

. . . Fire Protection by Computer Design

Residential Fire Protection
64 Daggett Hill Rd.
Greene, ME 04236
946-3473

Job Name : CUMBERLAND COURTHOUSE ADMINISTRATION RENOVATIONS
Building : STEEL, CONCRETE & BLOCK STRUCTURE
Location : FIRST FLOOR-ADMINISTRATION RENOVATION
System : WET
Contract : 17001
Data File : Cumberland Courthouse Reno-Hyd Calc.WXF

Hydraulic Design Information Sheet

Name - CUMBERLAND COURTHOUSE- ADMINISTRATION RENOVATION Date - 1/10/17
 Location - FIRST FLOOR-ADMINISTRATION RENOVATION
 Building - STEEL, CONCRETE & BLOCK STRUCTURE System No. - WET
 Contractor - RESIDENTIAL FIRE PROTECTION Contract No. - 17001
 Calculated By - T. PRAY Drawing No. - 1 OF 1
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 8'-5.5"
 Occupancy - OFFICE SPACE

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

M	Area of Sprinkler Operation	- 942	System Type	Sprinkler/Nozzle
	Density	- .1	(X) Wet	Make VIKING
D	Area Per Sprinkler	- 185	() Dry	Model VK102
E	Elevation at Highest Outlet	- 9.88	() Deluge	Size 1/2"
S	Hose Allowance - Inside	-	() Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	-	() Other	Temp.Rat.155
G	Hose Allowance - Outside	- N/A		

N Note

Calculation Flow Required - 186.42 Press Required - 52.54 AT ALM VLV
 Summary C-Factor Used: 120 Overhead N/A Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 9/16		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 94	@ Press -	
R	Residual Press - 84	Elev. -	Well
S	Flow - 480		Proof Flow
U	Elevation - 5.17'		

P Location - Alarm valve

L Source of Information - 2" main drain test on Inspection tag dated 9/2016

C	Commodity	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

E Horizontal Barriers Provided:

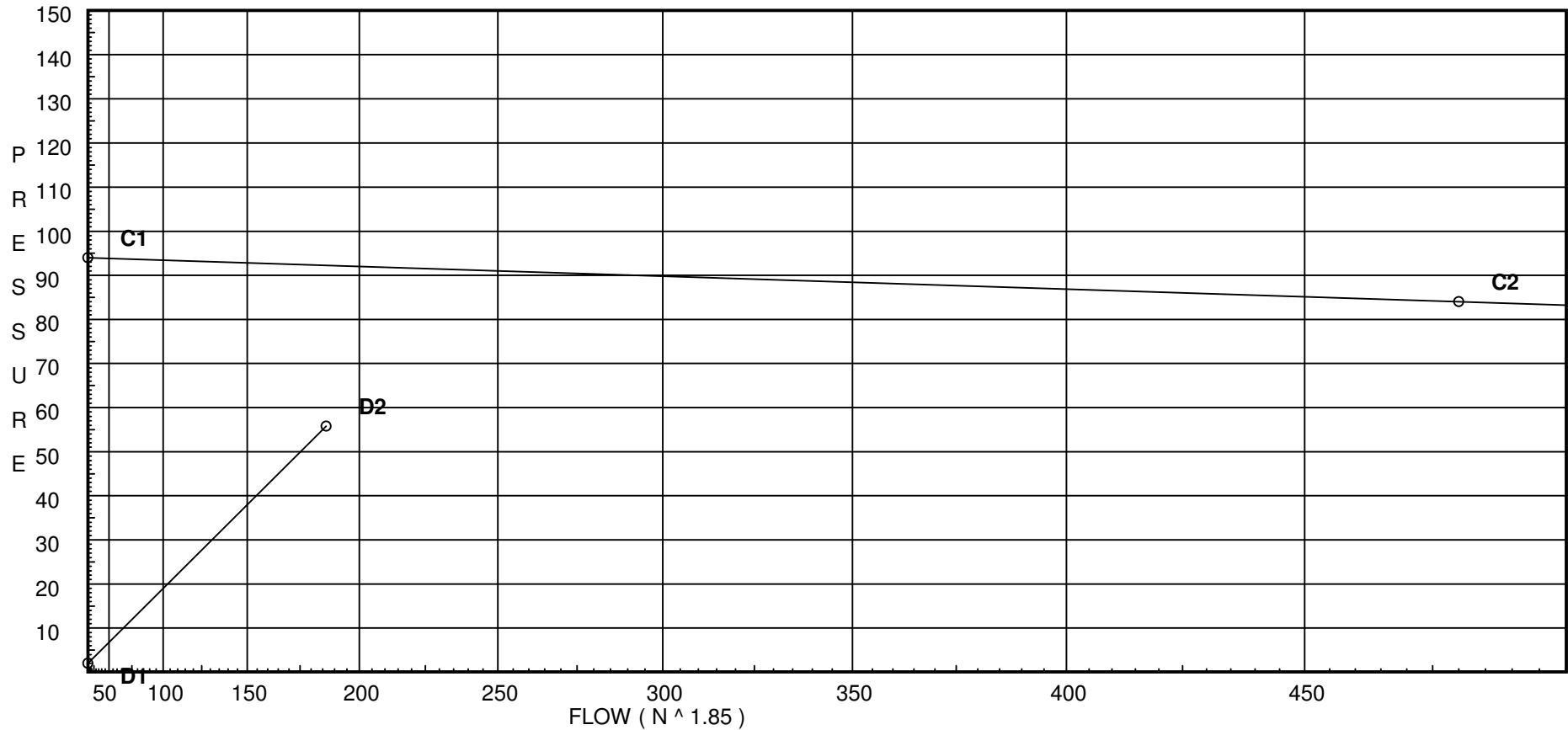
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 94
C2 - Residual Pressure: 84
C2 - Residual Flow : 480

Demand:
D1 - Elevation : 2.040
D2 - System Flow : 186.418
D2 - System Pressure : 55.795
Hose (Adj City) : _____
Hose (Demand) : _____
D3 - System Demand : 186.418
Safety Margin : 36.467



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
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
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
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

Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DO01	0.0	5.6	10.91	na	18.5	0.1	185	7.0
DO02	0.0	5.6	7.08	na	14.9	0.1	149	7.0
DO03	0.0	5.6	7.08	na	14.9	0.1	149	7.0
1	9.88	5.6	11.87	na	19.3	0.1	185	7.0
2	9.88	5.6	10.91	na	18.5	0.1	185	7.0
3	9.88	5.6	10.89	na	18.48	0.1	162	7.0
20	11.76		11.8	na				
21	12.09		13.82	na				
4	12.09	K = K @ EQ01	26.17	na	26.84			
22	12.09		31.9	na				
5	11.76	5.6	11.6	na	19.07	0.1	149	7.0
6	11.76	5.6	10.87	na	18.47	0.1	149	7.0
23	11.76		12.86	na				
24	12.09		14.94	na				
9	12.09	K = K @ EQ02	20.78	na	23.84			
7	12.09	K = K @ EQ03	14.12	na	20.59			
8	12.09	K = K @ EQ03	15.16	na	21.33			
25	12.09		16.18	na				
26	12.09		20.92	na				
27	12.09		29.48	na				
30	12.09		37.36	na				
31	12.09		37.65	na				
TOR	12.09		52.54	na				
ALV	5.17		55.8	na				

The maximum velocity is 22.16 and it occurs in the pipe between nodes 26 and 27

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	*****
DO01 to EQ01	18.50 18.5	1.049 120 0.1126	2E 1T	4.0 5.0 0.0	4.460 9.000 13.460	10.914 0.0 1.516			K Factor = 5.60	
	0.0 18.50						12.430		K Factor = 5.25	
DO02 to EQ02	14.90 14.9	1.049 120 0.0755	2E 1T	4.0 5.0 0.0	4.710 9.000 13.710	7.079 0.0 1.035			K Factor = 5.60	
	0.0 14.90						8.114		K Factor = 5.23	
DO03 to EQ03	14.90 14.9	1.049 120 0.0755	1E	2.0 0.0 0.0	2.210 2.000 4.210	7.079 0.0 0.318			K Factor = 5.60	
	0.0 14.90						7.397		K Factor = 5.48	
1 to 21	19.30 19.3	1.049 120 0.1218	3E	6.0 0.0 0.0	17.880 6.000 23.880	11.872 -0.957 2.908			K Factor = 5.60	
	0.0 19.30						13.823		K Factor = 5.19	
2 to 20	18.50 18.5	1.049 120 0.1126	2E 1T	4.0 5.0 0.0	6.130 9.000 15.130	10.914 -0.814 1.704			K Factor = 5.60	
	0.0 18.50						11.804		K Factor = 5.38	
3 to 20	18.48 18.48	1.049 120 0.1124	2E 1T	4.0 5.0 0.0	6.420 9.000 15.420	10.885 -0.814 1.733			K Factor = 5.60	
20 to 21	18.50 36.98	1.049 120 0.4056	1T	5.0 0.0 0.0	0.330 5.000 5.330	11.804 -0.143 2.162			Vel = 13.73	
21 to 4	19.29 56.27	1.049 120 0.8821		0.0 0.0 0.0	14.000 0.0 14.000	13.823 0.0 12.349			Vel = 20.89	
4 to 22	26.85 83.12	1.38 120 0.4773		0.0 0.0 0.0	12.000 0.0 12.000	26.172 0.0 5.728			K Factor @ node EQ01	
22 to 30	0.0 83.12	1.61 120 0.2254	1T	8.0 0.0 0.0	16.250 8.000 24.250	31.900 0.0 5.465			Vel = 13.10	
	0.0 83.12						37.365		K Factor = 13.60	
5 to 23	19.07 19.07	1.049 120 0.1192	1E 1T	2.0 5.0 0.0	3.550 7.000 10.550	11.601 0.0 1.258			K Factor = 5.60	
	0.0 19.07						12.859		K Factor = 5.32	

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	*****
6	18.47	1.049	2E	4.0	8.670	10.875			K Factor = 5.60	
to		120	1T	5.0	9.000	0.0				
23	18.47	0.1123		0.0	17.670	1.984			Vel = 6.86	
23	19.07	1.049	1T	5.0	0.330	12.859				
to		120		0.0	5.000	-0.143				
24	37.54	0.4171		0.0	5.330	2.223			Vel = 13.94	
24	0.0	1.049		0.0	14.000	14.939				
to		120		0.0	0.0	0.0				
9	37.54	0.4172		0.0	14.000	5.841			Vel = 13.94	
9	23.84	1.38		0.0	0.500	20.780			K Factor @ node EQ02	
to		120		0.0	0.0	0.0				
26	61.38	0.2720		0.0	0.500	0.136			Vel = 13.17	
	0.0									
	61.38					20.916			K Factor = 13.42	
7	20.59	1.049	1T	5.0	10.000	14.124			K Factor @ node EQ03	
to		120		0.0	5.000	0.0				
25	20.59	0.1373		0.0	15.000	2.060			Vel = 7.64	
	0.0									
	20.59					16.184			K Factor = 5.12	
8	21.33	1.049	1T	5.0	2.000	15.158			K Factor @ node EQ03	
to		120		0.0	5.000	0.0				
25	21.33	0.1466		0.0	7.000	1.026			Vel = 7.92	
25	20.59	1.049	1T	5.0	4.250	16.184				
to		120		0.0	5.000	0.0				
26	41.92	0.5116		0.0	9.250	4.732			Vel = 15.56	
26	61.38	1.38		0.0	12.000	20.916				
to		120		0.0	0.0	0.0				
27	103.3	0.7138		0.0	12.000	8.565			Vel = 22.16	
27	0.0	1.61	1T	8.0	16.250	29.481				
to		120		0.0	8.000	0.0				
31	103.3	0.3369		0.0	24.250	8.170			Vel = 16.28	
	0.0									
	103.30					37.651			K Factor = 16.83	
30	83.12	2.635		0.0	14.000	37.365				
to		120		0.0	0.0	0.0				
31	83.12	0.0204		0.0	14.000	0.286			Vel = 4.89	
31	103.30	2.635	1J	14.827	140.250	37.651				
to		120	1I	8.237	23.064	0.0				
TOR	186.42	0.0912		0.0	163.314	14.889			Vel = 10.97	
TOR	0.0	4.26	1A	22.384	6.920	52.540				
to		120		0.0	22.384	2.997				
ALV	186.42	0.0088		0.0	29.304	0.258			Vel = 4.20	
	0.0									
	186.42					55.795			K Factor = 24.96	