



AquaSAFE™ FIRE SAFETY SYSTEM

Uponor
5925 148th Street West

Apple Valley, MN 55124
800-321-4739

A handwritten signature in blue ink, appearing to be "M. J. Cor2", written over the right side of the company address box.

Job Name : GRABARZ RESIDENCE - One Head Calculation (H.13)
Drawing : RESIDENTIAL
Location : 25 HAVERTYS WAY PORTLAND ME 04101
Remote Area : 1
Contract : 121109-42L
Data File : 121109-42L Grabaz Residence.wx1

HYDRAULIC DESIGN INFORMATION SHEET

Name - GRABARZ RESIDENCE Date - 11/15/12
Location - PORTLAND ME 04101
Building - RESIDENTIAL System No. - 1
Contractor - RSD PLUMB & HTG Contract No. - 121109-42L
Calculated By - BRENT KOTULA SET IV Drawing No. - 1
Construction: (X) Combustible () Non-Combustible Ceiling Height 8
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 - 117 Feet Size 3/8 K-Factor 4.3
G Note: Temperature Rating 165
N

Calculation Gpm Required 13 Psi Required 46.1 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) - 52 Elev.
R Residual (Psi) - 47 Other Well
Flow (Gpm) - 300 Proof Flow Gpm
S Elevation - 91

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

Water Supply Curve (C)

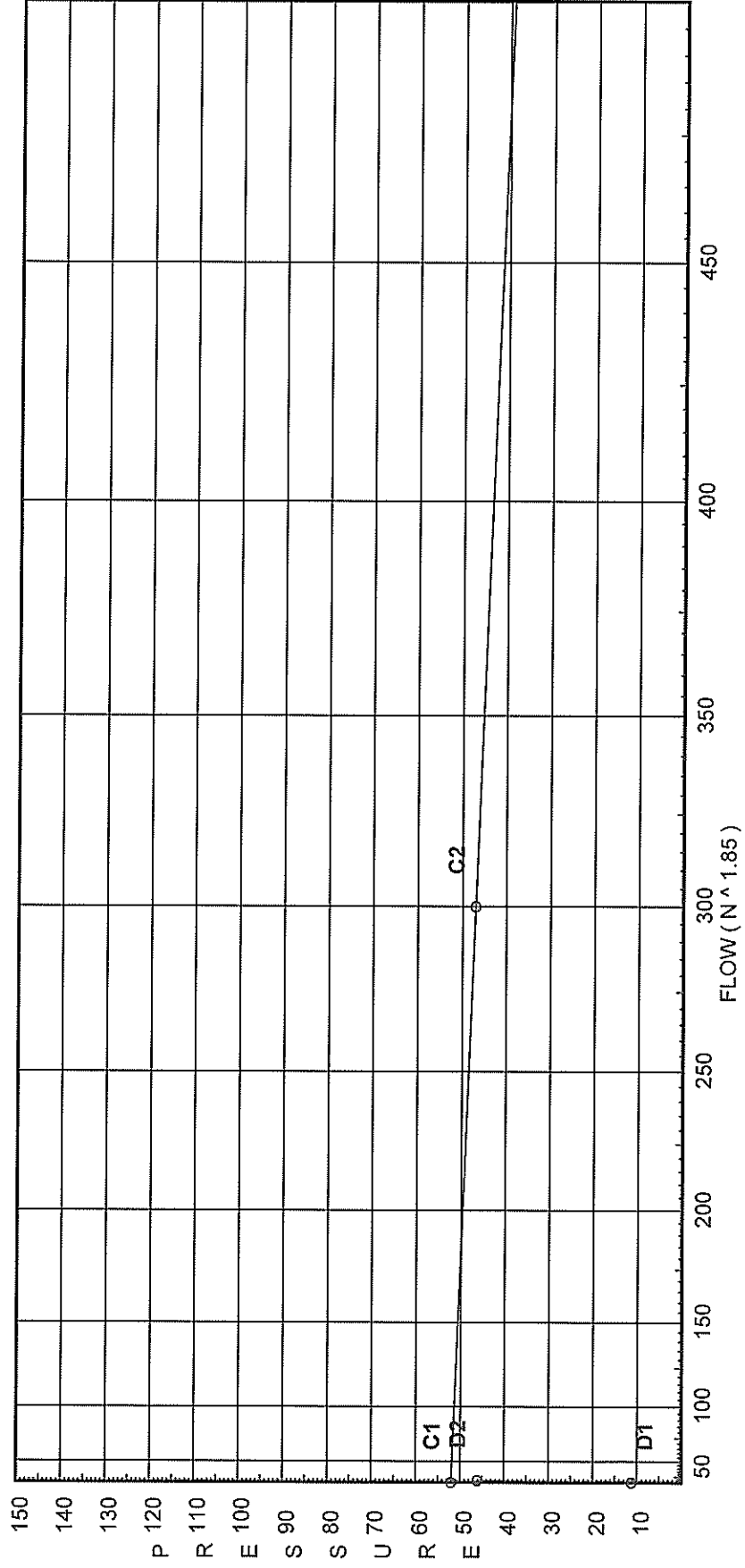
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City Water Supply:

C1 - Static Pressure : 52
C2 - Residual Pressure: 47
C2 - Residual Flow : 300

Demand:

D1 - Elevation : 11.261
D2 - System Flow : 12.9999
D2 - System Pressure : 46.096
Hose (Adj City) : _____
Hose (Demand) : _____
D3 - System Demand : 12.9999
Safety Margin : 5.888



Fittings Used Summary

Uponsor
 GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 3
 Date 11/15/2012

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
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	1	2	2	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
Utr	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 - NFFA 2007

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 4
Date 11/15/2012

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	52.0	47	300.0	51.985	13.0	46.096

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.13	117.0	4.3	9.14	13.0	
T.39	117.0		12.12		
H.1	108.0		28.22		
H.2	108.0		28.41		
T.28	108.0		28.35		
H.3	108.0		28.33		
T.27	108.0		28.36		
M.31	108.0		28.46		
T.25	108.0		27.51		
H.4	108.0		28.37		
T.30	108.0		28.7		
H.5	108.0		28.4		
H.15	99.0		32.99		
H.6	108.0		28.25		
H.11	99.0		32.96		
H.8	108.0		28.48		
H.7	108.0		26.71		
T.33	99.0		33.11		
T.34	99.0		33.07		
T.35	99.0		33.08		
M.32	99.0		33.08		
H.10	99.0		33.04		
T.36	99.0		33.06		
T.37	99.0		33.04		
H.9	99.0		33.04		
H.12	117.0		16.36		
H.16	117.0		16.36		
H.14	117.0		16.29		
H.17	99.0		33.01		
H.20	99.0		33.04		
T.38	117.0		16.32		
H.19	99.0		33.04		
H.18	117.0		23.76		
T.29	108.0		28.04		
M.41	117.0		24.6		
H.22	117.0		23.54		
H.21	117.0		23.35		
H.23	117.0		23.94		
H.24	117.0		24.13		
S.1	95.0		35.69		
MTR	91.0		44.71		
STR	91.0		46.1		

Flow Summary - NFPA 2007

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 5
Date 11/15/2012

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
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Final Calculations - Hazen-Williams

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 6
Date 11/15/2012

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.13 to T.39	2.78 2.78	0.475 150.0 0.1058	21U 1R	21.0 1.0 0.0	6.000 22.150 28.150	9.140 0.0 2.978			K Factor = 4.30 Vel = 5.03	
	0.0 2.78						12.118		K Factor = 0.80	
H.1 to H.2	0.43 0.43	0.475 150.0 0.0033	42U	42.0 0.0 0.0	16.000 42.300 58.300	28.215 0.0 0.193			Vel = 0.78	
	0.0 0.43						28.408		K Factor = 0.08	
T.28 to H.3	-0.16 -0.16	0.475 150.0 -0.0006	1Utr 1R 21U	1.0 1.0 21.0	11.000 23.150 34.150	28.348 0.0 -0.019			Vel = 0.29	
H.3 to T.26	0.52 0.36	0.475 150.0 0.0024	1Utr 21U 1R	1.0 21.0 1.0	3.000 23.150 26.150	28.329 0.0 0.064			Vel = 0.65	
	0.0 0.36						28.393		K Factor = 0.07	
T.27 to H.3	-0.23 -0.23	0.475 150.0 -0.0010	1Utr 1R 21U	1.0 1.0 21.0	5.000 23.150 28.150	28.358 0.0 -0.029			Vel = 0.42	
	0.0 -0.23						28.329		K Factor = -0.04	
M.31 to T.26	-0.36 -0.36	0.475 150.0 -0.0024	1T 1R	1.219 1.0 0.0	25.000 2.219 27.219	28.459 0.0 -0.066			Vel = 0.65	
	0.0 -0.36						28.393		K Factor = -0.07	
T.25 to H.1	0.98 0.98	0.475 150.0 0.0153	1Utb 1R 21U	2.0 1.0 21.0	22.000 24.150 46.150	27.510 0.0 0.705			Vel = 1.77	
	0.0 0.98						28.215		K Factor = 0.18	
M.31 to H.2	-0.28 -0.28	0.475 150.0 -0.0015	1T 21U	1.219 21.0 0.0	11.000 22.369 33.369	28.459 0.0 -0.051			Vel = 0.51	
	0.0 -0.28						28.408		K Factor = -0.05	
H.3 to T.29	-0.75 -0.75	0.475 150.0 -0.0095	1Utr 21U 1R	1.0 21.0 1.0	7.000 23.150 30.150	28.329 0.0 -0.285			Vel = 1.36	
	0.0 -0.75						28.044		K Factor = -0.14	
H.4 to T.28	-0.16 -0.16	0.475 150.0 -0.0005	21U 1R	21.0 1.0 0.0	22.000 22.150 44.150	28.372 0.0 -0.024			Vel = 0.29	
	0.0 -0.16						28.348		K Factor = -0.03	

Final Calculations - Hazen-Williams

Uponor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 7
Date 11/15/2012

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Fng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
H.4 to H.1	-0.40 -0.4	0.475 150.0 -0.0029	42U	42.0 0.0 0.0	12.000 42.300 54.300	28.372 0.0 -0.157			Vel = 0.72	
	0.0 -0.40					28.215			K Factor = -0.08	
T.30 to T.33	11.48 11.48	1.054 150.0 0.0301	1Utr	4.0 0.0 0.0	13.000 4.000 17.000	28.698 3.898 0.512			Vel = 4.22	
	0.0 11.48					33.108			K Factor = 2.00	
T.30 to M.31	-4.79 -4.79	0.862 150.0 -0.0159	1Utb	17.0 0.0 0.0	1.000 14.000 15.000	28.698 0.0 -0.239			Vel = 2.63	
	0.0 -4.79					28.459			K Factor = -0.90	
H.5 to H.2	0.09 0.09	0.475 150.0 0.0002	42U	42.0 0.0 0.0	15.000 42.300 57.300	28.398 0.0 0.010			Vel = 0.16	
	0.0 0.09					28.408			K Factor = 0.02	
M.31 to H.4	-0.42 -0.42	0.475 150.0 -0.0032	1T 21U	1.219 21.0 0.0	5.000 22.369 27.369	28.459 0.0 -0.087			Vel = 0.76	
	0.0 -0.42					28.372			K Factor = -0.08	
T.27 to H.5	0.23 0.23	0.475 150.0 0.0010	1R 21U	1.0 21.0 0.0	16.000 22.150 38.150	28.358 0.0 0.040			Vel = 0.42	
	0.0 0.23					28.398			K Factor = 0.04	
H.4 to H.5	0.14 0.14	0.475 150.0 0.0004	42U	42.0 0.0 0.0	19.000 42.300 61.300	28.372 0.0 0.026			Vel = 0.25	
	0.0 0.14					28.398			K Factor = 0.03	
T.25 to H.7	-0.98 -0.98	0.475 150.0 -0.0153	1R 21U	1.0 21.0 0.0	30.000 22.150 52.150	27.510 0.0 -0.796			Vel = 1.77	
	0.0 -0.98					26.714			K Factor = -0.19	
H.15 to H.8	-0.66 -0.66	0.475 150.0 -0.0075	42U	42.0 0.0 0.0	39.000 42.300 81.300	32.990 -3.898 -0.609			Vel = 1.19	
	0.0 -0.66					28.483			K Factor = -0.12	
M.31 to H.7	-1.40 -1.4	0.475 150.0 -0.0299	1T 21U	1.219 21.0 0.0	36.000 22.369 58.369	28.459 0.0 -1.745			Vel = 2.53	

Final Calculations - Hazen-Williams

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 8
Date 11/15/2012

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 -1.40						26.714		K Factor = -0.27	
H.6 to H.1	-0.15 -0.15	0.475 150.0 -0.0005	42U	42.0 0.0 0.0	30.000 42.300 72.300	28.250 0.0 -0.035			Vel = 0.27	
	0.0 -0.15						28.215		K Factor = -0.03	
H.11 to H.6	-0.86 -0.86	0.475 150.0 -0.0120	42U	42.0 0.0 0.0	25.000 42.300 67.300	32.957 -3.898 -0.809			Vel = 1.56	
	0.0 -0.86						28.250		K Factor = -0.16	
H.8 to H.2	-0.23 -0.23	0.475 150.0 -0.0011	42U	42.0 0.0 0.0	27.000 42.300 69.300	28.483 0.0 -0.075			Vel = 0.42	
	0.0 -0.23						28.408		K Factor = -0.04	
H.6 to M.31	0.56 0.56	0.475 150.0 0.0054	21U 1T	21.0 1.219 0.0	16.000 22.369 38.369	28.250 0.0 0.209			Vel = 1.01	
	0.0 0.56						28.459		K Factor = 0.10	
H.8 to M.31	-0.15 -0.15	0.475 150.0 -0.0005	21U 1T	21.0 1.219 0.0	29.000 22.369 51.369	28.483 0.0 -0.024			Vel = 0.27	
	0.0 -0.15						28.459		K Factor = -0.03	
H.8 to H.5	-0.28 -0.28	0.475 150.0 -0.0016	42U	42.0 0.0 0.0	12.000 42.300 54.300	28.483 0.0 -0.085			Vel = 0.51	
	0.0 -0.28						28.398		K Factor = -0.05	
H.7 to H.6	1.26 1.26	0.475 150.0 0.0247	42U	42.0 0.0 0.0	20.000 42.300 62.300	26.714 0.0 1.536			Vel = 2.28	
	0.0 1.26						28.250		K Factor = 0.24	
T.33 to S.1	13.00 13.0	1.054 150.0 0.0379	1T	2.44 0.0 0.0	20.000 2.440 22.440	33.108 1.732 0.851			Vel = 4.78	
	0.0 13.00						35.691		K Factor = 2.18	
T.33 to M.32	-1.52 -1.52	0.862 150.0 -0.0019	1Utb	17.0 0.0 0.0	1.000 14.000 15.000	33.108 0.0 -0.029			Vel = 0.84	
	0.0 -1.52						33.079		K Factor = -0.26	

Final Calculations - Hazen-Williams

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 9
Date 11/15/2012

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.34 to M.32	0.25 0.25	0.475 150.0 0.0012	1Utr 1R 1T	1.0 1.0 1.219	1.000 3.219 4.219	33.074 0.0 0.005			Vel = 0.45	
	0.0 0.25					33.079			K Factor = 0.04	
T.34 to H.9	-0.25 -0.25	0.475 150.0 -0.0012	1R 21U	1.0 21.0 0.0	2.000 22.150 24.150	33.074 0.0 -0.029			Vel = 0.45	
	0.0 -0.25					33.045			K Factor = -0.04	
T.35 to M.32	0.17 0.17	0.475 150.0 0.0006	1Utr 1R 1T	1.0 1.0 1.219	2.000 3.219 5.219	33.076 0.0 0.003			Vel = 0.31	
M.32 to H.10	-0.39 -0.22	0.475 150.0 -0.0010	1T 21U	1.219 21.0 0.0	11.000 22.369 33.369	33.079 0.0 -0.034			Vel = 0.40	
	0.0 -0.22					33.045			K Factor = -0.04	
T.36 to M.32	0.34 0.34	0.475 150.0 0.0021	1Utr 1R 1T	1.0 1.0 1.219	5.000 3.219 8.219	33.062 0.0 0.017			Vel = 0.62	
	0.0 0.34					33.079			K Factor = 0.06	
T.37 to H.9	0.0 0.0	0.475 150.0 0.0	1Utr 1R 21U	1.0 1.0 21.0	3.000 23.150 26.150	33.045 0.0 0.0			Vel = 0	
	0.0 0.0					33.045			K Factor = 0	
H.11 to M.32	0.38 0.38	0.475 150.0 0.0026	21U 1T	21.0 1.219 0.0	24.000 22.369 46.369	32.957 0.0 0.122			Vel = 0.69	
	0.0 0.38					33.079			K Factor = 0.07	
H.9 to T.40	0.01 0.01	0.475 150.0 0.0	1Utr 21U 1R	1.0 21.0 1.0	17.000 23.150 40.150	33.045 0.0 0.0			Vel = 0.02	
	0.0 0.01					33.045			K Factor = 0	
H.9 to H.11	-0.26 -0.26	0.475 150.0 -0.0013	42U	42.0 0.0 0.0	24.000 42.300 66.300	33.045 0.0 -0.088			Vel = 0.47	
	0.0 -0.26					32.957			K Factor = -0.05	
H.15 to H.10	0.20 0.2	0.475 150.0 0.0008	42U	42.0 0.0 0.0	24.000 42.300 66.300	32.990 0.0 0.055			Vel = 0.36	
	0.0 0.20					33.045			K Factor = 0.03	

Final Calculations - Hazen-Williams

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 10
Date 11/15/2012

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
T.36 to H.15	-0.34 -0.34	0.475 150.0 -0.0022	1R 21U	1.0 21.0 0.0	11.000 22.150 33.150	33.062 0.0 -0.072			Vel = 0.62	
	0.0 -0.34						32.990		K Factor = -0.06	
H.12 to H.14	-0.24 -0.24	0.475 150.0 -0.0012	42U	42.0 0.0 0.0	15.000 42.300 57.300	16.360 0.0 -0.066			Vel = 0.43	
	0.0 -0.24						16.294		K Factor = -0.06	
H.16 to T.39	-2.78 -2.78	0.475 150.0 -0.1058	1Utr 21U 1R	1.0 21.0 1.0	17.000 23.150 40.150	16.365 0.0 -4.247			Vel = 5.03	
	0.0 -2.78						12.118		K Factor = -0.80	
H.14 to T.38	0.22 0.22	0.475 150.0 0.0009	1Utr 21U 1R	1.0 21.0 1.0	9.000 23.150 32.150	16.294 0.0 0.030			Vel = 0.40	
	0.0 0.22						16.324		K Factor = 0.05	
H.16 to H.12	-0.06 -0.06	0.475 150.0 -0.0001	42U	42.0 0.0 0.0	10.000 42.300 52.300	16.365 0.0 -0.005			Vel = 0.11	
	0.0 -0.06						16.360		K Factor = -0.01	
H.13 to H.12	3.17 3.17	0.475 150.0 0.1355	42U	42.0 0.0 0.0	11.000 42.300 53.300	9.140 0.0 7.220			Vel = 5.74	
	0.0 3.17						16.360		K Factor = 0.78	
H.14 to H.13	-3.41 -3.41	0.475 150.0 -0.1545	42U	42.0 0.0 0.0	4.000 42.300 46.300	16.294 0.0 -7.154			Vel = 6.17	
	0.0 -3.41						9.140		K Factor = -1.13	
H.17 to H.11	-0.22 -0.22	0.475 150.0 -0.0010	42U	42.0 0.0 0.0	11.000 42.300 53.300	33.008 0.0 -0.051			Vel = 0.40	
	0.0 -0.22						32.957		K Factor = -0.04	
H.20 to H.10	0.02 0.02	0.475 150.0 0.0	42U	42.0 0.0 0.0	30.000 42.300 72.300	33.045 0.0 0.0			Vel = 0.04	
	0.0 0.02						33.045		K Factor = 0	
T.38 to H.16	0.22 0.22	0.475 150.0 0.0010	1R 21U	1.0 21.0 0.0	21.000 22.150 43.150	16.324 0.0 0.041			Vel = 0.40	

Final Calculations - Hazen-Williams

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 11
Date 11/15/2012

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 0.22						16.365		K Factor = 0.05	
H.17 to H.15	-0.12 -0.12	0.475 150.0 -0.0003	42U	42.0 0.0 0.0	11.000 42.300 53.300	33.008 0.0 -0.018			Vel = 0.22	
	0.0 -0.12						32.990		K Factor = -0.02	
M.32 to H.20	-0.16 -0.16	0.475 150.0 -0.0005	1T 21U	1.219 21.0 0.0	41.000 22.369 63.369	33.079 0.0 -0.034			Vel = 0.29	
	0.0 -0.16						33.045		K Factor = -0.03	
H.19 to T.35	0.17 0.17	0.475 150.0 0.0006	21U 1R	21.0 1.0 0.0	28.000 22.150 50.150	33.045 0.0 0.031			Vel = 0.31	
	0.0 0.17						33.076		K Factor = 0.03	
H.19 to H.10	0.01 0.01	0.475 150.0 0.0	42U	42.0 0.0 0.0	37.000 42.300 79.300	33.045 0.0 0.0			Vel = 0.02	
	0.0 0.01						33.045		K Factor = 0	
H.18 to H.12	-3.35 -3.35	0.475 150.0 -0.1501	42U	42.0 0.0 0.0	7.000 42.300 49.300	23.758 0.0 -7.398			Vel = 6.07	
	0.0 -3.35						16.360		K Factor = -0.83	
H.7 to H.13	-3.64 -3.64	0.475 150.0 -0.1747	42U	42.0 0.0 0.0	36.000 42.300 78.300	26.714 -3.898 -13.676			Vel = 6.59	
	0.0 -3.64						9.140		K Factor = -1.20	
T.37 to H.20	0.0 0.0	0.475 150.0 0.0	1R 21U	1.0 21.0 0.0	38.000 22.150 60.150	33.045 0.0 0.0			Vel = 0	
	0.0 0.0						33.045		K Factor = 0	
T.29 to H.18	-0.75 -0.75	0.475 150.0 -0.0094	1R 21U	1.0 21.0 0.0	19.000 22.150 41.150	28.044 -3.898 -0.388			Vel = 1.36	
	0.0 -0.75						23.758		K Factor = -0.15	
M.41 to H.18	1.30 1.3	0.475 150.0 -0.0260	1T 21U	1.219 21.0 0.0	10.000 22.369 32.369	24.600 0.0 -0.842			Vel = 2.35	
H.18 to M.41	-2.60 -1.3	0.475 150.0 0.0260	1T 21U	1.219 21.0 0.0	10.000 22.369 32.369	23.758 0.0 0.842			Vel = 2.35	

Final Calculations - Hazen-Williams

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 12
Date 11/15/2012

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 -1.30					24.600			K Factor = -0.26	
H.19 to T.40	-0.01 -0.01	0.475 150.0 0.0	21U 1R	21.0 1.0 0.0	19.000 22.150 41.150	33.045 0.0 0.0			Vel = 0.02	
	0.0 -0.01					33.045			K Factor = 0	
M.41 to T.30	6.69 6.69	1.054 150.0 0.0111		0.0 0.0 0.0	18.000 0.0 18.000	24.600 3.898 0.200			Vel = 2.46	
	0.0 6.69					28.698			K Factor = 1.25	
H.22 to H.14	-2.95 -2.95	0.475 150.0 -0.1182	42U	42.0 0.0 0.0	19.000 42.300 61.300	23.540 0.0 -7.246			Vel = 5.34	
	0.0 -2.95					16.294			K Factor = -0.73	
H.16 to H.21	3.06 3.06	0.475 150.0 0.1263	42U	42.0 0.0 0.0	13.000 42.300 55.300	16.365 0.0 6.983			Vel = 5.54	
	0.0 3.06					23.348			K Factor = 0.63	
H.17 to H.20	0.17 0.17	0.475 150.0 0.0006	42U	42.0 0.0 0.0	17.000 42.300 59.300	33.008 0.0 0.037			Vel = 0.31	
	0.0 0.17					33.045			K Factor = 0.03	
H.19 to H.17	-0.17 -0.17	0.475 150.0 -0.0006	42U	42.0 0.0 0.0	20.000 42.300 62.300	33.045 0.0 -0.037			Vel = 0.31	
	0.0 -0.17					33.008			K Factor = -0.03	
M.41 to H.22	1.15 1.15	0.475 150.0 -0.0206	1T 21U	1.219 21.0 0.0	29.000 22.369 51.369	24.600 0.0 -1.060			Vel = 2.08	
H.22 to M.41	-2.30 -1.15	0.475 150.0 0.0206	1T 21U	1.219 21.0 0.0	29.000 22.369 51.369	23.540 0.0 1.060			Vel = 2.08	
	0.0 -1.15					24.600			K Factor = -0.23	
H.21 to M.31	1.27 1.27	0.475 150.0 0.0251	21U 1T	21.0 1.219 0.0	26.000 22.369 48.369	23.348 3.898 1.213			Vel = 2.30	
	0.0 1.27					28.459			K Factor = 0.24	
H.23 to M.41	1.00 1.0	0.475 150.0 0.0161	21U 1T	21.0 1.219 0.0	19.000 22.369 41.369	23.936 0.0 0.664			Vel = 1.81	

Final Calculations - Hazen-Williams

Uponsor
GRABARZ RESIDENCE - One Head Calculation (H.13)

Page 13
Date 11/15/2012

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftnng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
M.41 to H.24	-1.79 -0.79	0.475 150.0 -0.0104	1T 21U	1.219 21.0 0.0	23.000 22.369 45.369	24.600 0.0 -0.470			Vel = 1.43	
	0.0 -0.79					24.130			K Factor = -0.16	
H.21 to H.23	0.84 0.84	0.475 150.0 0.0115	42U	42.0 0.0 0.0	9.000 42.300 51.300	23.348 0.0 0.588			Vel = 1.52	
	0.0 0.84					23.936			K Factor = 0.17	
H.22 to H.23	0.65 0.65	0.475 150.0 0.0073	42U	42.0 0.0 0.0	12.000 42.300 54.300	23.540 0.0 0.396			Vel = 1.18	
	0.0 0.65					23.936			K Factor = 0.13	
H.24 to H.21	-0.94 -0.94	0.475 150.0 -0.0144	42U	42.0 0.0 0.0	12.000 42.300 54.300	24.130 0.0 -0.782			Vel = 1.70	
	0.0 -0.94					23.348			K Factor = -0.19	
H.24 to H.23	-0.49 -0.49	0.475 150.0 -0.0042	42U	42.0 0.0 0.0	4.000 42.300 46.300	24.130 0.0 -0.194			Vel = 0.89	
	0.0 -0.49					23.936			K Factor = -0.10	
M.31 to H.24	-0.64 -0.64	0.475 150.0 -0.0070	1T 21U	1.219 21.0 0.0	39.000 22.369 61.369	28.459 -3.898 -0.431			Vel = 1.16	
	0.0 -0.64					24.130			K Factor = -0.13	
S.1 to MTR	13.00 13.0	1.054 150.0 0.0380	2E	2.44 0.0 0.0	5.000 2.440 7.440	35.691 8.732 0.283			* Fixed loss = 7 Vel = 4.78	
MTR to STR	0.0 13.0	1.314 150.0 0.0130	1E 1T 1G	2.247 4.495 0.562	100.000 7.304 107.304	44.706 0.0 1.390			Vel = 3.08	
	0.0 13.00					46.096			K Factor = 1.91	