. . . Fire Protection by Computer Design

REBEL FIRE PROTECTION INC.
6730 WEST HORSESHOE ROAD
MORGANTOWN, INDIANA
317-416-8786

Job Name	:	NEUROSCIENCES RESEARCH BUILDING
Building	:	BASEMENT
Location	:	320 WEST 15TH STREET - INDIANAPOLIS, INDIANA
System	:	BASEMENT
Contract	:	
Data File	:	NEUROBAS.WXF

Computer Programs by Hydratec Inc. Route 111 Windham N.H. USA 03087

Hydraulic Design Information Sheet

Name - NEUROSCIENCES RESEARCH BUILDING
Date - 12-12-12
Location - 320 WEST 15TH STREET - INDIANAPOLIS, INDIANA
Building - BASEMENT
System No. - BASEMENT
Contractor - REBEL FIRE PROTECTION, INC.
Contract No. -
Calculated By -
Drawing No. - FP2
Construction: ( ) Combustible (XX) Non-Combustible
Ceiling Height - VARIES
Occupancy - ORDINARY HAZARD .20/1500

SYSTEM

(X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.
( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve
Other
Specific Ruling Made By Date

DESIGN

Area of Sprinkler Operation	- 1500 SQFT	System Type	Sprinkler/Nozzle
Density	- .20	(X) Wet	Make TYCO
Area Per Sprinkler	- 130	( ) Dry	Model SEE LEGEND
Elevation at Highest Outlet	- 13.5	( ) Deluge	Size SEE LEGEND
Hose Allowance - Inside	- 100	( ) Preaction	K-Factor 5.6
Rack Sprinkler Allowance	-	( )	Temp.Rat.VARIES
Hose Allowance - Outside	- 150		

Note

Calculation Summary: Flow Required - 478.37 Press Required - 145.675
C-Factor Used: 120 Overhead 150 Underground

WATER SUPPLY

Water Flow Test:		Pump Data:		Tank or Reservoir:	
Date of Test	-			Cap. -	
Time of Test	-	Rated Cap.	- 1000	Elev.-	
Static Press	- 59 PSI	@ Press	- 115		
Residual Press	- 56 PSI	Elev.	-		Well
Flow	- 1050				Proof Flow
Elevation	- 2				

Location - AT SITE

Source of Information - LOCAL WATER AUTHORITY

COMMODITY STORAGE

Commodity Class Location
Storage Ht. Area Aisle W.
Storage Method: Solid Piled % Palletized % Rack

( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.
( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non
( ) Mult. Row ( ) Open Shelf

Flue Spacing Clearance:Storage to Ceiling
Longitudinal Transverse

Horizontal Barriers Provided:

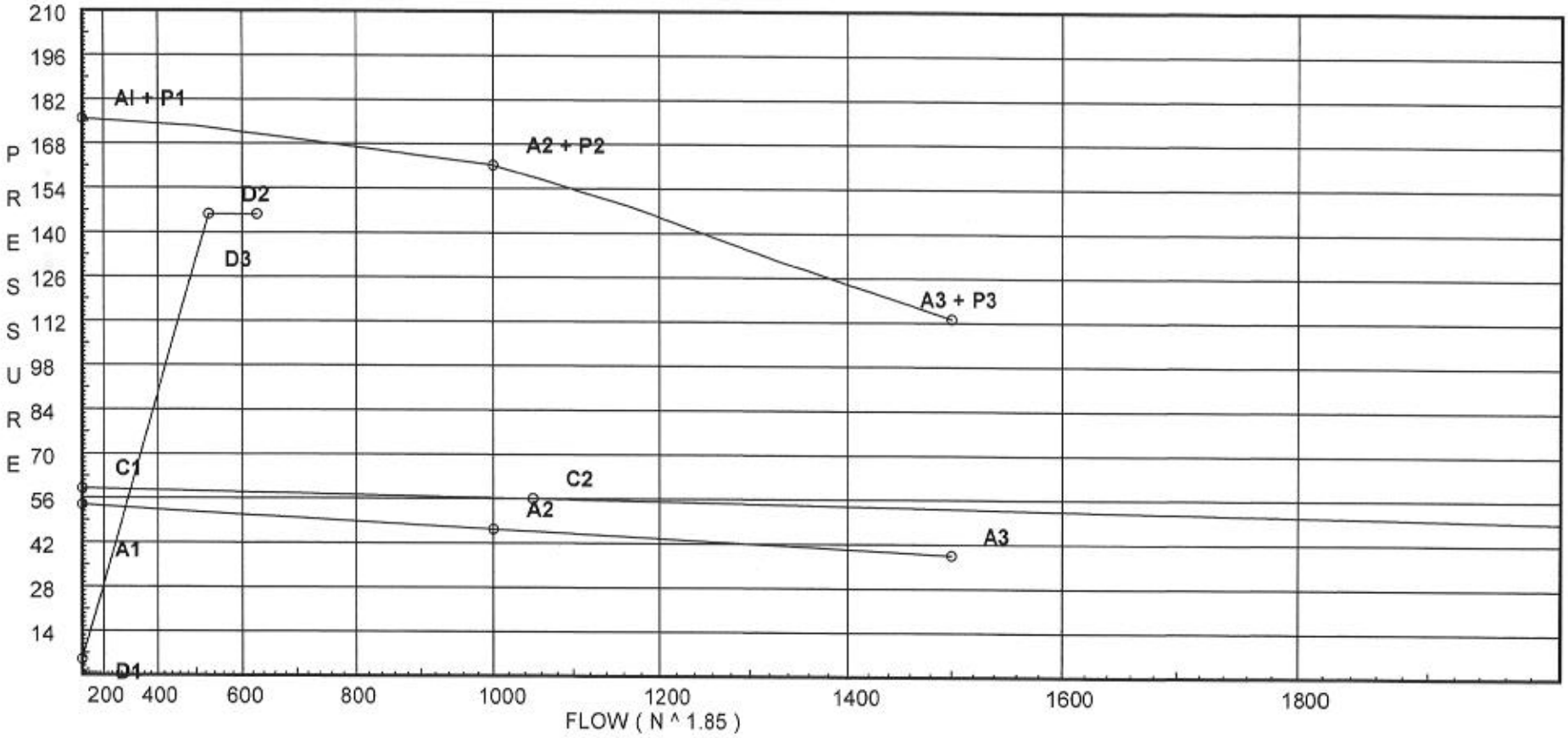
REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

City Water Supply:
- C1 - Static Pressure : 59
- C2 - Residual Pressure: 56
- C2 - Residual Flow : 1050

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 53.917
- A2 - Adj Resid : 46.387 @ 1000
- A3 - Adj Resid : 38.475 @ 1500

Pump Data:
- P1 - Pump Churn Pressure : 121.9
- P2 - Pump Rated Pressure : 115
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 74.75
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 5254.16
- City Residual Flow @ 20 = 4200.69
- City Water @ 150% of Pump = 53.20

Demand:
- D1 - Elevation : 4.981
- D2 - System Flow : 528.369
- D2 - System Pressure : 145.675
- Hose (Adj City) : _____
- Hose (Demand) : 100
- D3 - System Demand : 628.369
- Safety Margin : 28.017



Fittings Used Summary

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Date

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	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	0	0	0	0	0
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	0	0	0	0	0	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
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
X	90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0

Pressure / Flow Summary - STANDARD

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
15	10.0		141.93	na				
20	10.0		141.16	na	100.0			
29	10.0		139.72	na				
30	10.0		83.15	na				
31	10.0		60.53	na				
32	10.0		58.96	na				
41	10.0		26.67	na				
42	10.0		28.79	na				
43	10.0		30.87	na				
44	10.0		38.18	na				
45	10.0		43.8	na				
46	10.0		48.2	na				
47	10.0		53.69	na				
48	10.0		28.83	na				
49	10.0		31.12	na				
50	10.0		33.37	na				
51	10.0		43.24	na				
52	10.0		49.37	na				
S1	13.5	5.6	21.56	na	26.0	0.2	130	21.56
S2	13.5	5.6	23.39	na	27.09	0.2	130	21.56
S3	13.5	5.6	25.2	na	28.11	0.2	130	21.56
S4	9.0	5.6	33.25	na	32.29	0.2	130	21.56
S5	9.0	5.6	38.14	na	34.58	0.2	130	21.56
S6	9.0	5.6	41.98	na	36.28	0.2	130	21.56
S7	9.0	5.6	46.76	na	38.29	0.2	130	21.56
S8	13.5	5.6	23.43	na	27.11	0.2	130	21.56
S9	13.5	5.6	25.42	na	28.23	0.2	130	21.56
S10	13.5	5.6	27.37	na	29.3	0.2	130	21.56
S11	9.0	5.6	37.65	na	34.36	0.2	130	21.56
S12	9.0	5.6	42.99	na	36.72	0.2	130	21.56
PMPO	2.0		145.68	na				
PMPI	2.0		51.8	na				
BFO	2.0		52.31	na				
BFI	2.0		57.33	na				
10	2.0		57.37	na				
UG1	-5.0		60.46	na				
TEST	2.0		57.84	na				

The maximum velocity is 25.36 and it occurs in the pipe between nodes 29 and 30

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
15	-478.37	6.065	2V	20.0	30.000	141.927		
to		120	1X	25.0	55.000	0.0		
20	-478.37	-0.0090	1B	10.0	85.000	-0.764		Vel = 5.31
20	100.00	4.026	2V	13.6	20.000	141.163		Qa = 100
to		120		0.0	13.600	0.0		
29	-378.37	-0.0429		0.0	33.600	-1.441		Vel = 9.54
29	0.0	2.469	2E	12.0	110.000	139.722		
to		120		0.0	12.000	0.0		
30	-378.37	-0.4637		0.0	122.000	-56.569		Vel = 25.36
30	0.0	2.469	1X	10.8	38.000	83.153		
to		120		0.0	10.800	0.0		
31	-378.37	-0.4637		0.0	48.800	-22.627		Vel = 25.36
31	155.72	2.469		0.0	9.000	60.526		
to		120		0.0	0.0	0.0		
32	-222.65	-0.1739		0.0	9.000	-1.565		Vel = 14.92
32	74.58	2.469		0.0	9.000	58.961		
to		120		0.0	0.0	4.331		
33	-148.07	-0.0818		0.0	9.000	-0.736		Vel = 9.92
	0.0							
	-148.07					62.556		K Factor = -18.72
41	26.00	1.049		0.0	10.000	26.671		
to		120		0.0	0.0	0.0		
42	26.0	0.2115		0.0	10.000	2.115		Vel = 9.65
42	27.09	1.38		0.0	10.000	28.786		
to		120		0.0	0.0	0.0		
43	53.09	0.2082		0.0	10.000	2.082		Vel = 11.39
43	28.11	1.38	2E	6.0	10.000	30.868		
to		120		0.0	6.000	0.0		
44	81.2	0.4572		0.0	16.000	7.316		Vel = 17.42
44	32.29	1.61		0.0	14.000	38.184		
to		120		0.0	0.0	0.0		
45	113.49	0.4009		0.0	14.000	5.613		Vel = 17.89
45	34.58	1.61	1T	8.0	14.000	43.797		
to		120		0.0	8.000	4.331		
33	148.07	0.6558		0.0	22.000	14.428		Vel = 23.33
	0.0							
	148.07					62.556		K Factor = 18.72
46	36.28	1.049		0.0	14.000	48.204		
to		120		0.0	0.0	0.0		
47	36.28	0.3916		0.0	14.000	5.483		Vel = 13.47
47	38.30	1.38	1T	6.0	7.500	53.687		
to		120		0.0	6.000	0.0		
32	74.58	0.3907		0.0	13.500	5.274		Vel = 16.00
	0.0							
	74.58					58.961		K Factor = 9.71
48	27.11	1.049		0.0	10.000	28.833		
to		120		0.0	0.0	0.0		
49	27.11	0.2285		0.0	10.000	2.285		Vel = 10.06

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
49	28.23	1.38		0.0	10.000	31.118		
to		120		0.0	0.0	0.0		
50	55.34	0.2249		0.0	10.000	2.249		Vel = 11.87
50	29.30	1.38	2E	6.0	14.000	33.367		
to		120		0.0	6.000	0.0		
51	84.64	0.4936		0.0	20.000	9.873		Vel = 18.16
51	34.36	1.61		0.0	14.000	43.240		
to		120		0.0	0.0	0.0		
52	119.0	0.4377		0.0	14.000	6.128		Vel = 18.75
52	36.72	1.61	1T	8.0	7.500	49.368		
to		120		0.0	8.000	0.0		
31	155.72	0.7199		0.0	15.500	11.158		Vel = 24.54
	0.0							
	155.72					60.526		K Factor = 20.02
S1	26.00	1.049	2E	4.0	8.000	21.560		K Factor = 5.60
to		120	1T	5.0	9.000	1.516		
41	26.0	0.2115		0.0	17.000	3.595		Vel = 9.65
	0.0							
	26.00					26.671		K Factor = 5.03
S2	27.09	1.049	2E	4.0	8.000	23.393		K Factor = 5.60
to		120	1T	5.0	9.000	1.516		
42	27.09	0.2281		0.0	17.000	3.877		Vel = 10.06
	0.0							
	27.09					28.786		K Factor = 5.05
S3	28.11	1.049	2E	4.0	8.000	25.200		K Factor = 5.60
to		120	1T	5.0	9.000	1.516		
43	28.11	0.2442		0.0	17.000	4.152		Vel = 10.44
	0.0							
	28.11					30.868		K Factor = 5.06
S4	32.29	1.049	2E	4.0	8.000	33.250		K Factor = 5.60
to		120	1T	5.0	9.000	-0.433		
44	32.29	0.3157		0.0	17.000	5.367		Vel = 11.99
	0.0							
	32.29					38.184		K Factor = 5.23
S5	34.58	1.049	2E	4.0	8.000	38.137		K Factor = 5.60
to		120	1T	5.0	9.000	-0.433		
45	34.58	0.3584		0.0	17.000	6.093		Vel = 12.84
	0.0							
	34.58					43.797		K Factor = 5.23
S6	36.28	1.049	2E	4.0	8.000	41.979		K Factor = 5.60
to		120	1T	5.0	9.000	-0.433		
46	36.28	0.3916		0.0	17.000	6.658		Vel = 13.47
	0.0							
	36.28					48.204		K Factor = 5.23
S7	38.29	1.049	2E	4.0	8.000	46.763		K Factor = 5.60
to		120	1T	5.0	9.000	-0.433		
47	38.29	0.4328		0.0	17.000	7.357		Vel = 14.21

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
	0.0							
	38.29					53.687		K Factor = 5.23
S8	27.11	1.049	2E	4.0	8.000	23.434		K Factor = 5.60
to		120	1T	5.0	9.000	1.516		
48	27.11	0.2284		0.0	17.000	3.883		Vel = 10.06
	0.0							
	27.11					28.833		K Factor = 5.05
S9	28.23	1.049	2E	4.0	8.000	25.416		K Factor = 5.60
to		120	1T	5.0	9.000	1.516		
49	28.23	0.2462		0.0	17.000	4.186		Vel = 10.48
	0.0							
	28.23					31.118		K Factor = 5.06
S10	29.30	1.049	2E	4.0	8.000	27.368		K Factor = 5.60
to		120	1T	5.0	9.000	1.516		
50	29.3	0.2637		0.0	17.000	4.483		Vel = 10.88
	0.0							
	29.30					33.367		K Factor = 5.07
S11	34.36	1.049	2E	4.0	8.000	37.652		K Factor = 5.60
to		120	1T	5.0	9.000	-0.433		
51	34.36	0.3542		0.0	17.000	6.021		Vel = 12.76
	0.0							
	34.36					43.240		K Factor = 5.23
S12	36.72	1.049	2E	4.0	8.000	42.994		K Factor = 5.60
to		120	1T	5.0	9.000	-0.433		
52	36.72	0.4004		0.0	17.000	6.807		Vel = 13.63
	0.0							
	36.72					49.368		K Factor = 5.23
15	478.37	7.981	4V	52.0	35.000	141.927		
to		120	1X	33.0	85.000	3.465		
PMPO	478.37	0.0024		0.0	120.000	0.283		Vel = 3.07
	0.0							
	478.37					145.675		K Factor = 39.63
System Demand Pressure						145.675		
Safety Margin						28.017		
Continuation Pressure						173.692		
Pressure @ Pump Outlet						173.692		
Pressure From Pump Curve						-121.891		
Pressure @ Pump Inlet						51.801		
PMPI	0.0	7.981	6V	78.0	100.000	51.801		
to		120	1T	35.0	117.000	0.0		
BFO	478.37	0.0024	1G	4.0	217.000	0.513		Vel = 3.07
BFO	0.0	7.981		0.0	8.000	52.314		
to		120		0.0	0.0	5.000		* Fixed loss = 5
BFI	478.37	0.0024		0.0	8.000	0.019		Vel = 3.07
BFI	0.0	7.981	1V	13.0	5.000	57.333		
to		120		0.0	13.000	0.0		
10	478.37	0.0023		0.0	18.000	0.042		Vel = 3.07

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
10	0.0	8.27	1E	28.468	7.000	57.375		
to		140		0.0	28.468	3.032		
UG1	478.37	0.0015		0.0	35.468	0.053		Vel = 2.86
UG1	0.0	7.98	2E	54.365	150.000	60.460		
to		150	1T	52.855	113.260	-3.032		
TEST	478.37	0.0016	1G	6.041	263.260	0.412		Vel = 3.07
	0.0							
	478.37					57.840		K Factor = 62.90

. . . Fire Protection by Computer Design

REBEL FIRE PROTECTION INC.
6730 WEST HORSESHOE ROAD
MORGANTOWN, INDIANA
317-416-8786

Job Name	:	NEUROSCIENCES RESEARCH BUILDING
Building	:	5TH FLOOR
Location	:	320 WEST 15TH STREET - INDIANAPOLIS, INDIANA
System	:	5TH FLOOR
Contract	:	
Data File	:	NEURO 5TH FLOOR.WXF

Computer Programs by Hydratec Inc. Route 111 Windham N.H. USA 03087

Hydraulic Design Information Sheet

Name - NEUROSCIENCES RESEARCH BUILDING
Date - 1-13-13
Location - 320 WEST 15TH STREET - INDIANAPOLIS, INDIANA
Building - 5TH FLOOR
System No. - 5TH FLOOR
Contractor - REBEL FIRE PROTECTION, INC.
Contract No. -
Calculated By -
Drawing No. - FP6
Construction: ( ) Combustible (XX) Non-Combustible
Ceiling Height - VARIES
Occupancy - ORDINARY HAZARD .20/1500

SYSTEM

(X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.
( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve
Other
Specific Ruling Made By Date

DESIGN

Area of Sprinkler Operation	- 1500 SQFT	System Type	Sprinkler/Nozzle
Density	- .20	(X) Wet	Make TYCO
Area Per Sprinkler	- 130	( ) Dry	Model SEE LEGEND
Elevation at Highest Outlet	- 75'	( ) Deluge	Size SEE LEGEND
Hose Allowance - Inside	- 100	( ) Preaction	K-Factor 5.6
Rack Sprinkler Allowance	-	( )	Temp.Rat.155
Hose Allowance - Outside	- 150		

Note

Calculation Summary: Flow Required - 579.42 Press Required - 144.981
C-Factor Used: 120 Overhead 150 Underground

WATER SUPPLY

Water Flow Test:		Pump Data:		Tank or Reservoir:	
Date of Test	-			Cap.	-
Time of Test	-	Rated Cap.	- 1000	Elev.	-
Static Press	- 59 PSI	@ Press	- 115		
Residual Press	- 56 PSI	Elev.	-	Well Proof Flow	
Flow	- 1050				
Elevation	- 2				

Location - AT SITE

Source of Information - LOCAL WATER AUTHORITY

COMMODITY STORAGE

Commodity Class Location
Storage Ht. Area Aisle W.
Storage Method: Solid Piled % Palletized % Rack

( ) Single Row	( ) Conven. Pallet	( ) Auto. Storage	( ) Encap.
( ) Double Row	( ) Slave Pallet	( ) Solid Shelf	( ) Non
( ) Mult. Row		( ) Open Shelf	

RACK

Flue Spacing
Longitudinal
Clearance:Storage to Ceiling
Transverse

Horizontal Barriers Provided:

Water Supply Curve (C)

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

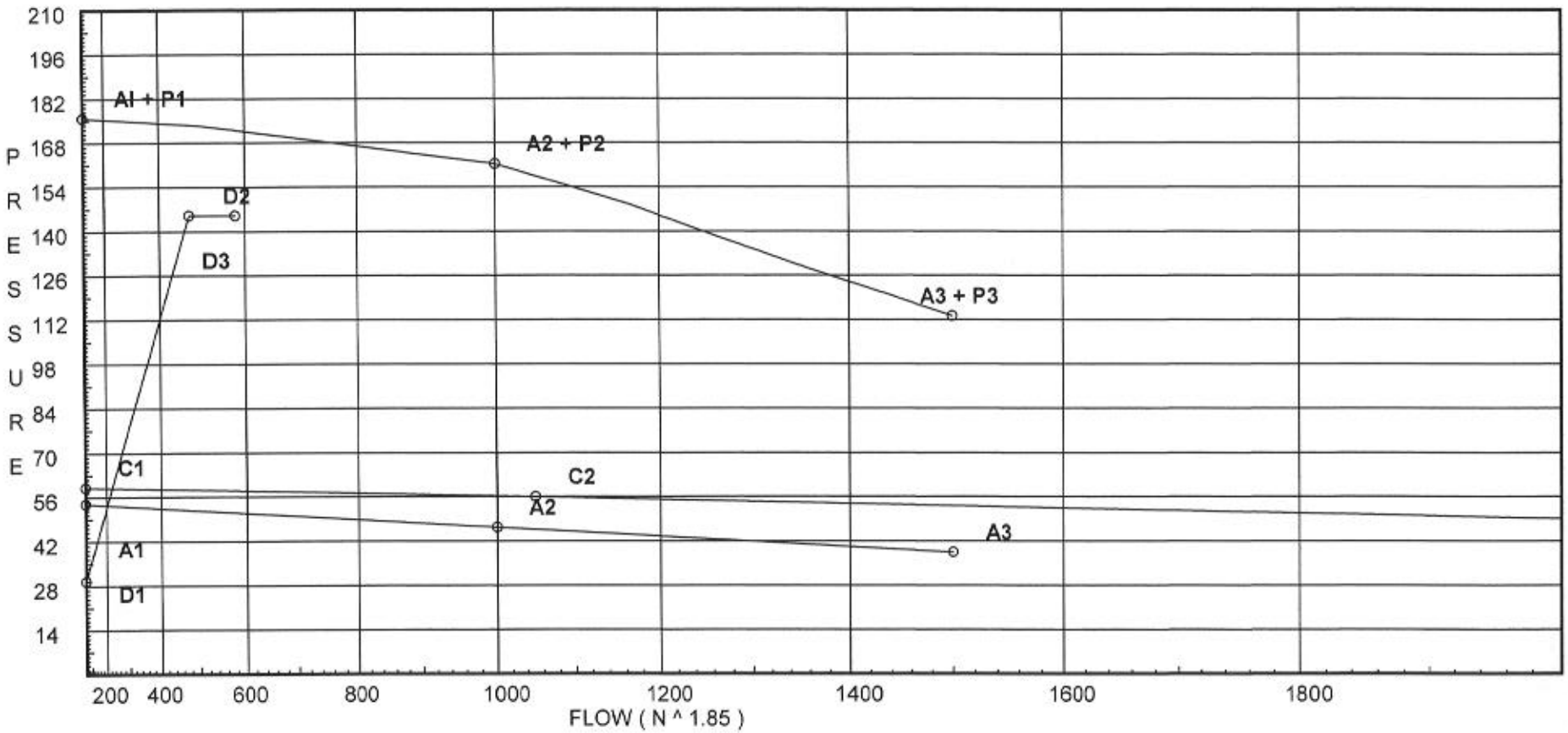
Date

City Water Supply:
- C1 - Static Pressure : 59
- C2 - Residual Pressure: 56
- C2 - Residual Flow : 1050

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 53.917
- A2 - Adj Resid : 46.387 @ 1000
- A3 - Adj Resid : 38.475 @ 1500

Pump Data:
- P1 - Pump Churn Pressure : 121.9
- P2 - Pump Rated Pressure : 115
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 74.75
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 5254.16
- City Residual Flow @ 20 = 4200.69
- City Water @ 150% of Pump = 53.20

Demand:
- D1 - Elevation : 29.451
- D2 - System Flow : 479.425
- D2 - System Pressure : 144.981
- Hose (Adj City) : 150
- Hose (Demand) : 100
- D3 - System Demand : 579.425
- Safety Margin : 27.070



Fittings Used Summary

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Date

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	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	0	0	0	0	0
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	0	0	0	0	0	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
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
X	90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
15	10.0		141.11	na				
20	10.0		140.02	na				
50	75.0		110.91	na	100.0			
30	75.0		107.15	na				
31	75.0		95.79	na				
32	75.0		66.48	na				
33	75.0		62.05	na				
61	75.0		26.17	na				
62	75.0		25.26	na				
80	75.0		28.17	na				
63	75.0		30.97	na				
64	75.0		36.19	na				
65	75.0		40.67	na				
66	75.0		47.13	na				
67	75.0		33.06	na				
68	75.0		36.43	na				
69	75.0		39.46	na				
70	75.0		46.13	na				
71	75.0		51.23	na				
72	75.0		41.83	na				
73	75.0		45.6	na				
74	75.0		47.83	na				
81	75.0		54.29	na				
S1	70.0	5.6	25.84	na	28.46	0.2	130	25.0
S2	70.0	5.6	25.0	na	28.0	0.2	130	25.0
S3	70.0	5.6	30.24	na	30.8	0.2	130	25.0
S4	70.0	5.6	35.05	na	33.15	0.2	130	25.0
S5	70.0	5.6	39.16	na	35.04	0.2	130	25.0
S6	70.0	5.6	45.11	na	37.61	0.2	130	25.0
S7	70.0	5.6	32.17	na	31.76	0.2	130	25.0
S8	70.0	5.6	35.26	na	33.25	0.2	130	25.0
S9	70.0	5.6	38.05	na	34.54	0.2	130	25.0
S10	70.0	5.6	44.19	na	37.23	0.2	130	25.0
S11	70.0	5.6	48.88	na	39.15	0.2	130	25.0
S12	70.0	5.6	40.23	na	35.52	0.2	130	25.0
S13	70.0	5.6	43.7	na	37.02	0.2	130	25.0
S14	70.0	5.6	45.75	na	37.88	0.2	130	25.0
PMPO	2.0		144.98	na				
PMPI	2.0		50.99	na				
BFO	2.0		51.72	na				
BFI	2.0		56.75	na				
10	2.0		56.81	na				
UG1	-5.0		59.92	na				
TEST	2.0		57.47	na	150.0			

The maximum velocity is 32.13 and it occurs in the pipe between nodes 31 and 32

Final Calculations - Hazen-Williams

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Date

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
15	-579.42	6.065	2V	20.0	30.000	141.112		
to		120	1X	25.0	55.000	0.0		
20	-579.42	-0.0128	1B	10.0	85.000	-1.089		Vel = 6.43
20	0.0	6.065		0.0	75.000	140.023		
to		120		0.0	0.0	-28.152		
50	-579.42	-0.0128		0.0	75.000	-0.961		Vel = 6.43
50	100.00	4.026	1X	16.0	15.000	110.910		Qa = 100
to		120	1B	12.0	41.600	0.0		
30	-479.42	-0.0664	2V	13.6	56.600	-3.759		Vel = 12.08
30	0.0	4.026	1X	16.0	155.000	107.151		
to		120		0.0	16.000	0.0		
31	-479.42	-0.0664		0.0	171.000	-11.357		Vel = 12.08
31	0.0	2.469	1X	10.8	30.000	95.794		
to		120		0.0	10.800	0.0		
32	-479.42	-0.7185		0.0	40.800	-29.313		Vel = 32.13
32	110.41	2.469		0.0	10.000	66.481		
to		120		0.0	0.0	0.0		
33	-369.01	-0.4427		0.0	10.000	-4.427		Vel = 24.73
33	175.94	2.469		0.0	15.500	62.054		
to		120		0.0	0.0	32.482		
34	-193.07	-0.1335		0.0	15.500	-2.069		Vel = 12.94
	0.0							
	-193.07					92.467		K Factor = -20.08
61	28.46	1.049	1T	5.0	3.000	26.170		
to		120		0.0	5.000	0.0		
80	28.46	0.2500		0.0	8.000	2.000		Vel = 10.57
	0.0							
	28.46					28.170		K Factor = 5.36
62	28.00	1.049	1T	5.0	7.000	25.260		
to		120		0.0	5.000	0.0		
80	28.0	0.2425		0.0	12.000	2.910		Vel = 10.39
80	28.46	1.38		0.0	12.000	28.170		
to		120		0.0	0.0	0.0		
63	56.46	0.2334		0.0	12.000	2.801		Vel = 12.11
63	30.80	1.38		0.0	10.000	30.971		
to		120		0.0	0.0	0.0		
64	87.26	0.5224		0.0	10.000	5.224		Vel = 18.72
64	33.15	1.61		0.0	10.000	36.195		
to		120		0.0	0.0	0.0		
65	120.41	0.4473		0.0	10.000	4.473		Vel = 18.98
65	35.05	1.61		0.0	9.000	40.668		
to		120		0.0	0.0	0.0		
66	155.46	0.7177		0.0	9.000	6.459		Vel = 24.50
66	37.61	1.61	1T	8.0	4.000	47.127		
to		120		0.0	8.000	32.482		
34	193.07	1.0715		0.0	12.000	12.858		Vel = 30.43
	0.0							
	193.07					92.467		K Factor = 20.08

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
67	31.76	1.049		0.0	11.000	33.064		
to		120		0.0	0.0	0.0		
68	31.76	0.3062		0.0	11.000	3.368		Vel = 11.79
68	33.26	1.38		0.0	10.000	36.432		
to		120		0.0	0.0	0.0		
69	65.02	0.3031		0.0	10.000	3.031		Vel = 13.95
69	34.54	1.38		0.0	10.000	39.463		
to		120		0.0	0.0	0.0		
70	99.56	0.6667		0.0	10.000	6.667		Vel = 21.36
70	37.23	1.61		0.0	9.000	46.130		
to		120		0.0	0.0	0.0		
71	136.79	0.5663		0.0	9.000	5.097		Vel = 21.56
71	39.15	1.61	1T	8.0	4.000	51.227		
to		120		0.0	8.000	0.0		
33	175.94	0.9022		0.0	12.000	10.827		Vel = 27.73
	0.0							
	175.94					62.054		K Factor = 22.33
72	35.52	1.049		0.0	10.000	41.834		
to		120		0.0	0.0	0.0		
73	35.52	0.3766		0.0	10.000	3.766		Vel = 13.19
73	37.02	1.38		0.0	6.000	45.600		
to		120		0.0	0.0	0.0		
74	72.54	0.3712		0.0	6.000	2.227		Vel = 15.56
74	37.88	1.38		0.0	8.000	47.827		
to		120		0.0	0.0	0.0		
81	110.42	0.8074		0.0	8.000	6.459		Vel = 23.69
81	0.0	1.61	1T	8.0	24.000	54.286		
to		120		0.0	8.000	0.0		
32	110.42	0.3811		0.0	32.000	12.195		Vel = 17.40
	0.0							
	110.42					66.481		K Factor = 13.54
S1	28.46	1.049	1T	5.0	3.000	25.835		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
61	28.46	0.2501		0.0	10.000	2.501		Vel = 10.57
	0.0							
	28.46					26.170		K Factor = 5.56
S2	28.00	1.049	1T	5.0	3.000	25.000		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
62	28.0	0.2426		0.0	10.000	2.426		Vel = 10.39
	0.0							
	28.00					25.260		K Factor = 5.57
S3	30.80	1.049	1T	5.0	3.000	30.244		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
63	30.8	0.2893		0.0	10.000	2.893		Vel = 11.43
	0.0							
	30.80					30.971		K Factor = 5.53
S4	33.15	1.049	1T	5.0	3.000	35.046		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
64	33.15	0.3315		0.0	10.000	3.315		Vel = 12.31

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							
	33.15					36.195		K Factor = 5.51
S5	35.04	1.049	1T	5.0	3.000	39.161		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
65	35.04	0.3673		0.0	10.000	3.673		Vel = 13.01
	0.0							
	35.04					40.668		K Factor = 5.49
S6	37.61	1.049	1T	5.0	3.000	45.106		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
66	37.61	0.4187		0.0	10.000	4.187		Vel = 13.96
	0.0							
	37.61					47.127		K Factor = 5.48
S7	31.76	1.049	1T	5.0	3.000	32.168		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
67	31.76	0.3062		0.0	10.000	3.062		Vel = 11.79
	0.0							
	31.76					33.064		K Factor = 5.52
S8	33.25	1.049	1T	5.0	3.000	35.264		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
68	33.25	0.3334		0.0	10.000	3.334		Vel = 12.34
	0.0							
	33.25					36.432		K Factor = 5.51
S9	34.54	1.049	1T	5.0	3.000	38.052		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
69	34.54	0.3577		0.0	10.000	3.577		Vel = 12.82
	0.0							
	34.54					39.463		K Factor = 5.50
S10	37.23	1.049	1T	5.0	3.000	44.188		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
70	37.23	0.4108		0.0	10.000	4.108		Vel = 13.82
	0.0							
	37.23					46.130		K Factor = 5.48
S11	39.15	1.049	1T	5.0	3.000	48.883		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
71	39.15	0.4510		0.0	10.000	4.510		Vel = 14.53
	0.0							
	39.15					51.227		K Factor = 5.47
S12	35.52	1.049	1T	5.0	3.000	40.234		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
72	35.52	0.3766		0.0	10.000	3.766		Vel = 13.19
	0.0							
	35.52					41.834		K Factor = 5.49
S13	37.02	1.049	1T	5.0	3.000	43.700		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
73	37.02	0.4066		0.0	10.000	4.066		Vel = 13.74
	0.0							
	37.02					45.600		K Factor = 5.48

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
S14	37.88	1.049	1T	5.0	3.000	45.751		K Factor = 5.60
to		120	1E	2.0	7.000	-2.166		
74	37.88	0.4242		0.0	10.000	4.242		Vel = 14.06
	0.0							
	37.88					47.827		K Factor = 5.48
15	579.42	7.981	4V	52.0	35.000	141.112		
to		120	1X	33.0	85.000	3.465		
PMPO	579.42	0.0034		0.0	120.000	0.404		Vel = 3.72
	0.0							
	579.42					144.981		K Factor = 48.12
System Demand Pressure						144.981		
Safety Margin						27.070		
Continuation Pressure						172.051		
Pressure @ Pump Outlet						172.051		
Pressure From Pump Curve						-121.061		
Pressure @ Pump Inlet						50.990		
PMPI	0.0	7.981	6V	78.0	100.000	50.990		
to		120	1T	35.0	117.000	0.0		
BFO	579.42	0.0034	1G	4.0	217.000	0.731		Vel = 3.72
BFO	0.0	7.981		0.0	8.000	51.721		
to		120		0.0	0.0	5.000		* Fixed loss = 5
BFI	579.42	0.0034		0.0	8.000	0.027		Vel = 3.72
BFI	0.0	7.981	1V	13.0	5.000	56.748		
to		120		0.0	13.000	0.0		
10	579.42	0.0033		0.0	18.000	0.060		Vel = 3.72
10	0.0	8.27	1E	28.468	7.000	56.808		
to		140		0.0	28.468	3.032		
UG1	579.42	0.0021		0.0	35.468	0.076		Vel = 3.46
UG1	0.0	7.98	2E	54.365	150.000	59.916		
to		150	1T	52.855	113.260	-3.032		
TEST	579.42	0.0022	1G	6.041	263.260	0.587		Vel = 3.72
	150.00							Qa = 150.00
	729.42					57.471		K Factor = 96.22

. . . Fire Protection by Computer Design

REBEL FIRE PROTECTION INC.
6730 WEST HORSESHOE ROAD
MORGANTOWN, INDIANA
317-416-8786

Job Name	:	NEUROSCIENCES RESEARCH BUILDING
Building	:	PENTHOUSE
Location	:	320 WEST 15TH STREET - INDIANAPOLIS, INDIANA
System	:	PENTHOUSE
Contract	:	
Data File	:	NEURO PENTHOUSE.WXF

Hydraulic Design Information Sheet

Name - NEUROSCIENCES RESEARCH BUILDING
Date - 1-13-13
Location - 320 WEST 15TH STREET - INDIANAPOLIS, INDIANA
Building - PENTHOUSE
System No. - PENTHOUSE
Contractor - REBEL FIRE PROTECTION, INC.
Contract No. -
Calculated By -
Drawing No. - FP7
Construction: ( ) Combustible (XX) Non-Combustible
Ceiling Height - VARIES
Occupancy - ORDINARY HAZARD .20/1500

SYSTEM

(X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.
( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve
Other
Specific Ruling Made By Date

DESIGN

Area of Sprinkler Operation	- 1500 SQFT	System Type	Sprinkler/Nozzle
Density	- .20	(X) Wet	Make TYCO
Area Per Sprinkler	- 100	( ) Dry	Model SEE LEGEND
Elevation at Highest Outlet	- 97'	( ) Deluge	Size SEE LEGEND
Hose Allowance - Inside	- 100	( ) Preaction	K-Factor 5.6
Rack Sprinkler Allowance	-	( )	Temp.Rat.175
Hose Allowance - Outside	- 150		

Note

Calculation Summary: Flow Required - 466.65 Press Required - 100.431
C-Factor Used: 120 Overhead 150 Underground

WATER SUPPLY

Water Flow Test:		Pump Data:		Tank or Reservoir:	
Date of Test	-			Cap.	-
Time of Test	-	Rated Cap.	- 1000	Elev.	-
Static Press	- 59 PSI	@ Press	- 115		
Residual Press	- 56 PSI	Elev.	-	Well Proof Flow	
Flow	- 1050				
Elevation	- 2				

Location - AT SITE

Source of Information - LOCAL WATER AUTHORITY

COMMODITY STORAGE

Commodity Class Location
Storage Ht. Area Aisle W.
Storage Method: Solid Piled % Palletized % Rack

( ) Single Row ( ) Conven. Pallet ( ) Auto. Storage ( ) Encap.
( ) Double Row ( ) Slave Pallet ( ) Solid Shelf ( ) Non
( ) Mult. Row ( ) Open Shelf

RACK

Flue Spacing Clearance:Storage to Ceiling
Longitudinal Transverse

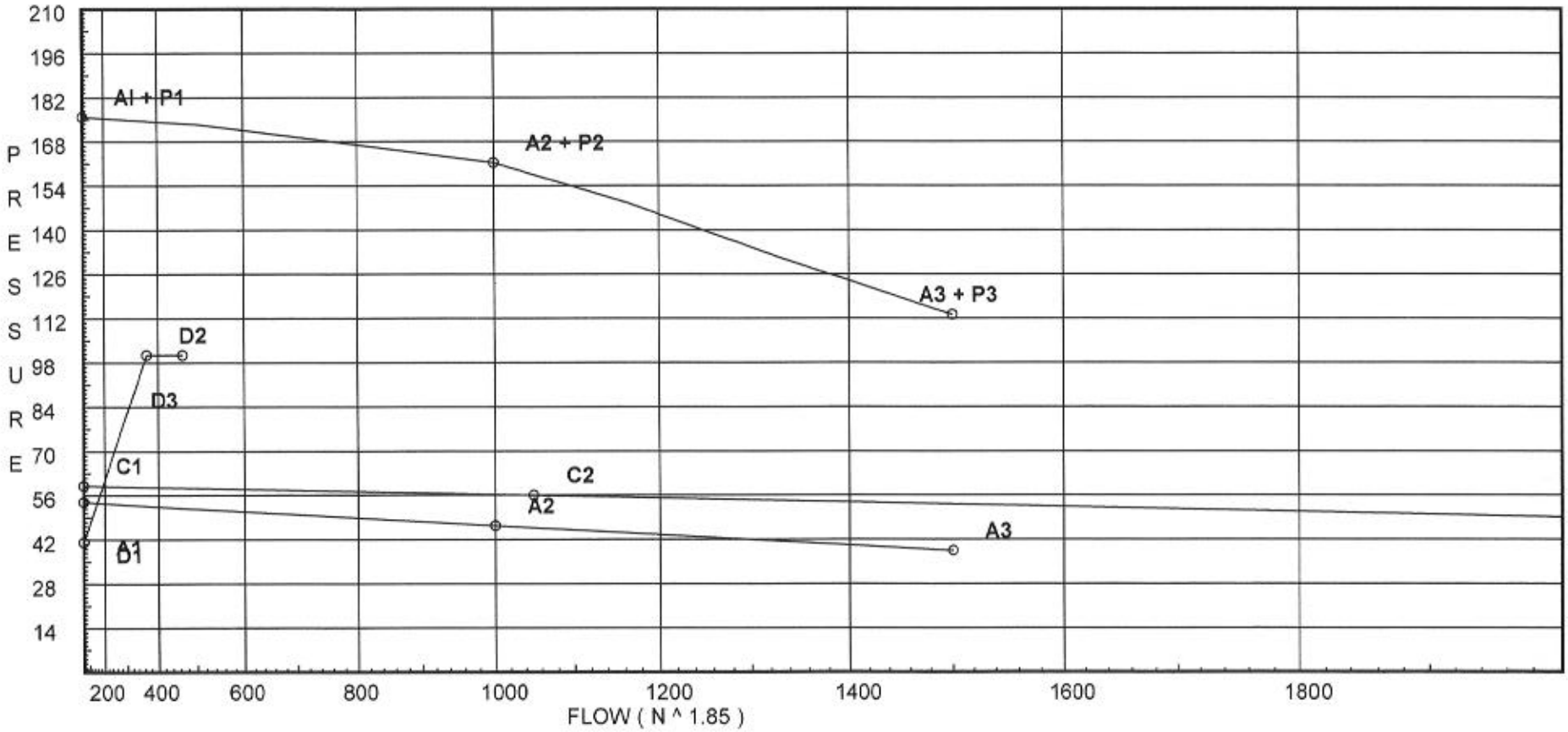
Horizontal Barriers Provided:

City Water Supply:
- C1 - Static Pressure : 59
- C2 - Residual Pressure: 56
- C2 - Residual Flow : 1050

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow
- A1 - Adjusted Static: 53.917
- A2 - Adj Resid : 46.387 @ 1000
- A3 - Adj Resid : 38.475 @ 1500

Pump Data:
- P1 - Pump Churn Pressure : 121.9
- P2 - Pump Rated Pressure : 115
- P2 - Pump Rated Flow : 1000
- P3 - Pump Pressure @ Max Flow : 74.75
- P3 - Pump Max Flow : 1500
- City Residual Flow @ 0 = 5254.16
- City Residual Flow @ 20 = 4200.69
- City Water @ 150% of Pump = 53.20

Demand:
- D1 - Elevation : 41.144
- D2 - System Flow : 366.651
- D2 - System Pressure : 100.431
- Hose (Adj City) : 150
- Hose (Demand) : 100
- D3 - System Demand : 466.651
- Safety Margin : 73.347



Fittings Used Summary

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

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	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	0	0	0	0	0
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	0	0	0	0	0	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
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
X	90'Tee-BranchFirelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	0	0	0	0	0	0	0

Pressure / Flow Summary - STANDARD

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
15	10.0		96.7	na				
20	10.0		95.97	na				
60	95.0		58.42	na	100.0			
30	95.0		41.32	na				
32	95.0		36.92	na				
33	95.0		35.4	na				
34	95.0		34.73	na				
40	95.0		17.92	na				
41	95.0		17.78	na				
42	95.0		17.34	na				
43	95.0		16.5	na				
44	95.0		16.13	na				
31	95.0		40.74	na				
80	95.0		33.91	na				
101	95.0		16.21	na				
102	95.0		15.33	na				
103	95.0		15.0	na				
104	95.0		14.96	na				
105	95.0		15.01	na				
106	95.0		15.27	na				
107	95.0		15.87	na				
108	95.0		15.0	na				
109	95.0		14.67	na				
110	95.0		14.63	na				
111	95.0		14.68	na				
112	95.0		14.93	na				
35	95.0		34.54	na				
113	95.0		15.77	na				
114	95.0		14.9	na				
115	95.0		14.58	na				
116	95.0		14.54	na				
117	95.0		14.59	na				
118	95.0		14.84	na				
S1	97.0	5.6	14.33	na	21.2	0.2	100	12.76
S2	97.0	5.6	13.5	na	20.58	0.2	100	12.76
S3	97.0	5.6	13.19	na	20.34	0.2	100	12.76
S4	97.0	5.6	13.15	na	20.31	0.2	100	12.76
S5	97.0	5.6	13.2	na	20.35	0.2	100	12.76
S6	97.0	5.6	13.45	na	20.54	0.2	100	12.76
S7	97.0	5.6	14.01	na	20.96	0.2	100	12.76
S8	97.0	5.6	13.19	na	20.34	0.2	100	12.76
S9	97.0	5.6	12.88	na	20.1	0.2	100	12.76
S10	97.0	5.6	12.85	na	20.07	0.2	100	12.76
S11	97.0	5.6	12.9	na	20.11	0.2	100	12.76
S12	97.0	5.6	13.13	na	20.29	0.2	100	12.76
S13	97.0	5.6	13.92	na	20.89	0.2	100	12.76
S14	97.0	5.6	13.1	na	20.27	0.2	100	12.76
S15	97.0	5.6	12.8	na	20.03	0.2	100	12.76
S16	97.0	5.6	12.76	na	20.0	0.2	100	12.76
S17	97.0	5.6	12.81	na	20.04	0.2	100	12.76
S18	97.0	5.6	13.04	na	20.22	0.2	100	12.76
PMPO	2.0		100.43	na				
PMPI	2.0		51.89	na				
BFO	2.0		52.38	na				
BFI	2.0		57.39	na				
10	2.0		57.44	na				
UG1	-5.0		60.52	na				
TEST	2.0		57.88	na	150.0			

The maximum velocity is 24.57 and it occurs in the pipe between nodes 60 and 30

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
15	-466.65	6.065	2V	20.0	30.000	96.696		
to		120	1X	25.0	55.000	0.0		
20	-466.65	-0.0086	1B	10.0	85.000	-0.730		Vel = 5.18
20	0.0	6.065		0.0	85.000	95.966		
to		120		0.0	0.0	-36.814		
60	-466.65	-0.0086		0.0	85.000	-0.730		Vel = 5.18
60	100.00	2.469	1X	10.8	17.000	58.422		Qa = 100
to		120	1B	7.0	22.100	0.0		
30	-366.65	-0.4375	1V	4.3	39.100	-17.105		Vel = 24.57
30	265.30	2.469	1X	10.8	3.500	41.317		
to		120		0.0	10.800	0.0		
31	-101.35	-0.0405		0.0	14.300	-0.579		Vel = 6.79
	0.0							
	-101.35					40.738		K Factor = -15.88
30	-265.30	2.469	1X	10.8	7.500	41.317		
to		120		0.0	10.800	0.0		
32	-265.3	-0.2404		0.0	18.300	-4.399		Vel = 17.78
32	52.82	2.469		0.0	9.500	36.918		
to		120		0.0	0.0	0.0		
33	-212.48	-0.1595		0.0	9.500	-1.515		Vel = 14.24
33	71.33	2.469		0.0	9.000	35.403		
to		120		0.0	0.0	0.0		
34	-141.15	-0.0749		0.0	9.000	-0.674		Vel = 9.46
34	70.67	2.469		0.0	9.250	34.729		
to		120		0.0	0.0	0.0		
35	-70.48	-0.0206		0.0	9.250	-0.191		Vel = 4.72
	0.0							
	-70.48					34.538		K Factor = -11.99
40	-50.87	2.469		0.0	12.000	17.920		
to		120		0.0	0.0	0.0		
41	-50.87	-0.0113		0.0	12.000	-0.136		Vel = 3.41
41	-50.48	2.469		0.0	11.000	17.784		
to		120		0.0	0.0	0.0		
42	-101.35	-0.0405		0.0	11.000	-0.446		Vel = 6.79
42	-52.82	2.469		0.0	9.500	17.338		
to		120		0.0	0.0	0.0		
43	-154.17	-0.0881		0.0	9.500	-0.837		Vel = 10.33
43	51.98	2.469		0.0	9.000	16.501		
to		120		0.0	0.0	0.0		
44	-102.19	-0.0411		0.0	9.000	-0.370		Vel = 6.85
44	51.20	2.469		0.0	9.250	16.131		
to		120		0.0	0.0	41.144		
45	-50.99	-0.0114		0.0	9.250	-0.105		Vel = 3.42
	0.0							
	-50.99					57.170		K Factor = -6.74
31	-101.35	1.61	1T	8.0	13.000	40.738		
to		120		0.0	8.000	0.0		
80	-101.35	-0.3252		0.0	21.000	-6.830		Vel = 15.97

Hyd. Ref. Point	Qa / Qt	Dia. "C" / Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt / Pe / Pf	Pt / Pv / Pn	******* Notes ******
80	50.48	1.61	2T	16.0	156.000	33.908		
to		120	1E	4.0	20.000	0.0		
40	-50.87	-0.0908		0.0	176.000	-15.988		Vel = 8.02
	0.0							
	-50.87					17.920		K Factor = -12.02
80	-50.48	1.61	3E	12.0	152.000	33.908		
to		120	2T	16.0	28.000	0.0		
41	-50.48	-0.0896		0.0	180.000	-16.124		Vel = 7.96
	0.0							
	-50.48					17.784		K Factor = -11.97
32	-52.82	1.61	2T	16.0	169.000	36.918		
to		120	4E	16.0	32.000	0.0		
42	-52.82	-0.0974		0.0	201.000	-19.580		Vel = 8.32
	0.0							
	-52.82					17.338		K Factor = -12.69
33	-71.33	1.61	1T	8.0	105.000	35.403		
to		120		0.0	8.000	0.0		
101	-71.33	-0.1698		0.0	113.000	-19.191		Vel = 11.24
101	21.20	1.61		0.0	10.000	16.212		
to		120		0.0	0.0	0.0		
102	-50.13	-0.0884		0.0	10.000	-0.884		Vel = 7.90
102	20.57	1.61		0.0	10.000	15.328		
to		120		0.0	0.0	0.0		
103	-29.56	-0.0333		0.0	10.000	-0.333		Vel = 4.66
103	20.34	1.61		0.0	10.000	14.995		
to		120		0.0	0.0	0.0		
104	-9.22	-0.0038		0.0	10.000	-0.038		Vel = 1.45
104	20.31	1.61		0.0	10.000	14.957		
to		120		0.0	0.0	0.0		
105	11.09	0.0054		0.0	10.000	0.054		Vel = 1.75
105	20.35	1.61		0.0	7.000	15.011		
to		120		0.0	0.0	0.0		
106	31.44	0.0373		0.0	7.000	0.261		Vel = 4.95
106	20.54	1.61	1T	8.0	5.000	15.272		
to		120		0.0	8.000	0.0		
43	51.98	0.0945		0.0	13.000	1.229		Vel = 8.19
	0.0							
	51.98					16.501		K Factor = 12.80
34	-70.67	1.61	1T	8.0	105.000	34.729		
to		120		0.0	8.000	0.0		
107	-70.67	-0.1669		0.0	113.000	-18.861		Vel = 11.14
107	20.96	1.61		0.0	10.000	15.868		
to		120		0.0	0.0	0.0		
108	-49.71	-0.0870		0.0	10.000	-0.870		Vel = 7.83
108	20.34	1.61		0.0	10.000	14.998		
to		120		0.0	0.0	0.0		
109	-29.37	-0.0329		0.0	10.000	-0.329		Vel = 4.63

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
109	20.10	1.61		0.0	10.000	14.669		
to		120		0.0	0.0	0.0		
110	-9.27	-0.0039		0.0	10.000	-0.039		Vel = 1.46
110	20.07	1.61		0.0	10.000	14.630		
to		120		0.0	0.0	0.0		
111	10.8	0.0052		0.0	10.000	0.052		Vel = 1.70
111	20.11	1.61		0.0	7.000	14.682		
to		120		0.0	0.0	0.0		
112	30.91	0.0361		0.0	7.000	0.253		Vel = 4.87
112	20.30	1.61	1T	8.0	5.000	14.935		
to		120		0.0	8.000	0.0		
44	51.21	0.0920		0.0	13.000	1.196		Vel = 8.07
	0.0							
	51.21					16.131		K Factor = 12.75
35	-70.48	1.61	1T	8.0	105.000	34.538		
to		120		0.0	8.000	0.0		
113	-70.48	-0.1661		0.0	113.000	-18.767		Vel = 11.11
113	20.89	1.61		0.0	10.000	15.771		
to		120		0.0	0.0	0.0		
114	-49.59	-0.0867		0.0	10.000	-0.867		Vel = 7.82
114	20.27	1.61		0.0	10.000	14.904		
to		120		0.0	0.0	0.0		
115	-29.32	-0.0328		0.0	10.000	-0.328		Vel = 4.62
115	20.04	1.61		0.0	10.000	14.576		
to		120		0.0	0.0	0.0		
116	-9.28	-0.0039		0.0	10.000	-0.039		Vel = 1.46
116	20.00	1.61		0.0	10.000	14.537		
to		120		0.0	0.0	0.0		
117	10.72	0.0051		0.0	10.000	0.051		Vel = 1.69
117	20.04	1.61		0.0	7.000	14.588		
to		120		0.0	0.0	0.0		
118	30.76	0.0359		0.0	7.000	0.251		Vel = 4.85
118	20.23	1.61	1T	8.0	5.000	14.839		
to		120		0.0	8.000	41.144		
45	50.99	0.0913		0.0	13.000	1.187		Vel = 8.04
	0.0							
	50.99					57.170		K Factor = 6.74
S1	21.20	1.049	1T	5.0	2.000	14.332		K Factor = 5.60
to		120		0.0	5.000	0.866		
101	21.2	0.1449		0.0	7.000	1.014		Vel = 7.87
	0.0							
	21.20					16.212		K Factor = 5.27
S2	20.58	1.049	1T	5.0	2.000	13.502		K Factor = 5.60
to		120		0.0	5.000	0.866		
102	20.58	0.1371		0.0	7.000	0.960		Vel = 7.64
	0.0							
	20.58					15.328		K Factor = 5.26
S3	20.34	1.049	1T	5.0	2.000	13.189		K Factor = 5.60
to		120		0.0	5.000	0.866		
103	20.34	0.1343		0.0	7.000	0.940		Vel = 7.55

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							
	20.34					14.995		K Factor = 5.25
S4	20.31	1.049	1T	5.0	2.000	13.153		K Factor = 5.60
to		120		0.0	5.000	0.866		
104	20.31	0.1340		0.0	7.000	0.938		Vel = 7.54
	0.0							
	20.31					14.957		K Factor = 5.25
S5	20.35	1.049	1T	5.0	2.000	13.204		K Factor = 5.60
to		120		0.0	5.000	0.866		
105	20.35	0.1344		0.0	7.000	0.941		Vel = 7.55
	0.0							
	20.35					15.011		K Factor = 5.25
S6	20.54	1.049	1T	5.0	2.000	13.449		K Factor = 5.60
to		120		0.0	5.000	0.866		
106	20.54	0.1367		0.0	7.000	0.957		Vel = 7.62
	0.0							
	20.54					15.272		K Factor = 5.26
S7	20.96	1.049	1T	5.0	2.000	14.009		K Factor = 5.60
to		120		0.0	5.000	0.866		
107	20.96	0.1419		0.0	7.000	0.993		Vel = 7.78
	0.0							
	20.96					15.868		K Factor = 5.26
S8	20.34	1.049	1T	5.0	2.000	13.192		K Factor = 5.60
to		120		0.0	5.000	0.866		
108	20.34	0.1343		0.0	7.000	0.940		Vel = 7.55
	0.0							
	20.34					14.998		K Factor = 5.25
S9	20.10	1.049	1T	5.0	2.000	12.884		K Factor = 5.60
to		120		0.0	5.000	0.866		
109	20.1	0.1313		0.0	7.000	0.919		Vel = 7.46
	0.0							
	20.10					14.669		K Factor = 5.25
S10	20.07	1.049	1T	5.0	2.000	12.847		K Factor = 5.60
to		120		0.0	5.000	0.866		
110	20.07	0.1310		0.0	7.000	0.917		Vel = 7.45
	0.0							
	20.07					14.630		K Factor = 5.25
S11	20.11	1.049	1T	5.0	2.000	12.896		K Factor = 5.60
to		120		0.0	5.000	0.866		
111	20.11	0.1314		0.0	7.000	0.920		Vel = 7.47
	0.0							
	20.11					14.682		K Factor = 5.25
S12	20.29	1.049	1T	5.0	2.000	13.133		K Factor = 5.60
to		120		0.0	5.000	0.866		
112	20.29	0.1337		0.0	7.000	0.936		Vel = 7.53
	0.0							
	20.29					14.935		K Factor = 5.25

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
S13	20.89	1.049	1T	5.0	2.000	13.917		K Factor = 5.60
to		120		0.0	5.000	0.866		
113	20.89	0.1411		0.0	7.000	0.988		Vel = 7.75
	0.0							
	20.89					15.771		K Factor = 5.26
S14	20.27	1.049	1T	5.0	2.000	13.104		K Factor = 5.60
to		120		0.0	5.000	0.866		
114	20.27	0.1334		0.0	7.000	0.934		Vel = 7.52
	0.0							
	20.27					14.904		K Factor = 5.25
S15	20.03	1.049	1T	5.0	2.000	12.797		K Factor = 5.60
to		120		0.0	5.000	0.866		
115	20.03	0.1304		0.0	7.000	0.913		Vel = 7.44
	0.0							
	20.03					14.576		K Factor = 5.25
S16	20.00	1.049	1T	5.0	2.000	12.760		K Factor = 5.60
to		120		0.0	5.000	0.866		
116	20.0	0.1301		0.0	7.000	0.911		Vel = 7.42
	0.0							
	20.00					14.537		K Factor = 5.25
S17	20.04	1.049	1T	5.0	2.000	12.808		K Factor = 5.60
to		120		0.0	5.000	0.866		
117	20.04	0.1306		0.0	7.000	0.914		Vel = 7.44
	0.0							
	20.04					14.588		K Factor = 5.25
S18	20.22	1.049	1T	5.0	2.000	13.043		K Factor = 5.60
to		120		0.0	5.000	0.866		
118	20.22	0.1329		0.0	7.000	0.930		Vel = 7.51
	0.0							
	20.22					14.839		K Factor = 5.25
15	466.65	7.981	4V	52.0	35.000	96.696		
to		120	1X	33.0	85.000	3.465		
PMPO	466.65	0.0023		0.0	120.000	0.270		Vel = 2.99
	0.0							
	466.65					100.431		K Factor = 46.56
System Demand Pressure						100.431		
Safety Margin						73.347		
Continuation Pressure						173.778		
Pressure @ Pump Outlet						173.778		
Pressure From Pump Curve						-121.891		
Pressure @ Pump Inlet						51.887		
PMPI	0.0	7.981	6V	78.0	100.000	51.887		
to		120	1T	35.0	117.000	0.0		
BFO	466.65	0.0023	1G	4.0	217.000	0.490		Vel = 2.99
BFO	0.0	7.981		0.0	8.000	52.377		
to		120		0.0	0.0	5.000		* Fixed loss = 5
BFI	466.65	0.0022		0.0	8.000	0.018		Vel = 2.99

REBEL FIRE PROTECTION INC.
NEUROSCIENCES RESEARCH BUILDING

Hyd. Ref. Point	Qa / Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
BFI	0.0	7.981	1V	13.0	5.000	57.395		
to		120		0.0	13.000	0.0		
10	466.65	0.0022		0.0	18.000	0.040		Vel = 2.99
10	0.0	8.27	1E	28.468	7.000	57.435		
to		140		0.0	28.468	3.032		
UG1	466.65	0.0014		0.0	35.468	0.051		Vel = 2.79
UG1	0.0	7.98	2E	54.365	150.000	60.518		
to		150	1T	52.855	113.260	-3.032		
TEST	466.65	0.0015	1G	6.041	263.260	0.393		Vel = 2.99
	150.00							Qa = 150.00
	616.65					57.879		K Factor = 81.05