OFFICE System No. - GRD Z1-LH.WX3
 Contractor - DEAN & ALLYN, INC. Contract No. - C121125
 Calculated By - T. CLARKE Drawing No. -
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 9'-4"
 Occupancy - OFFICE

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. () 1 () 2 () 3 () Ex.Haz.
 Y () NFPA 231 () NFPA 231C () Figure Curve

S Other

T Specific Ruling Made By Date

E

Area	Value	System Type	Make
Area of Sprinkler Operation - 1500		(X) Wet	VIKING
Density - 0.10		() Dry	VK534
Area Per Sprinkler - 18X18		() Deluge	Size 5/8 X 3/4
Elevation at Highest Outlet - 9'-4"		() Preaction	K-Factor 11.2
Hose Allowance - Inside - 0		() Other	Temp.Rat.155F
Rack Sprinkler Allowance - 0			
Hose Allowance - Outside - 100			

N

Note CALC WITH BOOSTER PUMP-43.7 PSI CUSHION

Calculation Flow Required - 407.9 Press Required - 22.4 AT TEST
 Summary C-Factor Used: 120 Overhead 140 Underground

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

U

P Location - HYDRANT #5

P

L Source of Information - BY OWNER

Y

Commodity	Class	Location
Storage Ht.	Area	Aisle W.
Storage Method:	%	Palletized % Rack
() Single Row	() Conven. Pallet	() Auto. Storage
() Double Row	() Slave Pallet	() Solid Shelf
() Mult. Row		() Open Shelf

S R

T A Flue Spacing Clearance:Storage to Ceiling
 O C Longitudinal Transverse

R K

G Horizontal Barriers Provided:

E

Fittings Used Summary

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UNUM HO1 GROUND FLOOR OPEN OFFICE

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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
H	45' Grvd-Vic Elbow #11	0	0	1	1.5	2	2	3	3	3.5	3.5	4.5	5	6.5	8.5	10	18	20	23	25	30
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.
681B	9.333	11.2	8.7	na	33.04	0.1	324	8.7
601A	9.75		8.7	na				
681	9.75	K = K @ 681A	14.53	na	33.04			
682	9.75	K = K @ 681A	15.78	na	34.44			
683	9.75	K = K @ 681A	20.5	na	39.25			
684	9.75		30.29	na				
685	9.75	K = K @ 681A	14.95	na	33.52			
686	9.75	K = K @ 681A	16.25	na	34.94			
687	9.75	K = K @ 681A	21.09	na	39.81			
688	9.75		31.14	na				
689	9.75		27.61	na				
690	9.75	K = K @ 681A	27.61	na	45.55			
691	9.75	K = K @ 681A	29.89	na	47.39			
692	9.75		37.47	na				
651	9.75		35.42	na				
652	9.75		36.4	na				
653	9.75		41.44	na				
654	9.75		47.55	na				
655	9.75		50.0	na				
656	9.75		58.56	na				
657	9.75		64.73	na				
658	9.75		64.77	na				
659	9.75		64.88	na				
660	9.75		65.08	na				
661	9.75		65.17	na				
662	9.75		65.3	na				
663	9.75		65.53	na				
664	9.75		65.62	na				
665	9.5		66.74	na				
673	9.5		67.0	na				
678	9.5		67.29	na				
679	9.5		67.44	na				
680	9.75		68.66	na				
TR1	5.833		71.55	na				
BR1	2.0		74.4	na				
PO	2.0		74.54	na				
PI	2.0		62.33	na				
FF	1.0		65.65	na				
UG1	-7.0		69.6	na	100.0			
UG2	-7.0		69.9	na				
UG3	-7.0		70.01	na				
TEST	2.0		66.2	na				

The maximum velocity is 27.03 and it occurs in the pipe between nodes 653 and 654

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 *****
681B to 681A	33.03	1.049 120.0	1T 5.0 0.0	0.417 5.000	8.700 4.042		K Factor = 11.20 Vel = 12.26
	0.0 33.03	0.3293	0.0	5.417	1.784		
					14.526		K Factor = 8.67
681 to 682	33.03	1.442 120.0	0.0 0.0	18.000 0.0	14.526 0.0		K Factor @ node 681A Vel = 6.49
682 to 683	33.03	0.0699 120.0	0.0 0.0	18.000 0.0	1.258 0.0		K Factor @ node 681A Vel = 13.25
683 to 684	34.44 67.47	1.442 0.2621	0.0 0.0	18.000 18.000	15.784 4.717		K Factor @ node 681A Vel = 13.25
683 to 684	39.25 106.72	1.442 0.6120	0.0 0.0	16.000 16.000	20.501 9.792		K Factor @ node 681A Vel = 20.97
684 to 651	0.0 106.72	1.442 120.0	1T 7.432 0.0	0.938 7.432	30.293 0.0		Vel = 20.97
	0.0 106.72	0.6119	0.0	8.370	5.122		Vel = 20.97
					35.415		K Factor = 17.93
685 to 686	33.52	1.442 120.0	0.0 0.0	18.000 0.0	14.953 0.0		K Factor @ node 681A Vel = 6.59
686 to 687	33.52	0.0718 120.0	0.0 0.0	18.000 0.0	1.293 0.0		Vel = 6.59 K Factor @ node 681A
686 to 687	34.93 68.45	1.442 0.2691	0.0 0.0	18.000 18.000	16.246 4.844		K Factor @ node 681A Vel = 13.45
687 to 688	39.81 108.26	1.442 0.6284	0.0 0.0	16.000 16.000	21.090 10.055		K Factor @ node 681A Vel = 21.27
687 to 652	0.0 108.26	1.442 120.0	1T 7.432 0.0	0.938 7.432	31.145 0.0		Vel = 21.27
	0.0 108.26	0.6284	0.0	8.370	5.260		Vel = 21.27
					36.405		K Factor = 17.94
689 to 690	0.0	1.442 120.0	0.0 0.0	18.000 0.0	27.611 0.0	0.0 0.0	Vel = 0
690 to 691	0.0	0.0 120.0	0.0 0.0	18.000 0.0	0.0 0.0	0.0	Vel = 0 K Factor @ node 681A
690 to 691	45.55 45.55	1.442 0.1267	0.0 0.0	18.000 18.000	27.611 2.280		K Factor @ node 681A Vel = 8.95
691 to 692	47.39 92.94	1.442 0.4738	0.0 0.0	16.000 16.000	29.891 7.581		K Factor @ node 681A Vel = 18.26

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	*****
692	0.0	1.442	1T 7.432	0.938	37.472				
to		120.0	0.0	7.432	0.0				
653	92.94	0.4738	0.0	8.370	3.966		Vel = 18.26		
	0.0								
	92.94				41.438		K Factor = 14.44		
651	106.72	2.157	0.0	11.500	35.415				
to		120.0	0.0	0.0	0.0				
652	106.72	0.0861	0.0	11.500	0.990		Vel = 9.37		
652	108.26	2.157	0.0	16.000	36.405				
to		120.0	0.0	0.0	0.0				
653	214.98	0.3146	0.0	16.000	5.033		Vel = 18.88		
653	92.93	2.157	0.0	10.000	41.438				
to		120.0	0.0	0.0	0.0				
654	307.91	0.6116	0.0	10.000	6.116		Vel = 27.03		
654	0.0	2.157	0.0	4.000	47.554				
to		120.0	0.0	0.0	0.0				
655	307.91	0.6112	0.0	4.000	2.445		Vel = 27.03		
655	0.0	2.157	0.0	14.000	49.999				
to		120.0	0.0	0.0	0.0				
656	307.91	0.6115	0.0	14.000	8.561		Vel = 27.03		
656	0.0	2.157	0.0	10.083	58.560				
to		120.0	0.0	0.0	0.0				
657	307.91	0.6115	0.0	10.083	6.166		Vel = 27.03		
657	0.0	4.26	0.0	1.917	64.726				
to		120.0	0.0	0.0	0.0				
658	307.91	0.0224	0.0	1.917	0.043		Vel = 6.93		
658	0.0	4.26	0.0	4.917	64.769				
to		120.0	0.0	0.0	0.0				
659	307.91	0.0222	0.0	4.917	0.109		Vel = 6.93		
659	0.0	4.26	0.0	9.167	64.878				
to		120.0	0.0	0.0	0.0				
660	307.91	0.0223	0.0	9.167	0.204		Vel = 6.93		
660	0.0	4.26	0.0	3.917	65.082				
to		120.0	0.0	0.0	0.0				
661	307.91	0.0222	0.0	3.917	0.087		Vel = 6.93		
661	0.0	4.26	0.0	6.083	65.169				
to		120.0	0.0	0.0	0.0				
662	307.91	0.0222	0.0	6.083	0.135		Vel = 6.93		
662	0.0	4.26	0.0	9.917	65.304				
to		120.0	0.0	0.0	0.0				
663	307.91	0.0223	0.0	9.917	0.221		Vel = 6.93		

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	*****
663 to 664	0.0 307.91	4.26 120.0 0.0222		4.188 0.0 4.188	65.525 0.0 0.093		Vel = 6.93		
664 to 665	0.0 307.91	4.26 120.0 0.0222	2I 18.434 1H 4.608	22.458 23.042 45.500	65.618 0.108 1.012		Vel = 6.93		
665 to 673	0.0 307.91	4.26 120.0 0.0222		11.854 0.0 11.854	66.738 0.0 0.263		Vel = 6.93		
673 to 678	0.0 307.91	6.357 120.0 0.0032	1J 31.433	60.271 31.433 91.704	67.001 0.0 0.291		Vel = 3.11		
678 to 679	0.0 307.91	6.357 120.0 0.0032	1J 31.433	17.042 31.433 48.475	67.292 0.0 0.153		Vel = 3.11		
679 to 680	0.0 307.91	6.357 120.0 0.0032	1J 31.433 1Bvca 17.603 1Fsp 0.0 1S 40.235	14.229 17.603 89.271 103.500	67.445 0.892 0.327		* Fixed loss = 1 Vel = 3.11		
680 to TR1	0.0 307.91	6.357 120.0 0.0032	12I 150.881	225.833 150.881 376.714	68.664 1.696 1.193		Vel = 3.11		
TR1 to BR1	0.0 307.91	6.357 120.0 0.0032	1Fsp 0.0 1Bvca 17.603 1T 37.72	3.833 55.323 59.156	71.553 2.660 0.187		* Fixed loss = 1 Vel = 3.11		
BR1 to PO	0.0 307.91	6.357 120.0 0.0032	2I 25.147	19.479 25.147 44.626	74.400 0.0 0.142		Vel = 3.11		
	0.0 307.91				74.542		K Factor = 35.66		
					74.542				
					43.786				
					118.328				
					118.328				
					-55.993				
					62.335				
PI to FF	0.0 307.91	6.357 120.0 0.0031	2I 25.147 1Zac 0.0	7.250 25.147 32.397	62.335 3.217 0.102		* Fixed loss = 2.784 Vel = 3.11		
FF to UG1	0.0 307.91	6.16 140.0 0.0028	2E 40.168 1T 43.037	90.667 83.205 173.872	65.654 3.465 0.483		Vel = 3.31		

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 *****
UG1 to UG2	100.00 407.91	8.27 140.0 0.0011	2F 1G 1T	28.468 6.326 55.354	174.667 90.148 264.815	69.602 0.0 0.294	Qa = 100 Vel = 2.44
UG2 to UG3	0.0 407.91	8.27 140.0 0.0011	1T	55.354 0.0 0.0	50.000 55.354 105.354	69.896 0.0 0.117	Vel = 2.44
UG3 to TEST	0.0 407.91	8.27 140.0 0.0011	1T 1G	55.354 6.326 0.0	13.167 61.680 74.847	70.013 -3.898 0.083	Vel = 2.44
	0.0 407.91					66.198	K Factor = 50.14

Water Supply Curve (C)

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City Water Supply: C1 - Static Pressure : 67 C2 - Residual Pressure: 60 C2 - Residual Flow : 1316 City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow A1 - Adjusted Static: 62.904 A2 - Adj Resid : 55.33 @ 750 A3 - Adj Resid : 45.031 @ 1125	Pump Data: P1 - Pump Churn Pressure : 56 P2 - Pump Rated Pressure : 50 P2 - Pump Rated Flow : 750 P3 - Pump Pressure @ Max Flow : 32.5 P3 - Pump Max Flow : 1125 City Residual Flow @ 0 = 4461.84 City Residual Flow @ 20 = 3683.69 City Water @ 150% of Pump = 61.76	Demand: D1 - Elevation : 3.357 D2 - System Flow : 307.913 D2 - System Pressure : 74.542 Hose (Demand) : D3 - System Demand : 307.913 Hose (Adj City) : 100 Safety Margin : 43.786
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