



**... Fire Protection by Computer Design**

Dean and Allyn Inc  
116 Lewiston Road  
Gray ME, 04039  
(207)657-5646

Job Name : UNUM HO-1  
Building : THIRD FLOOR  
Location : PUBLIC AREA  
System : WET  
Contract : C151248  
Data File : C1248 3RD.WXF

Hydraulic Design Information Sheet

Name - UNUM HO-1 Date - 2/18/15  
 Location - PUBLIC AREA  
 Building - THIRD FLOOR System No. - WET  
 Contractor - DEAN AND ALLYN Contract No. - C151248  
 Calculated By - S. COTE Drawing No. -  
 Construction: ( ) Combustible (x) Non-Combustible Ceiling Height - 11-3  
 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  
 M Area of Sprinkler Operation - 935 System Type Sprinkler/Nozzle  
 Density - .10 (x) Wet Make RELIABLE  
 D Area Per Sprinkler - 256 ( ) Dry Model J112  
 E Elevation at Highest Outlet - 149.25 ( ) Deluge Size 3/4"  
 S Hose Allowance - Inside - ( ) Preaction K-Factor 11.2  
 I Rack Sprinkler Allowance - ( ) Other Temp.Rat.155  
 G Hose Allowance - Outside - 100

N Note

Calculation Flow Required - 402.321 Press Required - 31.101  
 Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:  
 A Date of Test - 2013 Cap. -  
 T Time of Test - A.M. Rated Cap.- Elev.-  
 E Static Press - 67 @ Press -  
 R Residual Press - 60 Elev. - Well  
 Flow - 1316 Proof Flow  
 S Elevation - 100

U Location -

P  
 L Source of Information -  
 Y

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

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

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24	
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	
Fha *	½ in FlexHead - 2 Ft Long	0	0	11					0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																				
G	NFPA 13 Gate Valve	0	0	0	0	0	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	
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.
50B	162.333	11.2	7.2	na	30.05	0.1	256	7.2
50A	163.5		12.18	na				
51B	162.333	11.2	7.2	na	30.05	0.1	256	7.2
51A	163.5		13.01	na				
50	163.5	K = K @ 50A	12.18	na	0.0			
51	163.5	K = K @ 51A	15.49	na	0.0			
52	163.5	K = K @ 51A	18.91	na	0.0			
53	163.5	K = K @ 51A	26.84	na	0.0			
54A	163.583	5.6	27.69	na	29.47	0.1	73	7.0
55A	163.583	5.6	29.67	na	30.5	0.1	73	7.0
56A	161.0	5.6	30.47	na	30.91	0.1	21	7.0
57A	163.583	5.6	31.49	na	31.42	0.1	44	7.0
58A	163.583	5.6	41.71	na	36.17	0.1	67	7.0
54	164.583		32.67	na				
55	164.583		35.87	na				
56	164.583		35.71	na				
57	164.583		37.86	na				
58	164.583		48.94	na				
300	163.5		45.11	na				
301	163.5		50.74	na				
302	164.583		40.5	na				
303	163.5		49.51	na				
304	163.5		53.52	na				
305	164.583		53.7	na				
306	163.5		54.38	na				
307	163.5		54.49	na				
308	163.5		61.68	na				
208	148.5		68.33	na				
112	133.5		74.99	na				
113	118.5		81.59	na				
114	117.583		82.22	na				
115	118.5		82.05	na				
TR	113.833		84.56	na				
BR	110.0		87.4	na				
PO	110.0		87.53	na				
PI	110.0		61.95	na				
FF	109.0		65.28	na				
UG1	101.0		69.21	na	100.0			
UG2	101.0		69.49	na				
UG3	101.0		69.61	na				
TEST	109.0		66.22	na				

The maximum velocity is 22.42 and it occurs in the pipe between nodes 53 and 300

# 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	*****
50B to 50A	30.05 30.05	1.049 120.0 0.2764	3E Fha	6.0 11.0 0.0	2.833 17.000 19.833	7.200 -0.505 5.482			K Factor = 11.20 Vel = 11.16	
	0.0 30.05						12.177		K Factor = 8.61	
51B to 51A	30.05 30.05	1.049 120.0 0.2764	2E T Fha	4.0 5.0 11.0	2.833 20.000 22.833	7.200 -0.505 6.311			K Factor = 11.20 Vel = 11.16	
	0.0 30.05						13.006		K Factor = 8.33	
50 to 51	30.05 30.05	1.049 120.0 0.2764		0.0 0.0 0.0	12.000 0.0 12.000	12.177 0.0 3.317			K Factor @ node 50A Vel = 11.16	
51 to 52	32.80 62.85	1.38 120.0 0.2847		0.0 0.0 0.0	12.000 0.0 12.000	15.494 0.0 3.416			K Factor @ node 51A Vel = 13.48	
52 to 53	36.24 99.09	1.38 120.0 0.6608		0.0 0.0 0.0	12.000 0.0 12.000	18.910 0.0 7.930			K Factor @ node 51A Vel = 21.26	
53 to 300	43.17 142.26	1.61 120.0 0.6090	T	8.0 0.0 0.0	22.000 8.000 30.000	26.840 0.0 18.271			K Factor @ node 51A Vel = 22.42	
	0.0 142.26						45.111		K Factor = 21.18	
54A to 54	29.47 29.47	1.049 120.0 0.2665	Fha 3E	11.0 6.0 0.0	3.333 17.000 20.333	27.686 -0.433 5.418			K Factor = 5.60 Vel = 10.94	
	0.0 29.47						32.671		K Factor = 5.16	
55A to 55	30.50 30.5	1.049 120.0 0.2841	2E T Fha	4.0 5.0 11.0	3.333 20.000 23.333	29.672 -0.433 6.630			K Factor = 5.60 Vel = 11.32	
	0.0 30.50						35.869		K Factor = 5.09	
56A to 56	30.91 30.91	1.049 120.0 0.2912	2E T Fha	4.0 5.0 11.0	3.333 20.000 23.333	30.469 -1.552 6.795			K Factor = 5.60 Vel = 11.47	
	0.0 30.91						35.712		K Factor = 5.17	
57A to 57	31.42 31.42	1.049 120.0 0.3002	2E T Fha	4.0 5.0 11.0	2.666 20.000 22.666	31.488 -0.433 6.805			K Factor = 5.60 Vel = 11.66	
	0.0 31.42						37.860		K Factor = 5.11	
58A to 58	36.17 36.17	1.049 120.0 0.3894	3E Fha	6.0 11.0 0.0	2.666 17.000 19.666	41.710 -0.433 7.658			K Factor = 5.60 Vel = 13.43	

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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 36.17					48.935			K Factor = 5.17	
54 to 55	29.47	1.049 120.0		0.0	12.000 0.0	32.671 0.0			Vel = 10.94	
55 to 302	29.47 30.50 59.97	0.2665 1.049 120.0 0.9925		0.0	12.000 4.666 0.0 4.666	3.198 35.869 0.0 4.631			Vel = 22.26	
	0.0 59.97					40.500			K Factor = 9.42	
56 to 57	30.91	1.049 120.0		0.0	7.375 0.0	35.712 0.0			Vel = 11.47	
57 to 302	30.91 31.43 62.34	0.2913 1.38 120.0 0.2804	T	6.0	3.416 6.000 9.416	37.860 0.0 2.640			Vel = 13.37	
	0.0 62.34					40.500			K Factor = 9.80	
58 to 304	36.17	1.049 120.0	E T	2.0 5.0	3.583 7.000	48.935 0.469			Vel = 13.43	
	0.0 36.17					53.524			K Factor = 4.94	
300 to 301	142.26	1.61 120.0	T	8.0	1.250 8.000	45.111 0.0			Vel = 22.42	
301 to 307	142.26 122.31 264.57	0.6090 2.635 120.0 0.1743	T	16.474	9.250 5.000 16.474 21.474	5.633 50.744 0.0 3.742			Vel = 15.57	
	0.0 264.57					54.486			K Factor = 35.84	
302 to 303	122.31	1.61 120.0	E T	4.0 8.0	6.541 12.000	40.500 0.469			Vel = 19.28	
303 to 301	122.31 0.0 122.31	0.4604 2.635 120.0 0.0418		0.0	18.541 29.625 0.0 29.625	8.537 49.506 0.0 1.238			Vel = 7.20	
	0.0 122.31					50.744			K Factor = 17.17	
304 to 305	36.17	2.635 120.0	12E	98.845	47.541 98.845	53.524 -0.469			Vel = 2.13	
305 to 306	36.17 0.0 36.17	0.0044 2.635 120.0 0.0044	2E	16.474	146.386 32.875 16.474 49.349	0.643 53.698 0.469 0.216			Vel = 2.13	
306 to 307	36.17 0.0 36.17	0.0044 2.635 120.0 0.0044	T	16.474	23.432 6.958 16.474 23.432	0.103 54.383 0.0 0.103			Vel = 2.13	

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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	*****
307 to 308	264.57 300.74	2.635 120.0 0.2208	E Bvca Fsp	8.237 8.237 0.0	2.500 16.474 18.974	54.486 3.000 4.190			* * Fixed Loss = 3 Vel = 17.69	
308 to 208	0.0 300.74	6.357 120.0 0.0031	T	37.72 0.0 0.0	15.000 37.720 52.720	61.676 6.496 0.161			Vel = 3.04	
208 to 112	0.0 300.74	6.357 120.0 0.0030	T	37.72 0.0 0.0	15.000 37.720 52.720	68.333 6.496 0.160			Vel = 3.04	
112 to 113	0.0 300.74	6.357 120.0 0.0030	E	17.603 0.0 0.0	16.000 17.603 33.603	74.989 6.496 0.102			Vel = 3.04	
113 to 114	0.0 300.74	6.357 120.0 0.0030	2E	35.205 0.0 0.0	41.041 35.205 76.246	81.587 0.397 0.232			Vel = 3.04	
114 to 115	0.0 300.74	6.357 120.0 0.0030	2E	35.205 0.0 0.0	41.000 35.205 76.205	82.216 -0.397 0.230			Vel = 3.04	
115 to TR	0.0 300.74	6.357 120.0 0.0030	E	17.603 0.0 0.0	142.750 17.603 160.353	82.049 2.021 0.486			Vel = 3.04	
TR to BR	0.0 300.74	6.357 120.0 0.0030	Fsp Bvca T	0.0 17.603 37.72	3.833 55.323 59.156	84.556 2.660 0.180			* * Fixed Loss = 1 Vel = 3.04	
BR to PO	0.0 300.74	6.357 120.0 0.0030	2l	25.147 0.0 0.0	19.479 25.147 44.626	87.396 0.0 0.135			Vel = 3.04	
	0.0 300.74					87.531			K Factor = 32.14	
						System Demand Pressure Safety Margin Continuation Pressure	87.531 30.417 117.948			
						Pressure @ Pump Outlet Pressure From Pump Curve Pressure @ Pump Inlet	117.948 -55.993 61.955			
PI to FF	0.0 300.74	6.357 120.0 0.0030	2l Zac	25.147 0.0 0.0	7.250 25.147 32.397	61.955 3.231 0.098			* * Fixed Loss = 2.798 Vel = 3.04	
FF to UG1	0.0 300.74	6.16 140.0 0.0027	2E T	40.168 43.037 0.0	90.667 83.205 173.872	65.284 3.465 0.461			Vel = 3.24	
UG1 to UG2	100.00 400.74	8.27 140.0 0.0011	2F G T	28.468 6.326 55.354	174.667 90.148 264.815	69.210 0.0 0.285			Qa = 100 Vel = 2.39	
UG2 to UG3	0.0 400.74	8.27 140.0 0.0011	T	55.354 0.0 0.0	50.000 55.354 105.354	69.495 0.0 0.114			Vel = 2.39	
UG3 to TEST	0.0 400.74	8.27 140.0 0.0011	T G	55.354 6.326 0.0	13.167 61.680 74.847	69.609 -3.465 0.081			Vel = 2.39	

# 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	*****
	0.0 400.74				66.225			K Factor = 49.24	



# Water Supply Curve C

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<b>City Water Supply:</b> C1 - Static Pressure : 67 C2 - Residual Pressure: 60 C2 - Residual Flow : 1316  <b>City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow</b> A1 - Adjusted Static: 62.471 A2 - Adj Resid : 54.897 @ 750 A3 - Adj Resid : 44.598 @ 1125	<b>Pump Data:</b> 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	<b>Demand:</b> D1 - Elevation : 23.604 D2 - System Flow : 300.736 D2 - System Pressure : 87.531 Hose ( Demand ) : _____ D3 - System Demand : 300.736 Hose ( Adj City ) : 100 Safety Margin : 30.417
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