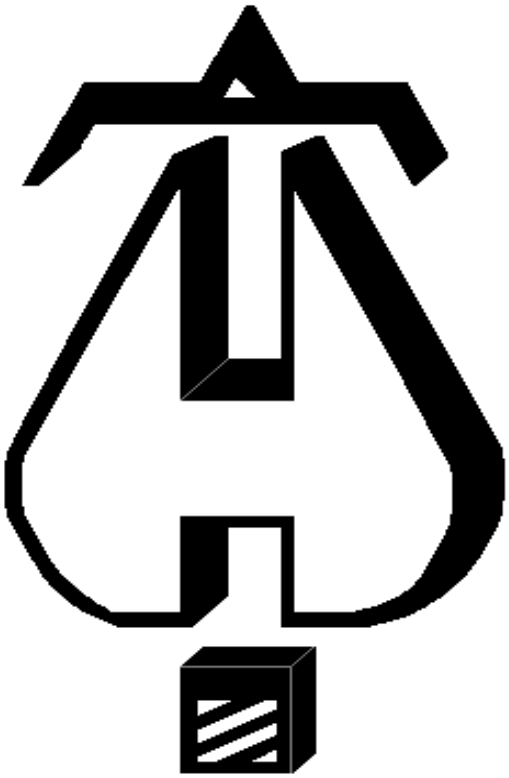


. . . Fire Protection by Computer Design

RSD FIRE PROTECTION, INC
737 SO. CEDAR ROAD
NEW LENOX, ILLINOIS
815-463-9985

Job Name : 66 ORLAND SQUARE DRIVE - MRA 1
Building : FP1
Location : 66 ORLAND SQUARE DRIVE, ORLAND PARK, ILLINOIS
System : MRA 1
Contract :
Data File : MRA 1.WXF

HYDRAULIC CALCULATIONS
for

Project name: 66 ORLAND SQUARE DRIVE - UNIT E
Location: 66 ORLAND SQUARE DRIVE, ORLAND PARK, ILLINOIS
Drawing no: FP1
Date: 7-15-15

Design

Remote area number: MRA 1
Remote area location: UNIT E
Occupancy classification: ORDINARY HAZARD - GROUP 2
Density: .20 - Gpm/SqFt
Area of application: 1590 - SqFt
Coverage per sprinkler: 130 MAX. - SqFt
Type of sprinklers calculated: EXSITNG 3/4" BR UPRIGHTS, K+8.0
No. of sprinklers calculated: 12
In-rack demand: NA - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 575.41 - GPM @ 33.058 - Psi
Type of system: WET
Volume of dry or preaction system: NA - Gal

Water supply information

Date: 7-8-15
Location: FIRE PUMP TEST ON SITE
Source: ROGERS PUMP

Name of contractor: RSD FIRE PROTECTION, INC.
Address: 737 SOUTH CEDAR ROAD, NEW LENOX, ILLINOIS 60451
Phone number: 815-463-9985
Name of designer: DS
Authority having jurisdiction: ORLAND PARK FIRE PREVENTION BUREAU
Notes: (Include peaking information or gridded systems here.)

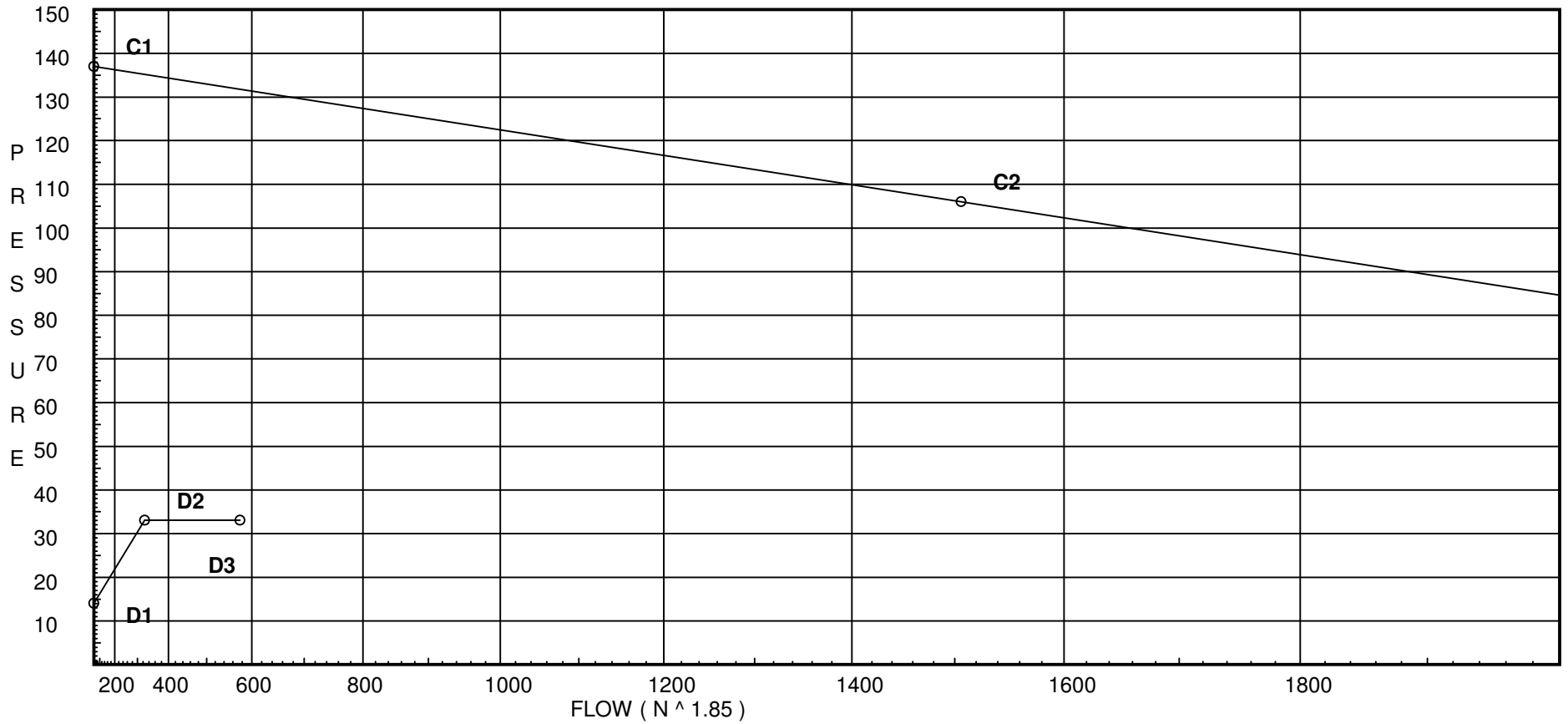
Water Supply Curve (C)

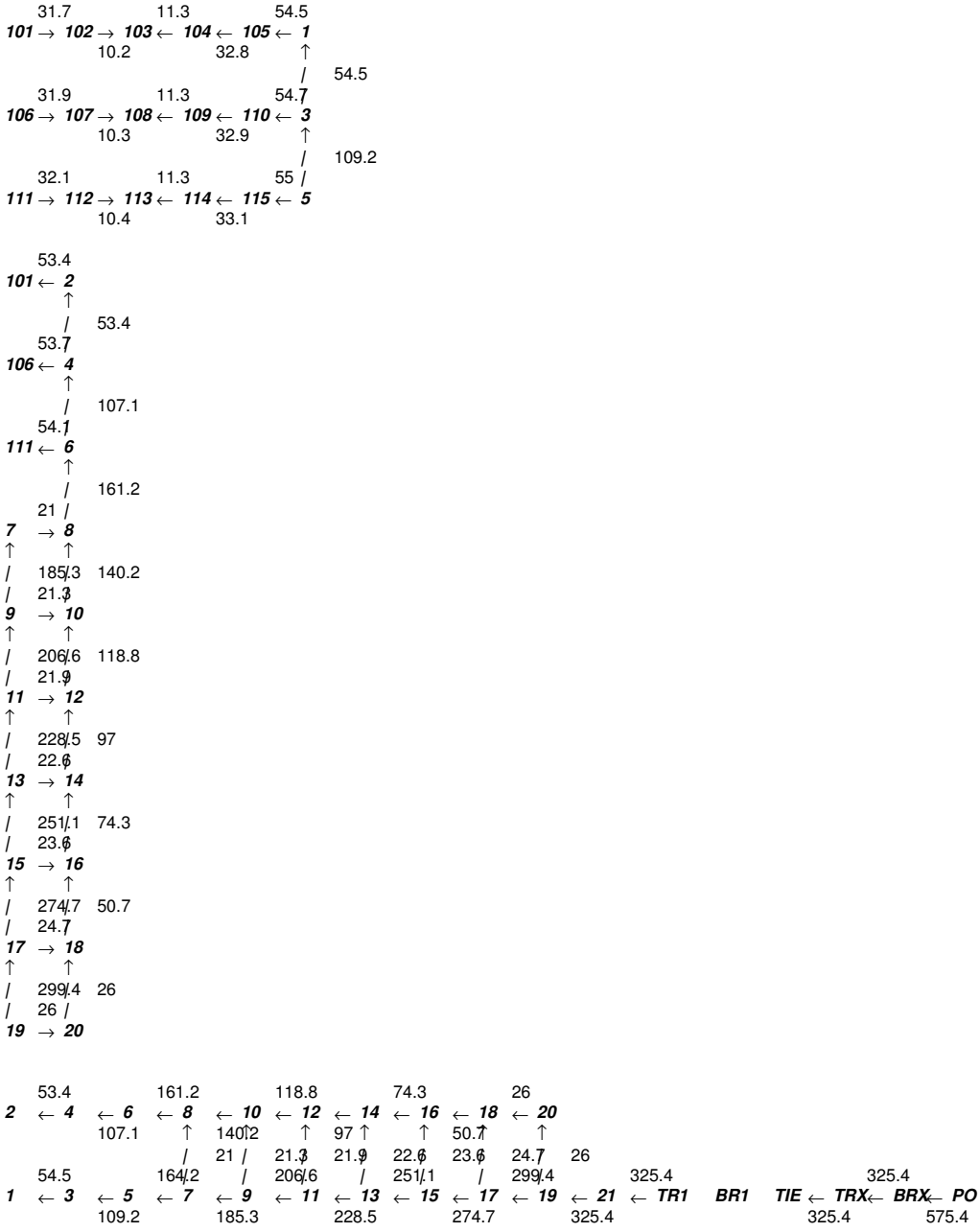
RSD FIRE PROTECTION, INC
66 ORLAND SQUARE DRIVE - MRA 1

Date 7-15-15

City Water Supply:
- C1 - Static Pressure : 137
- C2 - Residual Pressure: 106
- C2 - Residual Flow : 1506

Demand:
- D1 - Elevation : 14.076
- D2 - System Flow : 325.408
- D2 - System Pressure : 33.058
- Hose (Demand) : 250
- D3 - System Demand : 575.408
- Safety Margin : 98.714




31.7 11.3 54.5
101 → 102 → 103 ← 104 ← 105 ← 1
10.2 32.8
54.5
31.9 11.3 54.7
106 → 107 → 108 ← 109 ← 110 ← 3
10.3 32.9
109.2
32.1 11.3 55
111 → 112 → 113 ← 114 ← 115 ← 5
10.4 33.1
53.4
101 ← 2
53.4
53.7
106 ← 4
107.1
54.1
111 ← 6
161.2
21
7 → 8
185.3 140.2
21.3
9 → 10
206.6 118.8
21.9
11 → 12
228.5 97
22.6
13 → 14
251.1 74.3
23.6
15 → 16
274.7 50.7
24.7
17 → 18
299.4 26
26
19 → 20
53.4 161.2 118.8 74.3 26
2 ← 4 ← 6 ← 8 ← 10 ← 12 ← 14 ← 16 ← 18 ← 20
107.1 140.2 97 50.7
21 21.3 21.9 22.6 23.6 24.7 26
54.5 164.2 206.6 251.1 299.4 325.4 325.4
1 ← 3 ← 5 ← 7 ← 9 ← 11 ← 13 ← 15 ← 17 ← 19 ← 21 ← TR1 BR1 TIE ← TRX ← BRX ← PO
109.2 185.3 228.5 274.7 325.4 325.4 575.4

Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	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
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
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
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' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	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

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

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
101	32.5	8	7.35	na	21.69	0.2	107.5	7.0
102	32.5	8	7.24	na	21.52	0.2	107.5	7.0
103	32.5	8	7.22	na	21.5	0.2	107.5	7.0
104	32.5	8	7.24	na	21.52	0.2	107.5	7.0
105	32.5	8	7.36	na	21.7	0.2	107.5	7.0
106	32.5	8	7.42	na	21.79	0.2	107.5	7.0
107	32.5	8	7.3	na	21.62	0.2	107.5	7.0
108	32.5	8	7.29	na	21.6	0.2	107.5	7.0
109	32.5	8	7.31	na	21.62	0.2	107.5	7.0
110	32.5	8	7.43	na	21.8	0.2	107.5	7.0
111	32.5	8	7.5	na	21.91	0.2	107.5	7.0
112	32.5	8	7.39	na	21.74	0.2	107.5	7.0
113	32.5	8	7.37	na	21.72	0.2	107.5	7.0
114	32.5	8	7.39	na	21.75	0.2	107.5	7.0
115	32.5	8	7.51	na	21.92	0.2	107.5	7.0
7	31.0		12.2	na				
9	31.0		12.28	na				
11	31.0		12.39	na				
13	31.0		12.5	na				
15	31.0		12.64	na				
17	31.0		12.81	na				
19	31.0		13.0	na				
2	31.0		10.42	na				
4	31.0		10.51	na				
6	31.0		10.63	na				
8	31.0		10.88	na				
10	31.0		10.93	na				
12	31.0		10.96	na				
14	31.0		10.99	na				
16	31.0		11.0	na				
18	31.0		11.03	na				
1	31.0		11.73	na				
3	31.0		11.82	na				
5	31.0		11.94	na				
21	31.0		13.26	na				
TR1	31.0		13.99	na				
BR	31.0		15.26	na				
TIE	4.0		30.26	na				
TRX	31.0		19.26	na				
BRX	2.0		31.99	na	250.0			
PO	0.0		33.06	na				

The maximum velocity is 7.32 and it occurs in the pipe between nodes 19 and 21

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
101	-31.74	2.067		0.0	10.000	7.349		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
102	-31.74	-0.0113		0.0	10.000	-0.113		Vel = 3.03
102	21.52	2.067		0.0	10.000	7.236		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
103	-10.22	-0.0013		0.0	10.000	-0.013		Vel = 0.98
103	21.50	2.067		0.0	10.000	7.223		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
104	11.28	0.0016		0.0	10.000	0.016		Vel = 1.08
104	21.53	2.067		0.0	10.000	7.239		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
105	32.81	0.0120		0.0	10.000	0.120		Vel = 3.14
105	21.70	2.067	1J	8.5	103.125	7.359		K Factor = 8.00
to		120.0	1T	10.0	18.500	0.650		
1	54.51	0.0306		0.0	121.625	3.719		Vel = 5.21
	0.0							
	54.51					11.728		K Factor = 15.92
106	-31.91	2.067		0.0	10.000	7.416		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
107	-31.91	-0.0114		0.0	10.000	-0.114		Vel = 3.05
107	21.61	2.067		0.0	10.000	7.302		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
108	-10.3	-0.0014		0.0	10.000	-0.014		Vel = 0.98
108	21.60	2.067		0.0	10.000	7.288		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
109	11.3	0.0017		0.0	10.000	0.017		Vel = 1.08
109	21.62	2.067		0.0	10.000	7.305		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
110	32.92	0.0120		0.0	10.000	0.120		Vel = 3.15
110	21.80	2.067	1J	8.5	103.125	7.425		K Factor = 8.00
to		120.0	1T	10.0	18.500	0.650		
3	54.72	0.0308		0.0	121.625	3.746		Vel = 5.23
	0.0							
	54.72					11.821		K Factor = 15.92
111	-32.14	2.067		0.0	10.000	7.502		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
112	-32.14	-0.0115		0.0	10.000	-0.115		Vel = 3.07
112	21.74	2.067		0.0	10.000	7.387		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
113	-10.4	-0.0014		0.0	10.000	-0.014		Vel = 0.99
113	21.73	2.067		0.0	10.000	7.373		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
114	11.33	0.0017		0.0	10.000	0.017		Vel = 1.08
114	21.74	2.067		0.0	10.000	7.390		K Factor = 8.00
to		120.0		0.0	0.0	0.0		
115	33.07	0.0121		0.0	10.000	0.121		Vel = 3.16
115	21.93	2.067	1J	8.5	103.125	7.511		K Factor = 8.00
to		120.0	1T	10.0	18.500	0.650		
5	55.0	0.0311		0.0	121.625	3.781		Vel = 5.26

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 55.00					11.942		K Factor = 15.92
101 to 2	53.42 53.42	2.067 120.0 0.0295	1J 1T	8.5 10.0 0.0	63.750 18.500 82.250	7.349 0.650 2.423		Vel = 5.11
	0.0 53.42					10.422		K Factor = 16.55
106 to 4	53.70 53.7	2.067 120.0 0.0297	1J 1T	8.5 10.0 0.0	63.750 18.500 82.250	7.416 0.650 2.446		Vel = 5.13
	0.0 53.70					10.512		K Factor = 16.56
111 to 6	54.05 54.05	2.067 120.0 0.0301	1J 1T	8.5 10.0 0.0	63.750 18.500 82.250	7.502 0.650 2.476		Vel = 5.17
	0.0 54.05					10.628		K Factor = 16.58
7 to 8	-21.03 -21.03	2.067 120.0 -0.0052	2J 2T	17.0 20.0 0.0	214.875 37.000 251.875	12.197 0.0 -1.322		Vel = 2.01
	0.0 -21.03					10.875		K Factor = -6.38
9 to 10	-21.33 -21.33	2.067 120.0 -0.0054	2J 2T	17.0 20.0 0.0	214.875 37.000 251.875	12.284 0.0 -1.357		Vel = 2.04
	0.0 -21.33					10.927		K Factor = -6.45
11 to 12	-21.87 -21.87	2.067 120.0 -0.0056	2J 2T	17.0 20.0 0.0	214.875 37.000 251.875	12.386 0.0 -1.422		Vel = 2.09
	0.0 -21.87					10.964		K Factor = -6.60
13 to 14	-22.63 -22.63	2.067 120.0 -0.0060	2J 2T	17.0 20.0 0.0	214.875 37.000 251.875	12.502 0.0 -1.515		Vel = 2.16
	0.0 -22.63					10.987		K Factor = -6.83
15 to 16	-23.62 -23.62	2.067 120.0 -0.0065	2J 2T	17.0 20.0 0.0	214.875 37.000 251.875	12.642 0.0 -1.640		Vel = 2.26
	0.0 -23.62					11.002		K Factor = -7.12
17 to 18	-24.67 -24.67	2.067 120.0 -0.0071	2J 2T	17.0 20.0 0.0	214.875 37.000 251.875	12.806 0.0 -1.777		Vel = 2.36
	0.0 -24.67					11.029		K Factor = -7.43

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
19	-26.03	2.067	2J	17.0	214.875	12.998		
to		120.0	2T	20.0	37.000	13.426		
20	-26.03	-0.0078		0.0	251.875	-1.962		Vel = 2.49
	0.0							
	-26.03					24.462		K Factor = -5.26
2	53.42	2.635		0.0	10.000	10.422		
to		120.0		0.0	0.0	0.0		
4	53.42	0.0090		0.0	10.000	0.090		Vel = 3.14
4	53.70	3.26		0.0	10.000	10.512		
to		120.0		0.0	0.0	0.0		
6	107.12	0.0116		0.0	10.000	0.116		Vel = 4.12
6	54.06	3.26		0.0	10.000	10.628		
to		120.0		0.0	0.0	0.0		
8	161.18	0.0247		0.0	10.000	0.247		Vel = 6.20
8	-21.03	4.26		0.0	10.000	10.875		
to		120.0		0.0	0.0	0.0		
10	140.15	0.0052		0.0	10.000	0.052		Vel = 3.15
10	-21.33	4.26		0.0	9.542	10.927		
to		120.0		0.0	0.0	0.0		
12	118.82	0.0039		0.0	9.542	0.037		Vel = 2.67
12	-21.87	4.26		0.0	9.125	10.964		
to		120.0		0.0	0.0	0.0		
14	96.95	0.0025		0.0	9.125	0.023		Vel = 2.18
14	-22.63	4.26		0.0	9.125	10.987		
to		120.0		0.0	0.0	0.0		
16	74.32	0.0016		0.0	9.125	0.015		Vel = 1.67
16	-23.62	3.26		0.0	9.125	11.002		
to		120.0		0.0	0.0	0.0		
18	50.7	0.0030		0.0	9.125	0.027		Vel = 1.95
18	-24.67	3.26		0.0	9.125	11.029		
to		120.0		0.0	0.0	13.426		
20	26.03	0.0008		0.0	9.125	0.007		Vel = 1.00
	0.0							
	26.03					24.462		K Factor = 5.26
1	54.51	2.635		0.0	10.000	11.728		
to		120.0		0.0	0.0	0.0		
3	54.51	0.0093		0.0	10.000	0.093		Vel = 3.21
3	54.72	3.26		0.0	10.000	11.821		
to		120.0		0.0	0.0	0.0		
5	109.23	0.0121		0.0	10.000	0.121		Vel = 4.20
5	55.00	3.26		0.0	10.000	11.942		
to		120.0		0.0	0.0	0.0		
7	164.23	0.0255		0.0	10.000	0.255		Vel = 6.31
7	21.03	4.26		0.0	10.000	12.197		
to		120.0		0.0	0.0	0.0		
9	185.26	0.0087		0.0	10.000	0.087		Vel = 4.17
9	21.32	4.26		0.0	9.542	12.284		
to		120.0		0.0	0.0	0.0		
11	206.58	0.0107		0.0	9.542	0.102		Vel = 4.65

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
11	21.88	4.26		0.0	9.125	12.386		
to		120.0		0.0	0.0	0.0		
13	228.46	0.0127		0.0	9.125	0.116		Vel = 5.14
13	22.63	4.26		0.0	9.125	12.502		
to		120.0		0.0	0.0	0.0		
15	251.09	0.0153		0.0	9.125	0.140		Vel = 5.65
15	23.62	4.26		0.0	9.125	12.642		
to		120.0		0.0	0.0	0.0		
17	274.71	0.0180		0.0	9.125	0.164		Vel = 6.18
17	24.67	4.26		0.0	9.125	12.806		
to		120.0		0.0	0.0	0.0		
19	299.38	0.0210		0.0	9.125	0.192		Vel = 6.74
19	26.03	4.26	1V	8.954	1.500	12.998		
to		120.0		0.0	8.954	0.0		
21	325.41	0.0247		0.0	10.454	0.258		Vel = 7.32
21	0.0	4.26	1V	8.954	20.667	13.256		
to		120.0		0.0	8.954	0.0		
TR1	325.41	0.0246		0.0	29.621	0.729		Vel = 7.32
TR1	0.0	4.26	1B	15.8	27.000	13.985		
to		120.0	1V	8.954	24.754	0.0		
BR	325.41	0.0246		0.0	51.754	1.275		Vel = 7.32
BR	0.0	4.26	3V	26.861	107.500	15.260		
to		120.0		0.0	26.861	11.694		
TIE	325.41	0.0246		0.0	134.361	3.309		Vel = 7.32
TIE	0.0	6.357	1I	12.573	185.375	30.263		
to		120.0		0.0	12.573	-11.694		
TRX	325.41	0.0035		0.0	197.948	0.694		Vel = 3.29
TRX	0.0	6.357	1E	17.603	27.000	19.263		
to		120.0	1G	3.772	21.375	12.560		
BRX	325.41	0.0035		0.0	48.375	0.169		Vel = 3.29
BRX	250.00	7.981	1G	4.0	11.000	31.992		Qa = 250
to		120.0	1S	45.0	49.000	0.866		
PO	575.41	0.0033		0.0	60.000	0.200		Vel = 3.69
	0.0							
	575.41					33.058		K Factor = 100.08