



... Fire Protection by Computer Design

High Tech Fire Protection
PO Box 156
Minot, ME 04258
(207) 998-2551

Job Name : AC Hotel - Commercial Area Calc.
Building : AC Hotel
Location : Fore, Hancock and Thames Streets
System : NFPA 13
Contract : 122016-1
Data File : Commercial Area Calc.wxf

Hydraulic Design Information Sheet

Name - Commercial Area Calc. Date - 04/14/2017
 Location - Fore, Hancock and Thames Streets
 Building - AC Hotel System No. - NFPA 13
 Contractor - High Tech Fire Protection Contract No. - 122016-1
 Calculated By - Jeremy A Foss Drawing No. - FP-1.3
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 21'-0"
 Occupancy - Bar / Lounge

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

		Made By	Date
M	Area of Sprinkler Operation - 1500	System Type	Sprinkler/Nozzle
	Density - .1	(X) Wet	Make Reliable
D	Area Per Sprinkler - 225	() Dry	Model G5-56
E	Elevation at Highest Outlet - 22	() 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 - 100		

N Note

Calculation Flow Required - 371 Press Required - 98
 Summary C-Factor Used: 150 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 10/14/2016		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 110	@ Press -	
R	Residual Press - 106	Elev. -	Well
	Flow - 1591		Proof Flow
S	Elevation - -2		

U Location - Test Hydrant Located on Thames Street Adjacent to Project Site

P Source of Information - Portland Water District

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
M	() 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:

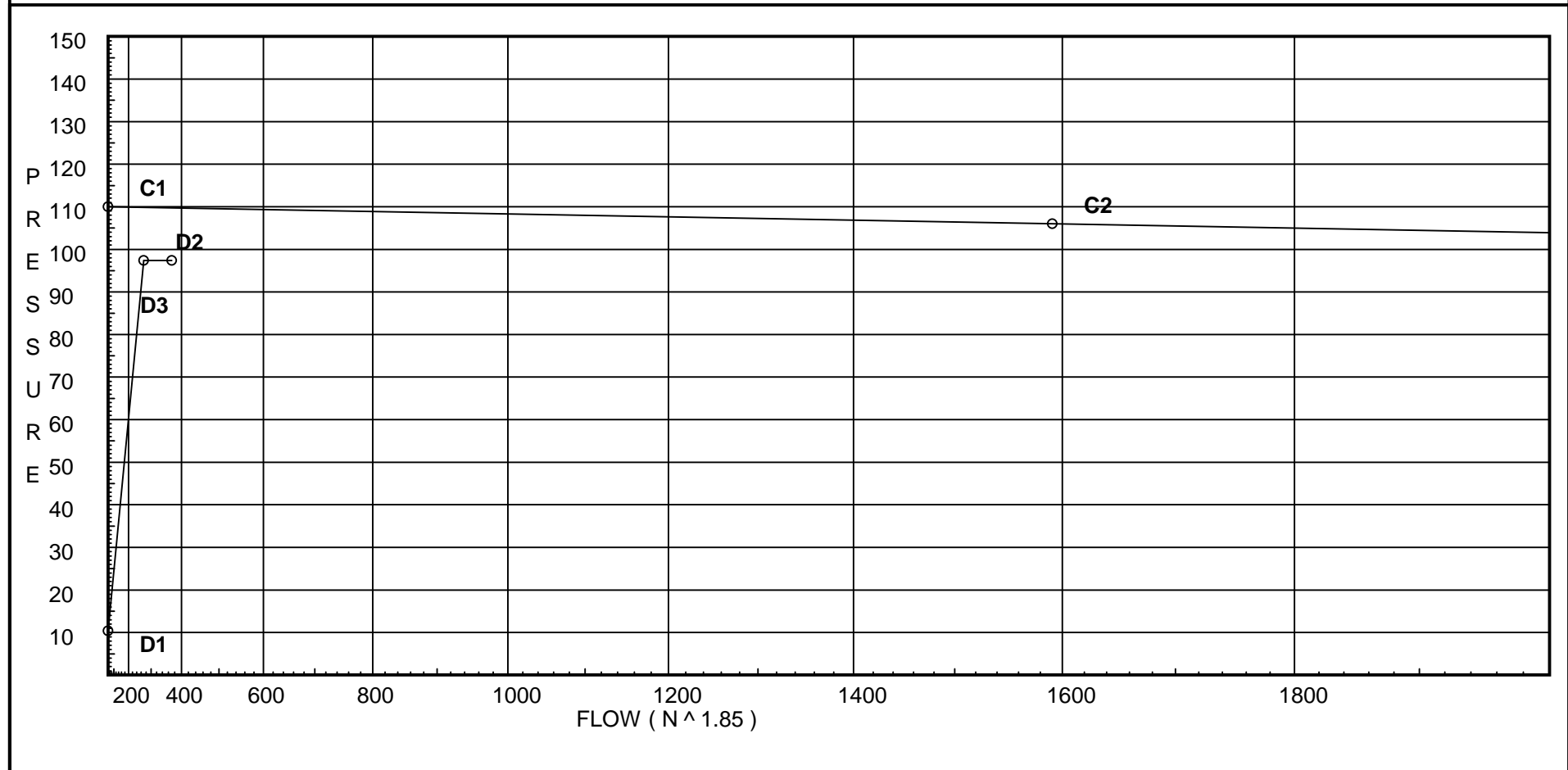
Water Supply Curve (C)

High Tech Fire Protection
AC Hotel - Commercial Area Calc.

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City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 106
C2 - Residual Flow : 1591

Demand:
D1 - Elevation : 10.394
D2 - System Flow : 270.907
D2 - System Pressure : 97.375
Hose (Demand) : 100
D3 - System Demand : 370.907
Safety Margin : 12.355



Fittings Used Summary

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Fitting Legend		½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Abbrev.	Name																				
B	NFPA 13 Butterfly Valve	0	0	0	0	5	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
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
N *	CPVC 90'EII Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
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
V	90' EII Firelock #001	0	0	0	0	3.5	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X	90'Tee-BranchFirelock002	0	0	0	0	8.5	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zia	Wilkins 350	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.
DP1	-1.0	5.6	16.14	na	22.5	0.1	225	7.0
DP2	-1.0	5.6	16.14	na	22.5	0.1	225	7.0
601	22.0	K = K @ EQ01	16.39	na	22.5			
602	22.0	K = K @ EQ02	18.33	na	23.92			
603	22.0	K = K @ EQ01	18.4	na	23.84			
604	22.0	K = K @ EQ01	18.95	na	24.2			
C1	22.0		19.53	na				
605	22.0	K = K @ EQ01	17.93	na	23.53			
606	22.0	K = K @ EQ02	19.22	na	24.49			
607	22.0	K = K @ EQ01	18.92	na	24.17			
608	22.0	K = K @ EQ02	20.08	na	25.03			
609	22.0	K = K @ EQ01	20.84	na	25.37			
610	22.0	K = K @ EQ02	22.32	na	26.39			
611	22.0	K = K @ EQ02	24.13	na	27.44			
C2	22.0		20.5	na				
C3	22.0		21.09	na				
C4	22.0		24.47	na				
C5	22.0		28.69	na				
C6	22.0		60.6	na				
C7	22.0		68.72	na				
C8	22.0		77.04	na				
BF1	12.0		81.92	na				
TOR	12.0		83.9	na				
BOR	4.0		90.51	na				
BASE	1.0		95.54	na				
H1	-1.0		96.76	na				
H2	-2.0		97.3	na				
TEST	-2.0		97.37	na	100.0			

The maximum velocity is 27.58 and it occurs in the pipe between nodes C4 and C5

Final Calculations - Hazen-Williams

High Tech Fire Protection
AC Hotel - Commercial Area Calc.

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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	*****
DP1 to EQ01	22.50 22.5	1.101 150.0 0.0846	1N	7.0 0.0 0.0	1.000 7.000 8.000	16.143 -0.433 0.677			K Factor = 5.60 Vel = 7.58	
	0.0 22.50						16.387		K Factor = 5.56	
DP2 to EQ02	22.50 22.5	1.101 150.0 0.0847	1O	5.0 0.0 0.0	1.000 5.000 6.000	16.143 -0.433 0.508			K Factor = 5.60 Vel = 7.58	
	0.0 22.50						16.218		K Factor = 5.59	
601 to 602	22.50 22.5	1.101 150.0 0.0846	1N	7.0 0.0 0.0	16.000 7.000 23.000	16.387 0.0 1.946			K Factor @ node EQ01 Vel = 7.58	
602 to C2	23.92 46.42	1.394 150.0 0.1024	1N	8.0 0.0 0.0	13.200 8.000 21.200	18.333 0.0 2.171			K Factor @ node EQ02 Vel = 9.76	
	0.0 46.42						20.504		K Factor = 10.25	
603 to C1	23.84 23.84	1.101 150.0 0.0942		0.0 0.0 0.0	12.000 0.0 12.000	18.402 0.0 1.131			K Factor @ node EQ01 Vel = 8.03	
	0.0 23.84						19.533		K Factor = 5.39	
604 to C1	24.20 24.2	1.101 150.0 0.0968	1O	5.0 0.0 0.0	1.000 5.000 6.000	18.952 0.0 0.581			K Factor @ node EQ01 Vel = 8.16	
C1 to C2	23.84 48.04	1.394 150.0 0.1091	1O	6.0 0.0 0.0	2.900 6.000 8.900	19.533 0.0 0.971			Vel = 10.10	
	0.0 48.04						20.504		K Factor = 10.61	
605 to 606	23.53 23.53	1.101 150.0 0.0919		0.0 0.0 0.0	14.000 0.0 14.000	17.928 0.0 1.287			K Factor @ node EQ01 Vel = 7.93	
606 to C3	24.50 48.03	1.394 150.0 0.1091	1O	6.0 0.0 0.0	11.200 6.000 17.200	19.215 0.0 1.876			K Factor @ node EQ02 Vel = 10.10	
	0.0 48.03						21.091		K Factor = 10.46	
607 to 608	24.17 24.17	1.101 150.0 0.0967		0.0 0.0 0.0	12.000 0.0 12.000	18.916 0.0 1.160			K Factor @ node EQ01 Vel = 8.15	
608 to C3	25.04 49.21	1.394 150.0 0.1140	1O	6.0 0.0 0.0	2.900 6.000 8.900	20.076 0.0 1.015			K Factor @ node EQ02 Vel = 10.34	

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	*****
	0.0 49.21						21.091		K Factor = 10.72	
609 to 610	25.37	1.101 150.0 0.1057		0.0	14.000 0.0	20.838 0.0			K Factor @ node EQ01	
610 to C4	25.37	0.1057		0.0	14.000	1.480			Vel = 8.55	
610 to C4	26.40	1.394 150.0 0.1252	1O	6.0	11.200 6.000	22.318 0.0			K Factor @ node EQ02	
	51.77			0.0	17.200	2.154			Vel = 10.88	
	0.0 51.77						24.472		K Factor = 10.47	
611 to C4	27.44	1.394 150.0 0.0387	1O	6.0	2.900 6.000	24.128 0.0			K Factor @ node EQ02	
	27.44	0.0387		0.0	8.900	0.344			Vel = 5.77	
	0.0 27.44						24.472		K Factor = 5.55	
C2 to C3	94.46	2.003 150.0 0.0652		0.0	9.000 0.0	20.504 0.0			Vel = 9.62	
C3 to C4	97.24	2.003 150.0 0.2415		0.0	14.000 0.0	21.091 0.0			Vel = 19.52	
C4 to C5	79.21	2.003 150.0 0.4580		0.0	9.200 0.0	24.472 0.0			Vel = 27.58	
C5 to C6	0.0	2.635 120.0 0.1820	1X	14.827	160.500 14.827	28.686 0.0			Vel = 15.94	
C6 to C7	0.0	2.635 120.0 0.1820	1T	16.474	28.100 16.474	60.603 0.0			Vel = 15.94	
C7 to C8	0.0	3.26 120.0 0.0646	1B 1Fsp 1S 2V 1T	13.44 0.0 21.503 13.44 20.159	13.900 68.542 82.442	68.717 3.000 5.323			* Fixed loss = 3 Vel = 10.41	
C8 to BF1	0.0	4.26 120.0 0.0175	1X	21.067	10.000 21.067	77.040 4.331			Vel = 6.10	
BF1 to TOR	0.0	4.26 120.0 0.0175	3V 1X 1B	26.861 21.067 15.8	49.400 63.728 113.128	81.916 0.0 1.985			Vel = 6.10	
TOR to BOR	0.0	4.26 120.0 0.0175	1Fsp	0.0	8.000 0.0	83.901 6.465			* Fixed loss = 3 Vel = 6.10	
BOR to BASE	0.0	4.26 120.0 0.0173	1Zia	0.0	3.000 0.0	90.506 4.979			* Fixed loss = 3.679 Vel = 6.10	
BASE	270.91	0.0173		0.0	3.000	0.052				

Final Calculations - Hazen-Williams

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AC Hotel - Commercial Area Calc.

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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	*****
BASE	0.0	6.16	2E 40.168	75.000	95.537				
to		140.0	1G 4.304	87.509	0.866				
H1	270.91	0.0022	1T 43.037	162.509	0.356		Vel = 2.92		
H1	0.0	12.24	2T 96.724	625.000	96.759				
to		100.0	2F 20.957	117.681	0.433				
H2	270.91	0.0001	0.0	742.681	0.107		Vel = 0.74		
H2	0.0	6.16	1E 20.084	10.000	97.299				
to		140.0	1G 4.304	24.388	0.0				
TEST	270.91	0.0022	0.0	34.388	0.076		Vel = 2.92		
	100.00						Qa = 100.00		
	370.91				97.375		K Factor = 37.59		



... Fire Protection by Computer Design

High Tech Fire Protection
PO Box 156
Minot, ME 04258
(207) 998-2551

Job Name : AC Hotel - Residential Pendent Calc.
Building : AC Hotel
Location : Fore, Hancock and Thames Streets
System : NFPA 13
Contract : 122016-1
Data File : Residential Pendent Calc.wxf

Hydraulic Design Information Sheet

Name - Residential Pendent Calc. Date - 04/14/2017
 Location - Fore, Hancock and Thames Streets
 Building - AC Hotel System No. - NFPA 13
 Contractor - High Tech Fire Protection Contract No. - 122016-1
 Calculated By - Jeremy A Foss Drawing No. - FP-1.3
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 9'-0"
 Occupancy - Hotel Guestroom

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

	Area	System Type	Make
M	Area of Sprinkler Operation - 428	(X) Wet	Sprinkler/Nozzle
	Density - .1	() Dry	Make Reliable
D	Area Per Sprinkler - 256	() Deluge	Model F1 Res 58
E	Elevation at Highest Outlet - 62	() Preaction	Size 1/2"
S	Hose Allowance - Inside -	() Other	K-Factor 5.8
I	Rack Sprinkler Allowance -		Temp.Rat.155
G	Hose Allowance - Outside - 100		

N Note

Calculation Flow Required - 209 Press Required - 91
 Summary C-Factor Used: 150 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
A Date of Test - 10/14/2016		Cap. -
T Time of Test -	Rated Cap.-	Elev.-
E Static Press - 110	@ Press -	
R Residual Press - 106	Elev. -	Well
Flow - 1591		Proof Flow
S Elevation - -2		

P Location - Test Hydrant Located on Thames Street Adjacent to Project Site

P Source of Information - Portland Water District

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

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

E Horizontal Barriers Provided:

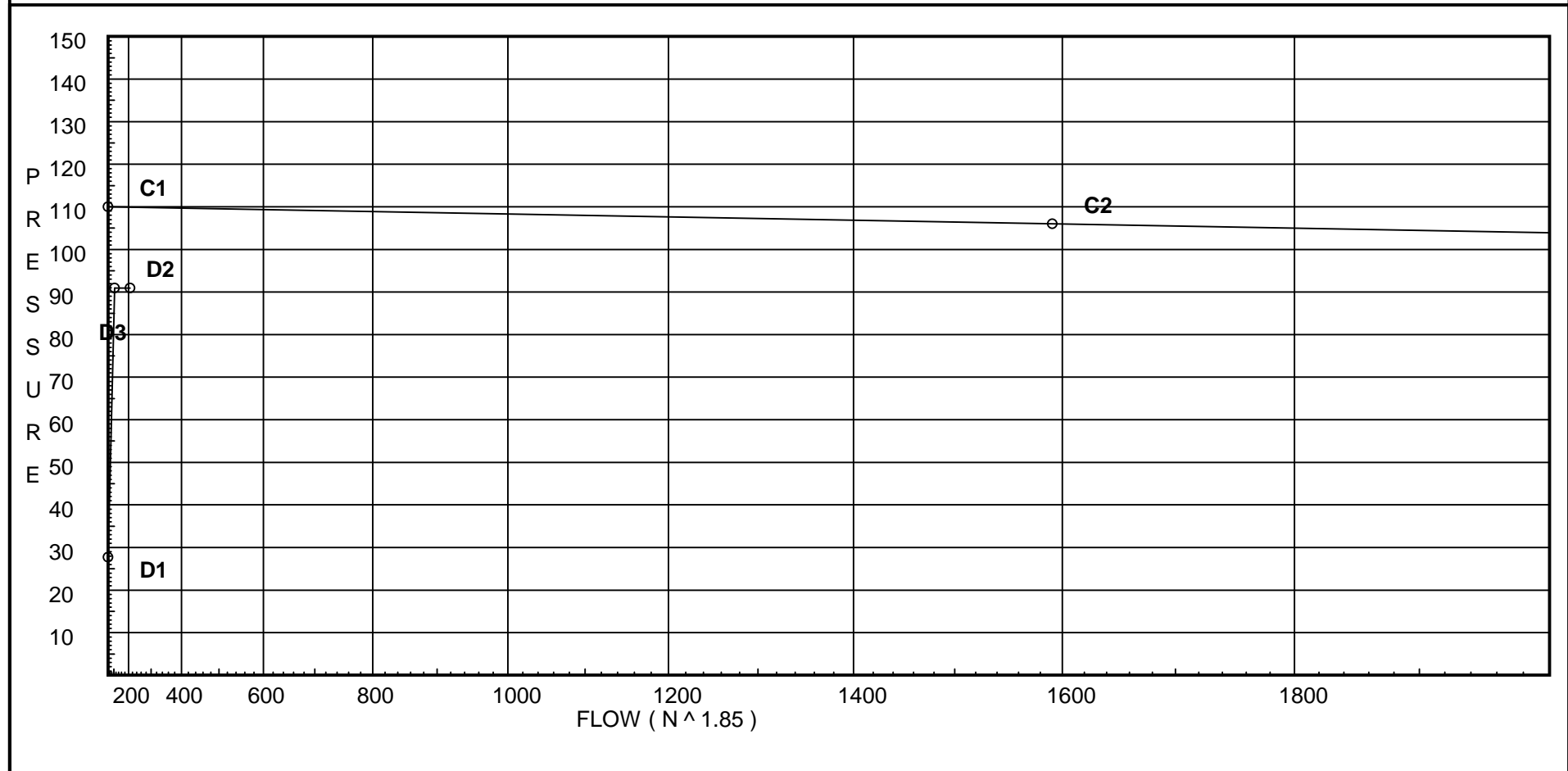
Water Supply Curve (C)

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AC Hotel - Residential Pendent Calc.

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City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 106
C2 - Residual Flow : 1591

Demand:
D1 - Elevation : 27.718
D2 - System Flow : 108.183
D2 - System Pressure : 90.952
Hose (Demand) : 100
D3 - System Demand : 208.183
Safety Margin : 18.955



Fittings Used Summary

High Tech Fire Protection
AC Hotel - Residential Pendent Calc.

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Fitting Legend		½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Abbrev.	Name																				
B	NFPA 13 Butterfly Valve	0	0	0	0	5	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
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
N *	CPVC 90'EII Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
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
V	90' EII Firelock #001	0	0	0	0	3.5	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X	90'Tee-BranchFirelock002	0	0	0	0	8.5	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zia	Wilkins 350	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

High Tech Fire Protection
AC Hotel - Residential Pendent Calc.

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	-1.0	5.8	19.48	na	25.6	0.1	256	7.6
DP2	-1.0	5.8	19.48	na	25.6	0.1	256	7.6
401	62.0	K = K @ EQ01	19.91	na	25.6			
402	62.0	K = K @ EQ02	22.05	na	26.51			
403	62.0	K = K @ EQ01	23.3	na	27.7			
B1	62.0		24.41	na				
404	62.0	K = K @ EQ01	24.45	na	28.37			
B2	62.0		25.3	na				
B3	62.0		32.3	na				
X1	62.0		34.19	na				
X2	62.0		48.42	na				
X3	62.0		51.87	na				
X4	62.0		55.84	na				
BF1	12.0		77.72	na				
TOR	12.0		78.09	na				
BOR	4.0		84.58	na				
BASE	1.0		89.55	na				
H1	-1.0		90.49	na				
H2	-2.0		90.94	na				
TEST	-2.0		90.95	na	100.0			

The maximum velocity is 22.74 and it occurs in the pipe between nodes B2 and B3

Final Calculations - Hazen-Williams

High Tech Fire Protection
AC Hotel - Residential Pendent Calc.

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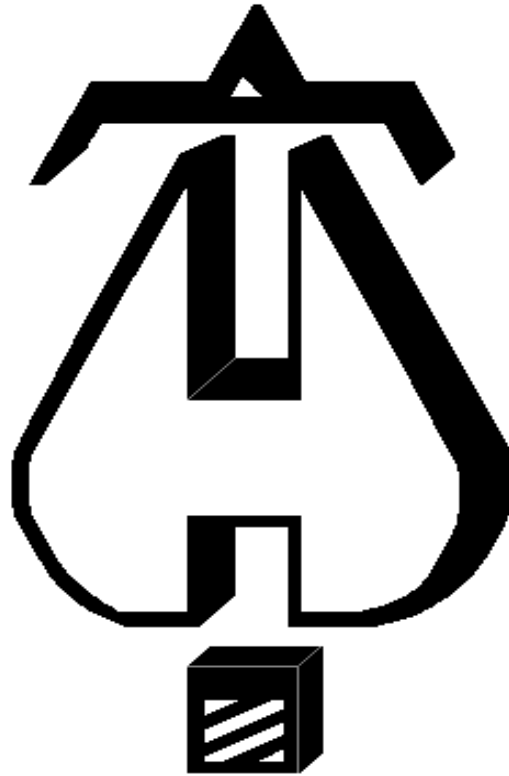
Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
DP1 to EQ01	25.60 25.6	1.101 150.0 0.1074	1N	7.0 0.0 0.0	1.000 7.000 8.000	19.482 -0.433 0.859			K Factor = 5.80 Vel = 8.63	
	0.0 25.60						19.908		K Factor = 5.74	
DP2 to EQ02	25.60 25.6	1.101 150.0 0.1074	1N 1O	7.0 5.0 0.0	2.000 12.000 14.000	19.482 -0.433 1.503			K Factor = 5.80 Vel = 8.63	
	0.0 25.60						20.552		K Factor = 5.65	
401 to 402	25.60 25.6	1.101 150.0 0.1074	1N	7.0 0.0 0.0	12.900 7.000 19.900	19.908 0.0 2.138			K Factor @ node EQ01 Vel = 8.63	
402 to B1	26.51 52.11	1.101 150.0 0.4002	1O	5.0 0.0 0.0	0.900 5.000 5.900	22.046 0.0 2.361			K Factor @ node EQ02 Vel = 17.56	
	0.0 52.11						24.407		K Factor = 10.55	
403 to B1	27.70 27.7	1.101 150.0 0.1243	1O	5.0 0.0 0.0	3.900 5.000 8.900	23.301 0.0 1.106			K Factor @ node EQ01 Vel = 9.33	
B1 to B2	52.11 79.81	1.394 150.0 0.2788		0.0 0.0 0.0	3.200 0.0 3.200	24.407 0.0 0.892			Vel = 16.78	
	0.0 79.81						25.299		K Factor = 15.87	
404 to B2	28.37 28.37	1.101 150.0 0.1298	1O	5.0 0.0 0.0	1.500 5.000 6.500	24.455 0.0 0.844			K Factor @ node EQ01 Vel = 9.56	
B2 to B3	79.81 108.18	1.394 150.0 0.4898	1O	6.0 0.0 0.0	8.300 6.000 14.300	25.299 0.0 7.004			Vel = 22.74	
B3 to X1	0.0 108.18	2.003 150.0 0.0838	1O	10.0 0.0 0.0	12.500 10.000 22.500	32.303 0.0 1.886			Vel = 11.01	
X1 to X2	0.0 108.18	2.003 150.0 0.0838	1O	10.0 0.0 0.0	159.800 10.000 169.800	34.189 0.0 14.234			Vel = 11.01	
X2 to X3	0.0 108.18	2.003 150.0 0.0838	1T	12.965 0.0 0.0	28.100 12.965 41.065	48.423 0.0 3.442			Vel = 11.01	
X3 to X4	0.0 108.18	3.26 120.0 0.0118	1B 1Fsp 1S 2V	13.44 0.0 21.503 13.44	13.900 68.542 82.442	51.865 3.000 0.974			* Fixed loss = 3 Vel = 4.16	

Final Calculations - Hazen-Williams

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AC Hotel - Residential Pendent Calc.

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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	*****
			1T	20.159					
X4 to BF1	0.0 108.18	4.26 120.0 0.0032	1X	21.067 0.0 0.0	50.000 21.067 71.067	55.839 21.655 0.228		Vel = 2.44	
BF1 to TOR	0.0 108.18	4.26 120.0 0.0032	3V 1X 1B	26.861 21.067 15.8	49.400 63.728 113.128	77.722 0.0 0.364		Vel = 2.44	
TOR to BOR	0.0 108.18	4.26 120.0 0.0031	1Fsp	0.0 0.0 0.0	8.000 0.0 8.000	78.086 6.465 0.025		* Fixed loss = 3 Vel = 2.44	
BOR to BASE	0.0 108.18	4.26 120.0 0.0033	1Zia	0.0 0.0 0.0	3.000 0.0 3.000	84.576 4.969 0.010		* Fixed loss = 3.67 Vel = 2.44	
BASE to H1	0.0 108.18	6.16 140.0 0.0004	2E 1G 1T	40.168 4.304 43.037	75.000 87.509 162.509	89.555 0.866 0.065		Vel = 1.16	
H1 to H2	0.0 108.18	12.24 100.0 0.0	2T 2F	96.724 20.957 0.0	625.000 117.681 742.681	90.486 0.433 0.020		Vel = 0.29	
H2 to TEST	0.0 108.18	6.16 140.0 0.0004	1E 1G	20.084 4.304 0.0	10.000 24.388 34.388	90.939 0.0 0.013		Vel = 1.16	
	100.00 208.18					90.952		Qa = 100.00 K Factor = 21.83	



... Fire Protection by Computer Design

High Tech Fire Protection
PO Box 156
Minot, ME 04258
(207) 998-2551

Job Name : AC Hotel - Residential Sidewall Calc.
Building : AC Hotel
Location : Fore, Hancock and Thames Streets
System : NFPA 13
Contract : 122016-1
Data File : Residential Sidewall Calc.wxf

Hydraulic Design Information Sheet

Name - Residential Sidewall Calc. Date - 04/14/2017
 Location - Fore, Hancock and Thames Streets
 Building - AC Hotel System No. - NFPA 13
 Contractor - High Tech Fire Protection Contract No. - 122016-1
 Calculated By - Jeremy A Foss Drawing No. - FP-1.3
 Construction: () Combustible (X) Non-Combustible Ceiling Height - 9'-0"
 Occupancy - Hotel Guestroom

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

	Area	System Type	Make
M	Area of Sprinkler Operation - 672	(X) Wet	Sprinkler/Nozzle
	Density - .1	() Dry	Make Reliable
D	Area Per Sprinkler - 320	() Deluge	Model F1 Res 58
E	Elevation at Highest Outlet - 62	() Preaction	Size 1/2"
S	Hose Allowance - Inside -	() Other	K-Factor 5.8
I	Rack Sprinkler Allowance -		Temp.Rat.155
G	Hose Allowance - Outside - 100		

N Note

Calculation Flow Required - 227 Press Required - 103
 Summary C-Factor Used: 150 Overhead 140 Underground

Water Flow Test:	Pump Data:	Tank or Reservoir:
A Date of Test - 10/14/2016		Cap. -
T Time of Test -	Rated Cap.-	Elev.-
E Static Press - 110	@ Press -	
R Residual Press - 106	Elev. -	Well
Flow - 1591		Proof Flow
S Elevation - -2		

P Location - Test Hydrant Located on Thames Street Adjacent to Project Site

P Source of Information - Portland Water District

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

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

E Horizontal Barriers Provided:

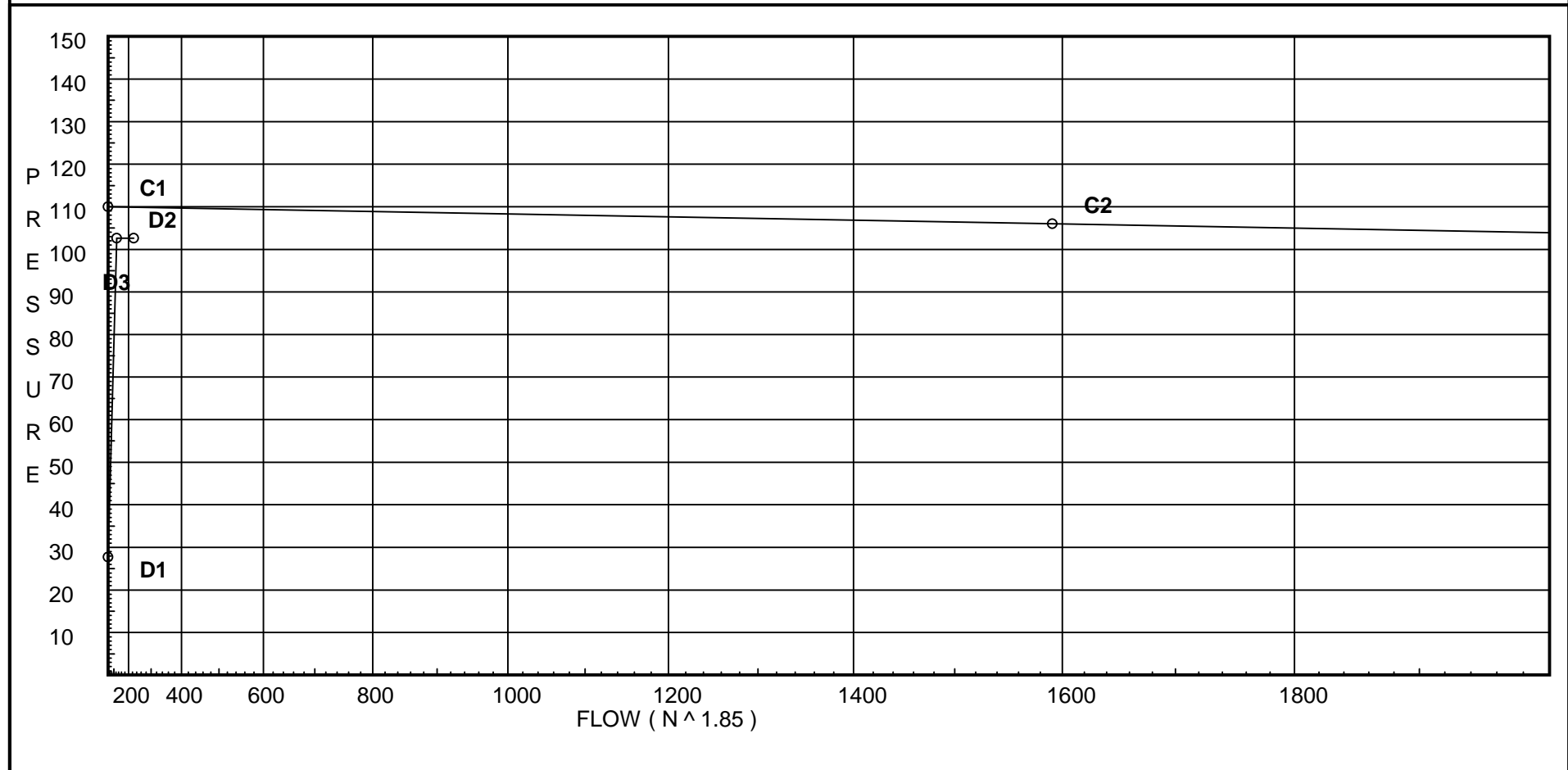
Water Supply Curve (C)

High Tech Fire Protection
AC Hotel - Residential Sidewall Calc.

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City Water Supply:
C1 - Static Pressure : 110
C2 - Residual Pressure: 106
C2 - Residual Flow : 1591

Demand:
D1 - Elevation : 27.718
D2 - System Flow : 126.719
D2 - System Pressure : 102.646
Hose (Demand) : 100
D3 - System Demand : 226.719
Safety Margin : 7.245



Fittings Used Summary

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Fitting Legend		½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
Abbrev.	Name																				
B	NFPA 13 Butterfly Valve	0	0	0	0	5	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
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
N*	CPVC 90'EII Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O*	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
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
V	90' EII Firelock #001	0	0	0	0	3.5	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0
X	90'Tee-BranchFirelock002	0	0	0	0	8.5	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0
Zia	Wilkins 350	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

High Tech Fire Protection
AC Hotel - Residential Sidewall Calc.

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP1	-1.0	5.8	19.48	na	25.6	0.1	256	7.6
DP2	-1.0	5.8	19.48	na	25.6	0.1	256	7.6
201	62.0	5.8	30.44	na	32.0	0.1	320	25.0
202	62.0	K = K @ EQ01	30.75	na	31.31			
203	62.0	5.8	30.72	na	32.15	0.1	320	25.0
204	62.0	K = K @ EQ02	29.68	na	31.26			
A2	62.0		31.11	na				
A1	62.0		33.69	na				
A3	62.0		34.05	na				
X1	62.0		39.45	na				
X2	62.0		58.52	na				
X3	62.0		63.13	na				
X4	62.0		67.44	na				
BF1	12.0		89.4	na				
TOR	12.0		89.89	na				
BOR	4.0		96.39	na				
BASE	1.0		101.22	na				
H1	-1.0		102.17	na				
H2	-2.0		102.63	na				
TEST	-2.0		102.65	na	100.0			

The maximum velocity is 13.33 and it occurs in the pipe between nodes A2 and A3

Final Calculations - Hazen-Williams

High Tech Fire Protection
AC Hotel - Residential Sidewall Calc.

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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	*****
DP1 to EQ01	25.60 25.6	1.101 150.0 0.1074	1N 1O	7.0 5.0 0.0	2.000 12.000 14.000	19.482 -0.433 1.503			K Factor = 5.80 Vel = 8.63	
	0.0 25.60						20.552		K Factor = 5.65	
DP2 to EQ02	25.60 25.6	1.101 150.0 0.1074	1N	7.0 0.0 0.0	1.000 7.000 8.000	19.482 -0.433 0.859			K Factor = 5.80 Vel = 8.63	
	0.0 25.60						19.908		K Factor = 5.74	
201 to 202	32.00 32.0	1.101 150.0 0.1621		0.0 0.0 0.0	1.900 0.0 1.900	30.440 0.0 0.308			K Factor = 5.80 Vel = 10.78	
202 to A1	31.31 63.31	1.394 150.0 0.1818	1O	6.0 0.0 0.0	10.200 6.000 16.200	30.748 0.0 2.945			K Factor @ node EQ01 Vel = 13.31	
	0.0 63.31						33.693		K Factor = 10.91	
203 to A2	32.15 32.15	1.101 150.0 0.1638		0.0 0.0 0.0	2.400 0.0 2.400	30.720 0.0 0.393			K Factor = 5.80 Vel = 10.83	
	0.0 32.15						31.113		K Factor = 5.76	
204 to A2	31.26 31.26	1.101 150.0 0.1554	1O	5.0 0.0 0.0	4.200 5.000 9.200	29.683 0.0 1.430			K Factor @ node EQ02 Vel = 10.53	
A2 to A3	32.15 63.41	1.394 150.0 0.1823	1O	6.0 0.0 0.0	10.100 6.000 16.100	31.113 0.0 2.935			Vel = 13.33	
	0.0 63.41						34.048		K Factor = 10.87	
A1 to A3	63.31 63.31	2.003 150.0 0.0311		0.0 0.0 0.0	11.400 0.0 11.400	33.693 0.0 0.355			Vel = 6.45	
A3 to X1	63.41 126.72	2.003 150.0 0.1123	1O	10.0 0.0 0.0	38.100 10.000 48.100	34.048 0.0 5.402			Vel = 12.90	
X1 to X2	0.0 126.72	2.003 150.0 0.1123	1O	10.0 0.0 0.0	159.800 10.000 169.800	39.450 0.0 19.072			Vel = 12.90	
X2 to X3	0.0 126.72	2.003 150.0 0.1123	1T	12.965 0.0 0.0	28.100 12.965 41.065	58.522 0.0 4.612			Vel = 12.90	
X3 to X4	0.0 126.72	3.26 120.0 0.0158	1B 1Fsp 1S	13.44 0.0 21.503	13.900 68.542 82.442	63.134 3.000 1.305			* Fixed loss = 3 Vel = 4.87	

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	*****
			2V 13.44 1T 20.159						
X4 to BF1	0.0 126.72	4.26 120.0 0.0043	1X	21.067 0.0 0.0	50.000 21.067 71.067	67.439 21.655 0.306		Vel = 2.85	
BF1 to TOR	0.0 126.72	4.26 120.0 0.0043	3V 1X 1B	26.861 21.067 15.8	49.400 63.728 113.128	89.400 0.0 0.487		Vel = 2.85	
TOR to BOR	0.0 126.72	4.26 120.0 0.0042	1Fsp	0.0 0.0 0.0	8.000 0.0 8.000	89.887 6.465 0.034		* Fixed loss = 3 Vel = 2.85	
BOR to BASE	0.0 126.72	4.26 120.0 0.0043	1Zia	0.0 0.0 0.0	3.000 0.0 3.000	96.386 4.816 0.013		* Fixed loss = 3.517 Vel = 2.85	
BASE to H1	0.0 126.72	6.16 140.0 0.0005	2E 1G 1T	40.168 4.304 43.037	75.000 87.509 162.509	101.215 0.866 0.087		Vel = 1.36	
H1 to H2	0.0 126.72	12.24 100.0 0.0	2T 2F	96.724 20.957 0.0	625.000 117.681 742.681	102.168 0.433 0.027		Vel = 0.35	
H2 to TEST	0.0 126.72	6.16 140.0 0.0005	1E 1G	20.084 4.304 0.0	10.000 24.388 34.388	102.628 0.0 0.018		Vel = 1.36	
	100.00 226.72					102.646		Qa = 100.00 K Factor = 22.38	