



## AquaSAFE™ FIRE SAFETY SYSTEM

Uponor  
5925 148th Street West

Apple Valley, MN 55124  
800-321-4739

Job Name : REQUIA RESIDENCE - One Head Calculation (H.4)  
Drawing : RESIDENTIAL  
Location : 47 PAMELA ROAD - LOT 35 PORTLAND ME 04103  
Remote Area : 1  
Contract : 21929F  
Data File : 21929F Requia.wx1

HYDRAULIC DESIGN INFORMATION SHEET

Name - REQUIA RESIDENCE Date - 3/15/17  
Location - PORTLAND ME 04103  
Building - RESIDENTIAL System No. - 1  
Contractor - MARK NIGRO SERVICES Contract No. - 21929F  
Calculated By - BRENT KOTULA SET IV 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 - 17 Gpm System Type  
Listed Pres. at Start Point - 12 Psi (X) Wet ( ) Dry  
D MAXIMUM LISTED SPACING 18 x 18 ( ) Deluge ( ) PreAction  
E Domestic Flow Added - 0 Gpm Sprinkler or Nozzle  
S Additional Flow Added - Gpm Make SENJU Model RC-RES  
I Elevation at Highest Outlet - 119 Feet Size 7/16 K-Factor 4.9  
G Note: Temperature Rating 162  
N

Calculation Gpm Required 17 Psi Required 38.62 At Ref Pt STR  
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data:  
A Date of Test - x Rated Cap.  
T Time of Test - x @ Psi  
E Static (Psi) - 60 Elev.  
R Residual (Psi) - 55 Other  
Flow (Gpm) - 300  
S Elevation - 95

P Location: STREET  
P  
L Source of Information: CONTRACTOR  
Y

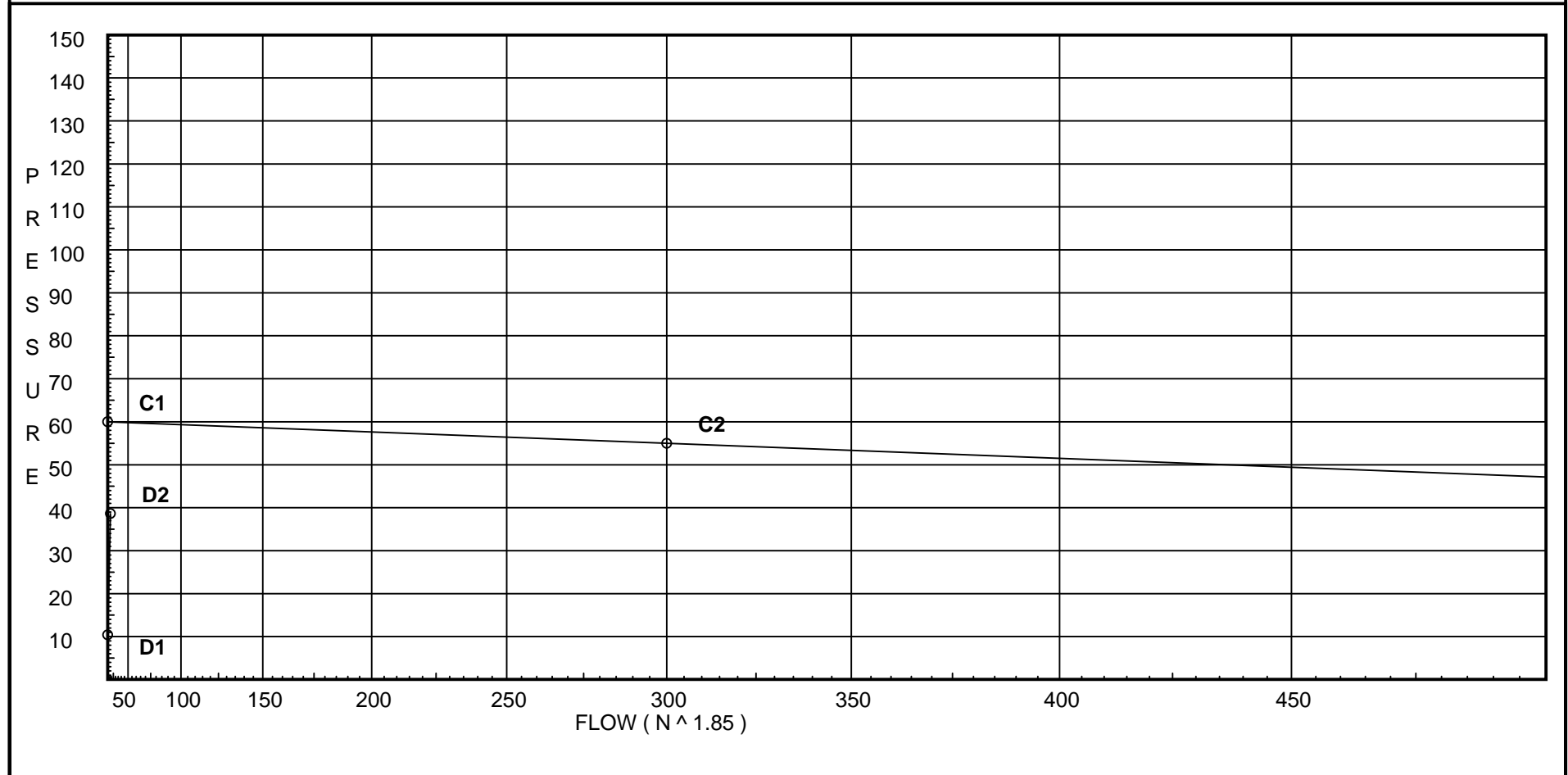
# Water Supply Curve C

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City Water Supply:  
C1 - Static Pressure : 60  
C2 - Residual Pressure: 55  
C2 - Residual Flow : 300

Demand:  
D1 - Elevation : 10.394  
D2 - System Flow : 16.974  
D2 - System Pressure : 38.620  
Hose ( Demand ) : \_\_\_\_\_  
D3 - System Demand : 16.974  
Safety Margin : 21.355



# 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
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
Utb *	Aquapex Tee - Branch	2	17	14	9	12	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utr *	Aquapex Tee - Run	1	2	2	4	2	1	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

# Flow Summary - NFPA 2007

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## SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
STR	60.0	55	300.0	59.975	16.97	38.62

## NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
H.4	119.0	4.9	12.0	16.97	
T.33	119.0		16.47		
H.10	119.0		17.38		
T.31	119.0		17.91		
H.3	119.0		18.28		
T.30	119.0		18.47		
T.32	119.0		19.23		
T.40	109.0		23.74		
T.51	99.0		29.02		
S.1	94.0		31.96		
MTR	95.0		35.32		
STR	95.0		38.62		
H.12	119.0		14.04		
T.35	119.0		16.58		
H.14	119.0		17.81		
H.13	119.0		18.06		
T.34	119.0		19.19		
T.46	109.0		23.68		
T.52	99.0		28.89		
T.41	109.0		21.04		
T.42	109.0		23.16		
T.54	99.0		27.7		
T.55	99.0		28.36		
H.25	99.0		28.46		
T.53	99.0		28.85		
T.48	109.0		21.07		
H.21	109.0		21.9		
T.49	109.0		23.29		
H.22	109.0		23.47		
T.47	109.0		23.66		
H.17	109.0		21.05		
H.16	109.0		21.05		
T.43	109.0		23.31		
H.18	109.0		23.38		
T.37	109.0		23.49		
H.15	109.0		23.51		
T.39	109.0		23.68		
T.60	99.0		27.69		
H.29	99.0		27.97		
T.56	99.0		28.21		
T.57	99.0		28.24		
H.26	99.0		28.33		

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**NODE ANALYSIS (cont.)**

<b>Node Tag</b>	<b>Elevation</b>	<b>Node Type</b>	<b>Pressure at Node</b>	<b>Discharge at Node</b>	<b>Notes</b>
H.23	99.0		28.52		
T.59	99.0		27.69		
H.28	99.0		27.7		
H.24	99.0		27.7		
H.7	119.0		19.2		
H.5	119.0		19.2		
H.9	119.0		19.2		
H.8	119.0		19.2		
H.11	119.0		19.21		
H.6	119.0		19.22		
H.1	119.0		19.22		
H.2	119.0		19.23		
T.44	109.0		23.66		
T.45	109.0		23.66		
H.19	109.0		23.67		
H.20	109.0		23.66		
H.27	99.0		28.23		

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
H.4 to T.33	9.36	0.671 150.0 0.1862	Utb Utr	17.0 2.0 0.0	5.000 19.000 24.000	12.000 0.0 4.468			K Factor = 4.90 Vel = 8.49	
T.33 to H.10	-5.40 3.96	0.671 150.0 0.0378	Utb	17.0 0.0 0.0	7.000 17.000 24.000	16.468 0.0 0.908			Vel = 3.59	
H.10 to T.31	0.0 3.96	0.671 150.0 0.0379	Utr	2.0 0.0 0.0	12.000 2.000 14.000	17.376 0.0 0.530			Vel = 3.59	
T.31 to H.3	0.0 3.96	0.671 150.0 0.0378	Utr	2.0 0.0 0.0	8.000 2.000 10.000	17.906 0.0 0.378			Vel = 3.59	
H.3 to T.30	0.0 3.96	0.671 150.0 0.0378	Utr	2.0 0.0 0.0	3.000 2.000 5.000	18.284 0.0 0.189			Vel = 3.59	
T.30 to T.32	0.0 3.96	0.671 150.0 0.0378	Utb	17.0 0.0 0.0	3.000 17.000 20.000	18.473 0.0 0.757			Vel = 3.59	
T.32 to T.40	0.30 4.26	0.862 150.0 0.0129	Utr	2.0 0.0 0.0	12.000 2.000 14.000	19.230 4.331 0.180			Vel = 2.34	
T.40 to T.51	2.04 6.3	0.862 150.0 0.0264	Utb	17.0 0.0 0.0	22.000 14.000 36.000	23.741 4.331 0.952			Vel = 3.46	
T.51 to S.1	10.67 16.97	1.054 150.0 0.0621	Utr T	4.0 2.44 0.0	6.000 6.440 12.440	29.024 2.166 0.772			Vel = 6.24	
S.1 to MTR	0.0 16.97	0.995 150.0 0.0822	2E	4.673 0.0 0.0	5.000 4.673 9.673	31.962 2.567 0.795			** Fixed Loss = 3 Vel = 7.00	
MTR to STR	0.0 16.97	0.911 150.0 0.1264	E T G	1.521 3.801 0.76	20.000 6.082 26.082	35.324 0.0 3.296			Vel = 8.35	
	0.0 16.97					38.620			K Factor = 2.73	
H.4 to H.12	7.62	0.671 150.0 0.1272	Utr	2.0 0.0 0.0	14.000 2.000 16.000	12.000 0.0 2.035			Vel = 6.91	
H.12 to T.35	0.0 7.62	0.671 150.0 0.1272	Utb	17.0 0.0 0.0	3.000 17.000 20.000	14.035 0.0 2.544			Vel = 6.91	
T.35 to H.14	-3.76 3.86	0.671 150.0 0.0362	Utb Utr	17.0 2.0 0.0	15.000 19.000 34.000	16.579 0.0 1.231			Vel = 3.50	
H.14 to H.13	0.0 3.86	0.671 150.0 0.0363		0.0 0.0 0.0	7.000 0.0 7.000	17.810 0.0 0.254			Vel = 3.50	
H.13 to T.34	0.0 3.86	0.671 150.0 0.0362	Utb Utr	17.0 2.0 0.0	12.000 19.000 31.000	18.064 0.0 1.122			Vel = 3.50	

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.34 to T.46	-0.31 3.55	0.862 150.0 0.0092	Utr 0.0 0.0	2.0 0.0 17.800	15.800 2.000 17.800	19.186 4.331 0.164		Vel = 1.95	
T.46 to T.52	1.31 4.86	0.862 150.0 0.0164	Utb 0.0 0.0	17.0 0.0 53.800	39.800 14.000 53.800	23.681 4.331 0.880		Vel = 2.67	
T.52 to T.51	5.81 10.67	1.054 150.0 0.0264	Utr 0.0 0.0	4.0 0.0 5.000	1.000 4.000 5.000	28.892 0.0 0.132		Vel = 3.92	
	0.0 10.67					29.024		K Factor = 1.98	
T.33 to T.41	5.40 5.4	0.862 150.0 0.0198	0.0 0.0 0.0	0.0 0.0 12.000	12.000 0.0 12.000	16.468 4.331 0.238		Vel = 2.97	
T.41 to T.42	-0.38 5.02	0.671 150.0 0.0589	2Utb 0.0 0.0	34.0 0.0 36.000	2.000 34.000 36.000	21.037 0.0 2.119		Vel = 4.55	
T.42 to T.54	-1.72 3.3	0.862 150.0 0.0080	0.0 0.0 0.0	0.0 0.0 27.000	27.000 0.0 27.000	23.156 4.331 0.215		Vel = 1.81	
T.54 to T.55	0.20 3.5	0.671 150.0 0.0301	Utr Utb 0.0	2.0 17.0 0.0	3.000 19.000 22.000	27.702 0.0 0.663		Vel = 3.18	
T.55 to H.25	0.0 3.5	0.671 150.0 0.0300	0.0 0.0 0.0	0.0 0.0 3.000	3.000 0.0 3.000	28.365 0.0 0.090		Vel = 3.18	
H.25 to T.53	0.0 3.5	0.671 150.0 0.0301	Utr 0.0 0.0	2.0 0.0 13.000	11.000 2.000 13.000	28.455 0.0 0.391		Vel = 3.18	
T.53 to T.52	2.31 5.81	1.054 150.0 0.0086	0.0 0.0 0.0	0.0 0.0 5.329	5.329 0.0 5.329	28.846 0.0 0.046		Vel = 2.14	
	0.0 5.81					28.892		K Factor = 1.08	
T.35 to T.48	3.76 3.76	0.862 150.0 0.0102	0.0 0.0 0.0	0.0 0.0 16.000	16.000 0.0 16.000	16.579 4.331 0.163		Vel = 2.07	
T.48 to H.21	0.38 4.14	0.671 150.0 0.0411	Utb Utr 0.0	17.0 2.0 0.0	1.000 19.000 20.000	21.073 0.0 0.822		Vel = 3.76	
H.21 to T.49	0.0 4.14	0.671 150.0 0.0411	Utb 0.0 0.0	17.0 0.0 34.000	17.000 17.000 34.000	21.895 0.0 1.397		Vel = 3.76	
T.49 to H.22	-2.52 1.62	0.671 150.0 0.0073	Utb 0.0 0.0	17.0 0.0 24.000	7.000 17.000 24.000	23.292 0.0 0.175		Vel = 1.47	
H.22 to T.47	0.0 1.62	0.671 150.0 0.0073	Utb Utr 0.0	17.0 2.0 0.0	7.000 19.000 26.000	23.467 0.0 0.189		Vel = 1.47	



# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.47 to T.46	-0.31 1.31	0.862 150.0 0.0015	Utb	17.0 0.0 0.0	3.000 14.000 17.000	23.656 0.0 0.025				Vel = 0.72
	0.0 1.31					23.681				K Factor = 0.27
T.41 to H.17	0.38 0.38	0.671 150.0 0.0005	Utb Utr	17.0 2.0 0.0	2.000 19.000 21.000	21.037 0.0 0.011				Vel = 0.34
H.17 to H.16	0.0 0.38	0.671 150.0 0.0005	Utr	2.0 0.0 0.0	11.000 2.000 13.000	21.048 0.0 0.006				Vel = 0.34
H.16 to T.48	0.0 0.38	0.671 150.0 0.0005	Utb	17.0 0.0 0.0	20.000 17.000 37.000	21.054 0.0 0.019				Vel = 0.34
	0.0 0.38					21.073				K Factor = 0.08
T.42 to T.43	1.72 1.72	0.671 150.0 0.0081	Utb	17.0 0.0 0.0	2.000 17.000 19.000	23.156 0.0 0.154				Vel = 1.56
T.43 to H.18	0.0 1.72	0.671 150.0 0.0081	Utr	2.0 0.0 0.0	7.000 2.000 9.000	23.310 0.0 0.073				Vel = 1.56
H.18 to T.37	0.0 1.72	0.671 150.0 0.0082	Utr	2.0 0.0 0.0	11.000 2.000 13.000	23.383 0.0 0.106				Vel = 1.56
T.37 to H.15	0.0 1.72	0.671 150.0 0.0080	Utr	2.0 0.0 0.0	1.000 2.000 3.000	23.489 0.0 0.024				Vel = 1.56
H.15 to T.39	0.0 1.72	0.671 150.0 0.0082	Utb	17.0 0.0 0.0	3.000 17.000 20.000	23.513 0.0 0.163				Vel = 1.56
T.39 to T.40	0.32 2.04	0.862 150.0 0.0033	Utb	17.0 0.0 0.0	5.839 14.000 19.839	23.676 0.0 0.065				Vel = 1.12
	0.0 2.04					23.741				K Factor = 0.42
T.49 to T.60	2.51 2.51	0.862 150.0 0.0049		0.0 0.0 0.0	14.000 0.0 14.000	23.292 4.331 0.068				Vel = 1.38
T.60 to H.29	-0.19 2.32	0.671 150.0 0.0141	Utb	17.0 0.0 0.0	3.000 17.000 20.000	27.691 0.0 0.282				Vel = 2.10
H.29 to T.56	0.0 2.32	0.671 150.0 0.0141	Utr	2.0 0.0 0.0	15.000 2.000 17.000	27.973 0.0 0.239				Vel = 2.10
T.56 to T.57	-0.42 1.9	0.671 150.0 0.0097	Utr	2.0 0.0 0.0	1.000 2.000 3.000	28.212 0.0 0.029				Vel = 1.72

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftg's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.57 to H.26	0.42 2.32	0.671 150.0 0.0142	Utr 0.0 0.0	2.0 4.000 2.000 6.000	28.241 0.0 0.085		Vel = 2.10		
H.26 to H.23	0.0 2.32	0.671 150.0 0.0141	Utr 0.0 0.0	2.0 12.000 2.000 14.000	28.326 0.0 0.197		Vel = 2.10		
H.23 to T.53	0.0 2.32	0.671 150.0 0.0140	Utb 17.0 Utr 2.0 0.0	4.000 19.000 23.000	28.523 0.0 0.323		Vel = 2.10		
	0.0 2.32				28.846		K Factor = 0.43		
T.60 to T.59	0.20 0.2	0.671 150.0 0.0002	Utb 17.0 0.0 0.0	1.000 17.000 18.000	27.691 0.0 0.003		Vel = 0.18		
T.59 to H.28	0.0 0.2	0.671 150.0 0.0002	Utr 2.0 0.0 0.0	10.000 2.000 12.000	27.694 0.0 0.002		Vel = 0.18		
H.28 to H.24	0.0 0.2	0.671 150.0 0.0001	Utr 2.0 0.0 0.0	17.000 2.000 19.000	27.696 0.0 0.002		Vel = 0.18		
H.24 to T.54	0.0 0.2	0.671 150.0 0.0001	Utb 17.0 Utr 2.0 0.0	8.000 19.000 27.000	27.698 0.0 0.004		Vel = 0.18		
	0.0 0.20				27.702		K Factor = 0.04		
T.34 to H.7	0.31 0.31	0.671 150.0 0.0003	Utb 17.0 0.0 0.0	12.000 17.000 29.000	19.186 0.0 0.010		Vel = 0.28		
H.7 to H.5	0.0 0.31	0.671 150.0 0.0003	Utr 2.0 0.0 0.0	10.000 2.000 12.000	19.196 0.0 0.004		Vel = 0.28		
H.5 to H.9	0.0 0.31	0.671 150.0 0.0004	Utr 2.0 0.0 0.0	3.000 2.000 5.000	19.200 0.0 0.002		Vel = 0.28		
H.9 to H.8	0.0 0.31	0.671 150.0 0.0004	Utr 2.0 0.0 0.0	3.000 2.000 5.000	19.202 0.0 0.002		Vel = 0.28		
H.8 to H.11	0.0 0.31	0.671 150.0 0.0003	0.0 0.0 0.0	16.000 0.0 16.000	19.204 0.0 0.005		Vel = 0.28		
H.11 to H.6	0.0 0.31	0.671 150.0 0.0004	Utr 2.0 0.0 0.0	17.000 2.000 19.000	19.209 0.0 0.007		Vel = 0.28		
H.6 to H.1	0.0 0.31	0.671 150.0 0.0003	Utr 2.0 0.0 0.0	17.000 2.000 19.000	19.216 0.0 0.006		Vel = 0.28		
H.1 to H.2	0.0 0.31	0.671 150.0 0.0003	Utr 2.0 0.0 0.0	13.000 2.000 15.000	19.222 0.0 0.005		Vel = 0.28		

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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.2 to T.32	0.0 0.31	0.671 150.0 0.0003	Utr	2.0 0.0 0.0	7.000 2.000 9.000	19.227 0.0 0.003				
	0.0 0.31					19.230			Vel = 0.28	
									K Factor = 0.07	
T.47 to T.44	0.31	0.671 150.0 0.0003	Utb	17.0 0.0 0.0	7.000 17.000 24.000	23.656 0.0 0.008				
	0.31								Vel = 0.28	
T.44 to T.45	-0.05 0.26	0.671 150.0 0.0003	Utr	2.0 0.0 0.0	1.000 2.000 3.000	23.664 0.0 0.001				
	0.26								Vel = 0.24	
T.45 to H.19	0.05 0.31	0.671 150.0 0.0003	Utr	2.0 0.0 0.0	4.000 2.000 6.000	23.665 0.0 0.002				
	0.31								Vel = 0.28	
H.19 to T.39	0.0 0.31	0.671 150.0 0.0004	Utb Utr	17.0 2.0 0.0	6.000 19.000 25.000	23.667 0.0 0.009				
	0.0 0.31								Vel = 0.28	
						23.676			K Factor = 0.06	
T.44 to H.20	0.06	0.671 150.0 0.0	Utb	17.0 0.0 0.0	4.000 17.000 21.000	23.664 0.0 0.001				
	0.06								Vel = 0.05	
H.20 to T.45	0.0 0.06	0.671 150.0 0.0	Utb Utr	17.0 2.0 0.0	5.000 19.000 24.000	23.665 0.0 0.0				
	0.06								Vel = 0.05	
	0.0 0.06									
						23.665			K Factor = 0.01	
T.56 to H.27	0.42	0.671 150.0 0.0006	Utb	17.0 0.0 0.0	6.000 17.000 23.000	28.212 0.0 0.014				
	0.42								Vel = 0.38	
H.27 to T.57	0.0 0.42	0.671 150.0 0.0006	Utb Utr	17.0 2.0 0.0	7.000 19.000 26.000	28.226 0.0 0.015				
	0.42								Vel = 0.38	
	0.0 0.42									
						28.241			K Factor = 0.08	