



AQUASAFE® Fire Safety System

Uponor
5925 148th Street West

Apple Valley, MN 55124
800-321-4739

Job Name : 25A SUMAC - One Head Calculation (H.16)
Drawing : RESIDENTIAL
Location : 25A SUMAC PORTLAND ME
Remote Area : 1
Contract : 120228-41N
Data File : 120228-41N 25A Sumac.wx1

HYDRAULIC DESIGN INFORMATION SHEET

Name - 25A SUMAC Date - 3/05/12
Location - PORTLAND ME
Building - RESIDENTIAL System No. - 1
Contractor - SPB PLG & HTG Contract No. - 120228-41N
Calculated By - DEVON HUYNH Drawing No. - 1
Construction: (X) Combustible () Non-Combustible Ceiling Height VARIES
OCCUPANCY - RESIDENTIAL

S Type of Calculation: ()NFPA 13 Residential ()NFPA 13R (X)NFPA 13D
Y Number of Sprinklers Flowing: (X)1 ()2 ()4 ()
S ()Other
T ()Specific Ruling Made by Date
E
M Listed Flow at Start Point - 13 Gpm System Type
Listed Pres. at Start Point - 9.14 Psi (X) Wet () Dry
D MAXIMUM LISTED SPACING 16 x 16 () Deluge () PreAction
E Domestic Flow Added - 0 Gpm Sprinkler or Nozzle
S Additional Flow Added - Gpm Make RELIABE-ASSEMBLIES Model AFC43
I Elevation at Highest Outlet - 128 Feet Size 3/8 K-Factor 4.3
G Note: Temperature Rating 155
N

Calculation Gpm Required 13 Psi Required 53.3 At Ref Pt STR
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - x Rated Cap. Cap.
T Time of Test - x @ Psi Elev.
E Static (Psi) - 80 Elev.
R Residual (Psi) - 75 Other Well
Flow (Gpm) - 300 Proof Flow Gpm
S Elevation - 100

P Location: x
P
L Source of Information: CITY SUPPLY
Y

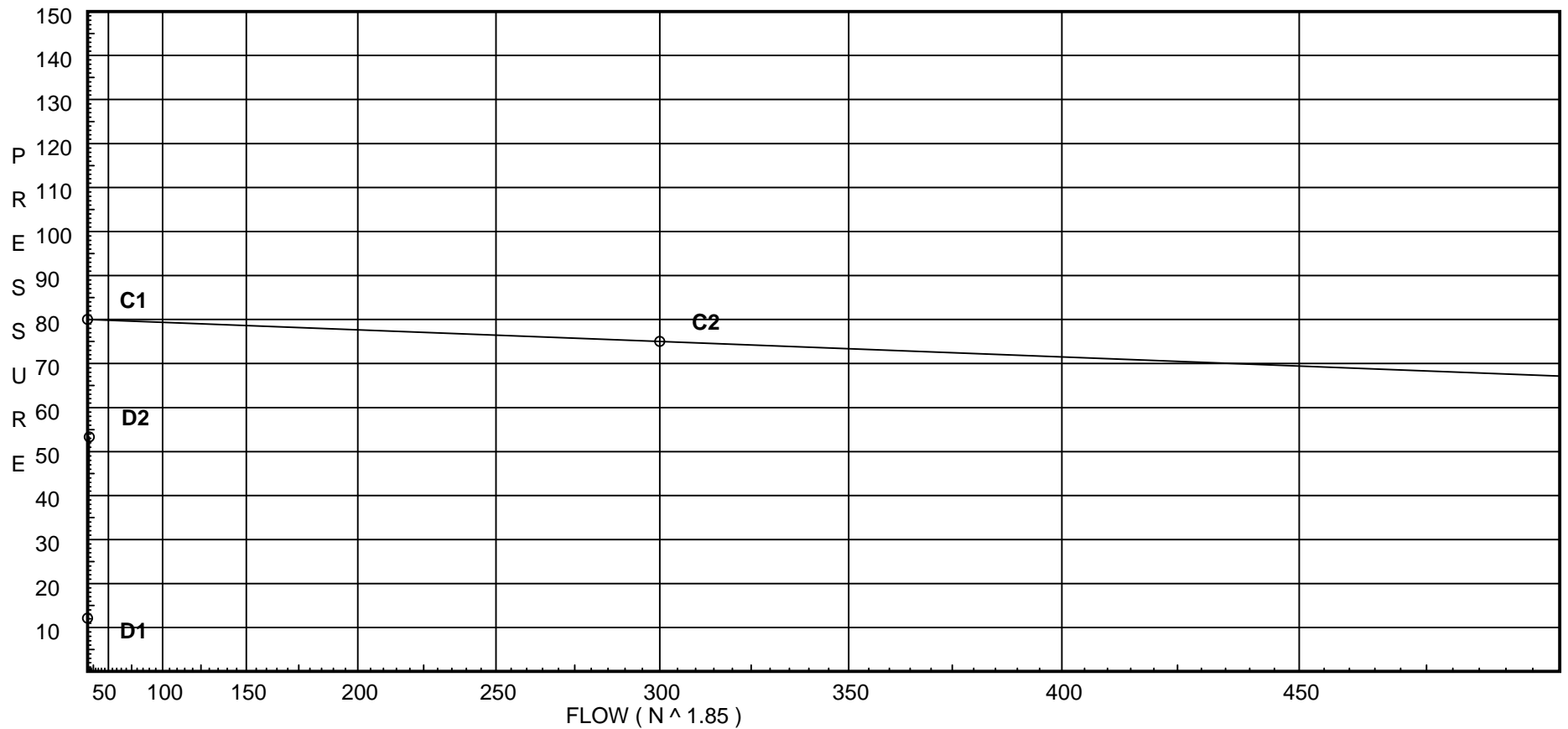
Water Supply Curve (C)

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City Water Supply:
C1 - Static Pressure : 80
C2 - Residual Pressure: 75
C2 - Residual Flow : 300

Demand:
D1 - Elevation : 12.127
D2 - System Flow : 12.9999
D2 - System Pressure : 53.303
Hose (Adj City) : _____
Hose (Demand) : _____
D3 - System Demand : 12.9999
Safety Margin : 26.682



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
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	Generic Gate Valve	1	1	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
R	CPVC Coupling Tee - Run	1	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
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
U	UnAdjusted Fitting	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Utb	Aquapex Tee - Branch	2	6	6	9.08	12.88	13.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utr	Aquapex Tee - Run	1	2	2	1.64	2.39	2.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Units Summary

Diameter Units Inches
 Length Units Feet
 Flow Units US Gallons per Minute
 Pressure Units Pounds per Square Inch

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
STR	80.0	75	300.0	79.985	13.0	53.303

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
H.16	128.0	4.3	9.14	13.0	
H.12	128.0		17.39		
H.2	128.0		19.09		
H.3	128.0		19.0		
H.4	128.0		19.12		
H.9	118.0		24.43		
M.22	128.0		19.3		
H.1	128.0		19.04		
T.23	128.0		18.16		
H.7	128.0		18.97		
M.25	108.0		30.0		
H.5	108.0		29.57		
H.8	118.0		24.4		
H.6	108.0		29.52		
H.10	128.0		17.36		
H.13	108.0		29.48		
T.24	108.0		30.03		
M.27	118.0		24.53		
T.26	118.0		24.54		
H.17	118.0		24.1		
H.11	128.0		17.4		
T.30	128.0		13.39		
H.15	118.0		24.53		
H.14	118.0		24.57		
T.28	118.0		24.46		
H.20	108.0		29.61		
T.29	128.0		13.27		
H.19	108.0		29.54		
T.33	118.0		24.53		
H.18	128.0		17.4		
T.31	118.0		24.31		
T.32	118.0		24.1		
H.21	118.0		24.1		
T.34	118.0		23.19		
S.1	104.0		32.46		
MTR	100.0		40.75		
STR	100.0		53.3		

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	*****
H.16 to H.12	3.28 3.28	0.475 150.0 0.1440	42U	42.0 0.0 0.0	15.000 42.300 57.300	9.140 0.0 8.254			K Factor = 4.30 Vel = 5.94	
	0.0 3.28					17.394			K Factor = 0.79	
H.2 to H.1	-0.18 -0.18	0.475 150.0 -0.0007	42U	42.0 0.0 0.0	22.000 42.300 64.300	19.086 0.0 -0.043			Vel = 0.33	
	0.0 -0.18					19.043			K Factor = -0.04	
H.3 to H.1	0.20 0.2	0.475 150.0 0.0008	42U	42.0 0.0 0.0	10.000 42.300 52.300	18.999 0.0 0.044			Vel = 0.36	
	0.0 0.20					19.043			K Factor = 0.05	
H.4 to H.1	-0.28 -0.28	0.475 150.0 -0.0015	42U	42.0 0.0 0.0	8.000 42.300 50.300	19.118 0.0 -0.075			Vel = 0.51	
	0.0 -0.28					19.043			K Factor = -0.06	
H.9 to H.4	-1.02 -1.02	0.475 150.0 -0.0166	42U	42.0 0.0 0.0	17.000 42.300 59.300	24.431 -4.331 -0.982			Vel = 1.85	
H.4 to H.3	0.68 -0.34	0.475 150.0 -0.0022	42U	42.0 0.0 0.0	12.000 42.300 54.300	19.118 0.0 -0.119			Vel = 0.62	
	0.0 -0.34					18.999			K Factor = -0.08	
M.22 to H.3	-0.76 -0.76	0.475 150.0 -0.0096	1T 21U	1.219 21.0 0.0	9.000 22.369 31.369	19.301 0.0 -0.302			Vel = 1.38	
	0.0 -0.76					18.999			K Factor = -0.17	
H.1 to H.7	-0.26 -0.26	0.475 150.0 -0.0013	42U	42.0 0.0 0.0	16.000 42.300 58.300	19.043 0.0 -0.075			Vel = 0.47	
	0.0 -0.26					18.968			K Factor = -0.06	
T.23 to H.2	1.33 1.33	0.475 150.0 0.0272	1R 21U 1Utr	1.0 21.0 1.0	11.000 23.150 34.150	18.156 0.0 0.930			Vel = 2.41	
	0.0 1.33					19.086			K Factor = 0.30	
M.22 to H.2	-0.55 -0.55	0.475 150.0 -0.0053	1T 21U	1.219 21.0 0.0	18.000 22.369 40.369	19.301 0.0 -0.215			Vel = 1.00	
H.2 to H.8	1.51 0.96	0.475 150.0 0.0150	42U	42.0 0.0 0.0	23.000 42.300 65.300	19.086 4.331 0.978			Vel = 1.74	

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 0.96						24.395		K Factor = 0.19	
H.3 to H.11	-1.30 -1.3	0.475 150.0 -0.0262	42U	42.0 0.0 0.0	19.000 42.300 61.300	18.999 0.0 -1.604			Vel = 2.35	
	0.0 -1.30						17.395		K Factor = -0.31	
H.7 to H.4	0.40 0.4	0.475 150.0 0.0029	42U	42.0 0.0 0.0	9.000 42.300 51.300	18.968 0.0 0.150			Vel = 0.72	
	0.0 0.40						19.118		K Factor = 0.09	
M.22 to T.26	7.81 7.81	0.862 150.0 0.0393	1Utb	6.0 0.0 0.0	17.000 6.000 23.000	19.301 4.331 0.904			Vel = 4.29	
	0.0 7.81						24.536		K Factor = 1.58	
M.22 to H.7	-0.83 -0.83	0.475 150.0 -0.0113	1T 21U	1.219 21.0 0.0	7.000 22.369 29.369	19.301 0.0 -0.333			Vel = 1.50	
	0.0 -0.83						18.968		K Factor = -0.19	
M.25 to H.5	-0.88 -0.88	0.475 150.0 -0.0127	1T 21U	1.219 21.0 0.0	12.000 22.369 34.369	30.002 0.0 -0.435			Vel = 1.59	
	0.0 -0.88						29.567		K Factor = -0.16	
H.9 to H.6	0.84 0.84	0.475 150.0 0.0115	42U	42.0 0.0 0.0	24.000 42.300 66.300	24.431 4.331 0.761			Vel = 1.52	
	0.0 0.84						29.523		K Factor = 0.15	
H.8 to H.9	0.18 0.18	0.475 150.0 0.0006	42U	42.0 0.0 0.0	14.000 42.300 56.300	24.395 0.0 0.036			Vel = 0.33	
	0.0 0.18						24.431		K Factor = 0.04	
H.6 to H.13	-0.16 -0.16	0.475 150.0 -0.0005	42U	42.0 0.0 0.0	28.000 42.300 70.300	29.523 0.0 -0.038			Vel = 0.29	
	0.0 -0.16						29.485		K Factor = -0.03	
H.10 to T.23	1.33 1.33	0.475 150.0 0.0273	21U 1R	21.0 1.0 0.0	7.000 22.150 29.150	17.361 0.0 0.795			Vel = 2.41	
	0.0 1.33						18.156		K Factor = 0.31	

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	*****
M.22 to H.11	-2.02 -2.02	0.475 150.0 -0.0589	1T 21U	1.219 21.0 0.0	10.000 22.369 32.369	19.301 0.0 -1.906				
	0.0								Vel = 3.66	
	-2.02					17.395			K Factor = -0.48	
M.22 to H.12	-1.96 -1.96	0.475 150.0 -0.0555	1T 21U	1.219 21.0 0.0	12.000 22.369 34.369	19.301 0.0 -1.907				
	0.0								Vel = 3.55	
	-1.96					17.394			K Factor = -0.47	
M.25 to H.6	-0.90 -0.9	0.475 150.0 -0.0132	1T 21U	1.219 21.0 0.0	14.000 22.369 36.369	30.002 0.0 -0.479				
	0.0								Vel = 1.63	
	-0.90					29.523			K Factor = -0.17	
H.13 to H.5	0.27 0.27	0.475 150.0 0.0014	42U	42.0 0.0 0.0	17.000 42.300 59.300	29.485 0.0 0.082				
	0.0								Vel = 0.49	
	0.27					29.567			K Factor = 0.05	
H.7 to H.12	-1.49 -1.49	0.475 150.0 -0.0333	42U	42.0 0.0 0.0	5.000 42.300 47.300	18.968 0.0 -1.574				
	0.0								Vel = 2.70	
	-1.49					17.394			K Factor = -0.36	
H.8 to T.28	0.34 0.34	0.475 150.0 0.0021	21U 1R 1Utr	21.0 1.0 1.0	5.000 23.150 28.150	24.395 0.0 0.060				
	0.0								Vel = 0.62	
	0.34					24.455			K Factor = 0.07	
T.24 to S.1	13.00 13.0	1.054 150.0 0.0380	1T	2.44 0.0 0.0	16.000 2.440 18.440	30.027 1.732 0.700				
	0.0								Vel = 4.78	
	13.00					32.459			K Factor = 2.28	
H.10 to H.12	0.16 0.16	0.475 150.0 0.0005	42U	42.0 0.0 0.0	18.000 42.300 60.300	17.361 0.0 0.033				
	0.0								Vel = 0.29	
	0.16					17.394			K Factor = 0.04	
M.25 to T.24	3.37 3.37	0.862 150.0 0.0083	1Utr	2.0 0.0 0.0	1.000 2.000 3.000	30.002 0.0 0.025				
	0.0								Vel = 1.85	
T.24 to T.26	-13.00 -9.63	0.862 150.0 -0.0580	1Utb 1Utr	6.0 2.0 0.0	12.000 8.000 20.000	30.027 -4.331 -1.160				
	0.0								Vel = 5.29	
	-9.63					24.536			K Factor = -1.94	

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	*****
M.27 to H.8	-0.45 -0.45	0.475 150.0 -0.0037	1T 21U	1.219 21.0 0.0	15.000 22.369 37.369	24.533 0.0 -0.138			Vel = 0.81	
	0.0 -0.45					24.395			K Factor = -0.09	
T.26 to M.27	-1.83 -1.83	0.862 150.0 -0.0030		0.0 0.0 0.0	1.000 0.0 1.000	24.536 0.0 -0.003			Vel = 1.01	
	0.0 -1.83					24.533			K Factor = -0.37	
H.17 to H.10	-1.69 -1.69	0.475 150.0 -0.0421	42U	42.0 0.0 0.0	15.000 42.300 57.300	24.104 -4.331 -2.412			Vel = 3.06	
	0.0 -1.69					17.361			K Factor = -0.41	
H.11 to T.29	-3.31 -3.31	0.475 150.0 -0.1466	21U 1R 1Utr	21.0 1.0 1.0	5.000 23.150 28.150	17.395 0.0 -4.127			Vel = 5.99	
	0.0 -3.31					13.268			K Factor = -0.91	
T.30 to H.10	3.18 3.18	0.475 150.0 0.1363	1R 21U 1Utb	1.0 21.0 2.0	5.000 24.150 29.150	13.387 0.0 3.974			Vel = 5.76	
	0.0 3.18					17.361			K Factor = 0.76	
H.15 to H.5	0.79 0.79	0.475 150.0 0.0104	42U	42.0 0.0 0.0	26.000 42.300 68.300	24.527 4.331 0.709			Vel = 1.43	
	0.0 0.79					29.567			K Factor = 0.15	
H.14 to H.9	-0.36 -0.36	0.475 150.0 -0.0024	42U	42.0 0.0 0.0	14.000 42.300 56.300	24.567 0.0 -0.136			Vel = 0.65	
	0.0 -0.36					24.431			K Factor = -0.07	
M.27 to H.14	0.22 0.22	0.475 150.0 0.0010	1T 21U	1.219 21.0 0.0	13.000 22.369 35.369	24.533 0.0 0.034			Vel = 0.40	
	0.0 0.22					24.567			K Factor = 0.04	
T.28 to H.15	0.34 0.34	0.475 150.0 0.0021	1R 21U	1.0 21.0 0.0	12.000 22.150 34.150	24.455 0.0 0.072			Vel = 0.62	
	0.0 0.34					24.527			K Factor = 0.07	
H.20 to H.5	-0.18 -0.18	0.475 150.0 -0.0006	42U	42.0 0.0 0.0	21.000 42.300 63.300	29.607 0.0 -0.040			Vel = 0.33	

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 -0.18					29.567			K Factor = -0.03	
M.22 to H.18	-1.68	0.475 150.0	1T 21U	1.219 21.0	23.000 22.369	19.301 0.0				
	-1.68	-0.0420		0.0	45.369	-1.906			Vel = 3.04	
	0.0 -1.68					17.395			K Factor = -0.40	
H.14 to H.13	0.76	0.475 150.0	42U	42.0 0.0	18.000 42.300	24.567 4.331				
	0.76	0.0097		0.0	60.300	0.587			Vel = 1.38	
	0.0 0.76					29.485			K Factor = 0.14	
H.6 to H.19	0.10	0.475 150.0	42U	42.0 0.0	18.000 42.300	29.523 0.0				
	0.1	0.0002		0.0	60.300	0.013			Vel = 0.18	
	0.0 0.10					29.536			K Factor = 0.02	
T.29 to H.16	-3.31	0.475 150.0	1R 21U	1.0 21.0	4.000 24.150	13.268 0.0				
	-3.31	-0.1466	1Utb	2.0	28.150	-4.128			Vel = 5.99	
H.16 to T.30	6.49	0.475 150.0	21U 1R	21.0 1.0	9.000 22.150	9.140 0.0				
	3.18	0.1363		0.0	31.150	4.247			Vel = 5.76	
	0.0 3.18					13.387			K Factor = 0.87	
H.11 to H.18	-0.02	0.475 150.0	42U	42.0 0.0	22.000 42.300	17.395 0.0				
	-0.02	0.0		0.0	64.300	0.0			Vel = 0.04	
	0.0 -0.02					17.395			K Factor = 0	
M.25 to H.20	-0.77	0.475 150.0	1T 21U	1.219 21.0	18.000 22.369	30.002 0.0				
	-0.77	-0.0098		0.0	40.369	-0.395			Vel = 1.39	
	0.0 -0.77					29.607			K Factor = -0.14	
H.14 to H.15	-0.19	0.475 150.0	42U	42.0 0.0	12.000 42.300	24.567 0.0				
	-0.19	-0.0007		0.0	54.300	-0.040			Vel = 0.34	
	0.0 -0.19					24.527			K Factor = -0.04	
M.27 to H.17	-0.77	0.475 150.0	1T 21U	1.219 21.0	21.000 22.369	24.533 0.0				
	-0.77	-0.0099		0.0	43.369	-0.429			Vel = 1.39	
	0.0 -0.77					24.104			K Factor = -0.16	
M.25 to H.19	-0.82	0.475 150.0	1T 21U	1.219 21.0	20.000 22.369	30.002 0.0				
	-0.82	-0.0110		0.0	42.369	-0.466			Vel = 1.48	

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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 -0.82					29.536			K Factor = -0.15	
H.20 to H.13	-0.34	0.475 150.0	42U	42.0 0.0	15.000 42.300	29.607 0.0				
	-0.34	-0.0021		0.0	57.300	-0.122			Vel = 0.62	
	0.0 -0.34					29.485			K Factor = -0.06	
H.15 to T.31	-0.64	0.475 150.0	21U 1R	21.0 1.0	8.000 23.150	24.527 0.0				
	-0.64	-0.0071	1Utr	1.0	31.150	-0.221			Vel = 1.16	
	0.0 -0.64					24.306			K Factor = -0.13	
M.27 to H.21	-0.82	0.475 150.0	1T 21U	1.219 21.0	17.000 22.369	24.533 0.0				
	-0.82	-0.0110		0.0	39.369	-0.434			Vel = 1.48	
	0.0 -0.82					24.099			K Factor = -0.17	
H.16 to H.18	3.22	0.475 150.0	42U	42.0 0.0	17.000 42.300	9.140 0.0				
	3.22	0.1392		0.0	59.300	8.255			Vel = 5.83	
	0.0 3.22					17.395			K Factor = 0.77	
H.19 to H.20	0.25	0.475 150.0	42U	42.0 0.0	14.000 42.300	29.536 0.0				
	0.25	0.0013		0.0	56.300	0.071			Vel = 0.45	
	0.0 0.25					29.607			K Factor = 0.05	
T.33 to H.17	-0.97	0.475 150.0	1R 21U	1.0 21.0	5.000 23.150	24.533 0.0				
	-0.97	-0.0152	1Utr	1.0	28.150	-0.429			Vel = 1.76	
	0.0 -0.97					24.104			K Factor = -0.20	
H.18 to T.34	1.52	0.475 150.0	21U 1R	21.0 1.0	19.000 23.150	17.395 4.331				
	1.52	0.0347	1Utr	1.0	42.150	1.464			Vel = 2.75	
	0.0 1.52					23.190			K Factor = 0.32	
T.31 to H.21	-0.64	0.475 150.0	1R 21U	1.0 21.0	7.000 22.150	24.306 0.0				
	-0.64	-0.0071		0.0	29.150	-0.207			Vel = 1.16	
	0.0 -0.64					24.099			K Factor = -0.13	
T.32 to H.17	0.06	0.475 150.0	1R 21U	1.0 21.0	10.000 23.150	24.101 0.0				
	0.06	0.0001	1Utr	1.0	33.150	0.003			Vel = 0.11	
	0.0 0.06					24.104			K Factor = 0.01	

Final Calculations - Hazen-Williams

Uponor
25A SUMAC - One Head Calculation (H.16)

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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	*****
H.21 to T.32	0.06 0.06	0.475 150.0 0.0001	21U 1R	21.0 1.0 0.0	9.000 22.150 31.150	24.099 0.0 0.002				
	0.0 0.06								Vel = 0.11	
							24.101		K Factor = 0.01	
T.34 to H.21	1.52 1.52	0.475 150.0 0.0348	1R 21U	1.0 21.0 0.0	4.000 22.150 26.150	23.190 0.0 0.909				
	0.0 1.52								Vel = 2.75	
							24.099		K Factor = 0.31	
H.19 to T.33	-0.97 -0.97	0.475 150.0 -0.0152	21U 1R 1Utb	21.0 1.0 2.0	20.000 24.150 44.150	29.536 -4.331 -0.672				
	0.0 -0.97								Vel = 1.76	
							24.533		K Factor = -0.20	
S.1 to MTR	13.00 13.0	0.785 150.0 0.1593	2E	4.773 0.0 0.0	5.000 4.773 9.773	32.459 6.732 1.557				
									* Fixed loss = 5	
									Vel = 8.62	
MTR to STR	0.0 13.0	0.911 150.0 0.0771	1E 1T 1G	1.521 3.801 0.76	40.000 6.082 46.082	40.748 9.000 3.555				
	0.0 13.00								* Fixed loss = 9	
									Vel = 6.40	
							53.303		K Factor = 1.78	