Hydraulic Summary

Job Number: S1ST-52
Report Description: Residential (#1)

Job

Job Number: S1ST-52	Design Engineer: Crown Fire System Design
Job Name: Mercantile Library Building	State Certification/License Number:
Address 1: 414 Walnut Street	AHJ:
Address 2: Cincinnati, OH 45202	Job Site/Building:
Address 3:	Drawing Name: Library Bldg

System

Most Demanding Sprinkler Data: 4.2 K-Factor 12.19 at 8.426

Hose Allowance At Source: 100.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 100.00

System Flow Demand	Total Water Required (Including Hose Allowance)
133.77	233.77

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 28.12 between nodes 304 and 318

Maximum Velocity Under Ground:

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
1476.15gal	

Remote Area(s)

Occupancy	Job Suffix
Residential	

Density	Area of Application
0.10gpm/ft²	900ft² (Actual 911ft²)

Number Of Sprinklers Calculated	Number Of Nozzles Calculated	Coverage Per Sprinkler
9	0	122ft²

AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area

Supplies

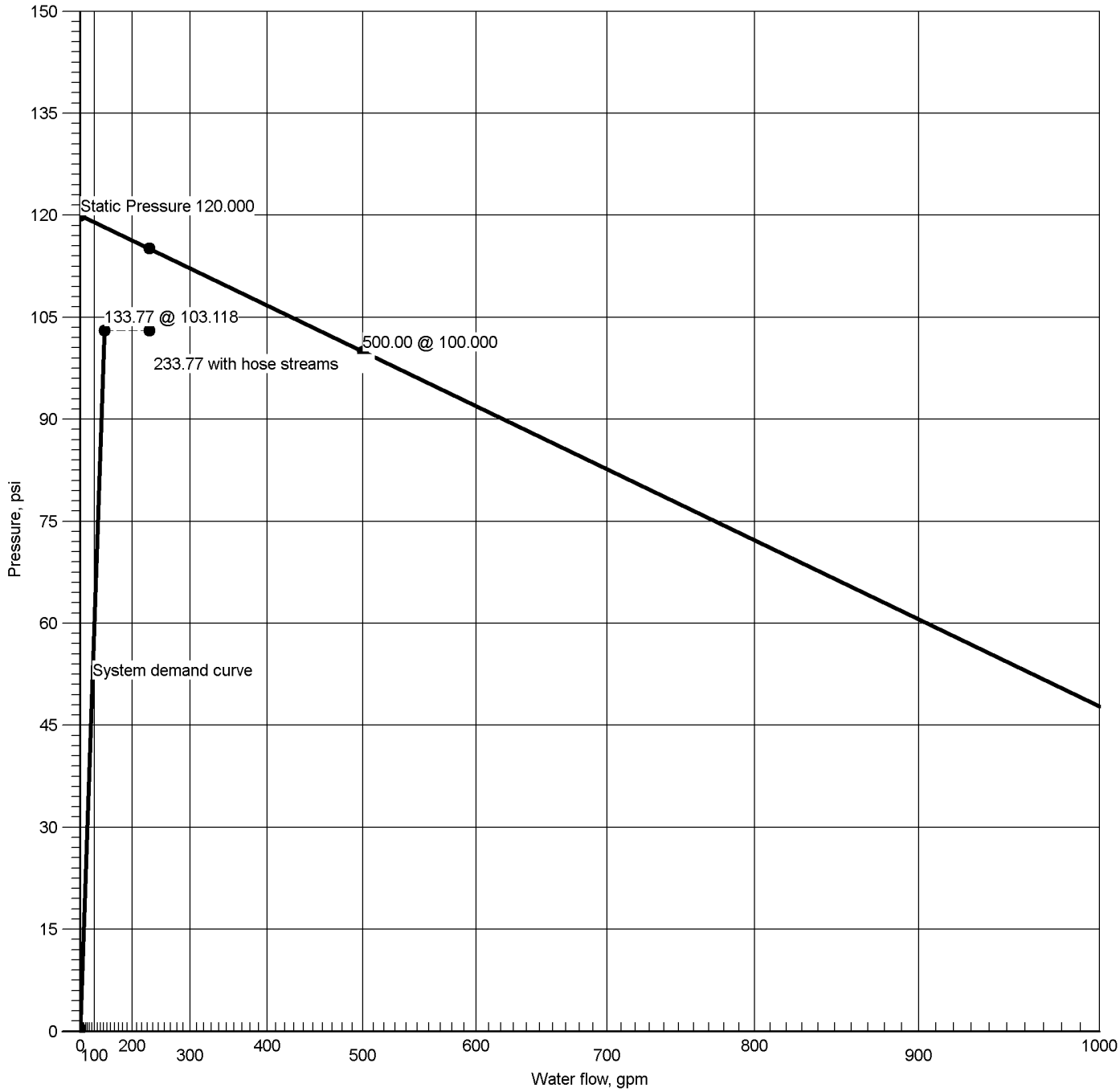
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
3	Water Supply	100.00	120.000	100.000		500.00	119.867		100.00	103.118	16.748

Pumps: Static = Churn (Pressure @ Zero Flow)

Contractor

	Contractor Number: S1ST	Contact Name: Guss Cox	Contact Title: VP Operations
Name of Contractor: Safety First Fire Protection		Phone: 859-291-1585	Extension:
Address 1: PO Box 530		FAX: 859-291-4111	
Address 2: Independence, KY 41051		E-mail: guss@safety1stfire.com	
Address 3:		Web-Site:	

Water Supply at Node 3



Hydraulic Graph	Water Supply at Node 3
Static: Pressure	120.000
Residual: Pressure	100.000 @ 500.00
Available Pressure at Time of Test	119.867 @ 100.00
System Demand	103.118 @ 0.00
System Demand (Including Hose Allowance at Source)	103.118 @ 100.00

Summary Of Outflowing Devices

Job Number: S1ST-52
Report Description: Residential (#1)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**959**	**12.19**	**12.19**	**4.2**	**8.426**		
Sprinkler	1050	12.38	12.00	4.2	8.692		
Sprinkler	1051	14.59	12.00	4.2	12.072		
Sprinkler	1052	15.89	12.00	4.2	14.305		
Sprinkler	1059	12.82	12.19	4.2	9.313		
Sprinkler	1060	14.30	12.19	4.2	11.590		
Sprinkler	1061	18.44	16.00	4.2	19.283		
Sprinkler	1062	16.36	12.19	4.2	15.169		

Most Demanding Sprinkler Data

Node Analysis

Job Number: S1ST-52
Report Description: Residential (#1)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
4	0'-6	S	100.619	133.77	
959	9'-10	Spr(-8.426)	8.426	12.19	
1050	9'-10	Spr(-8.692)	8.692	12.38	
1051	9'-10	Spr(-12.072)	12.072	14.59	
1052	9'-10	Spr(-14.305)	14.305	15.89	
1059	8'-7	Spr(-9.313)	9.313	12.82	
1060	8'-7	Spr(-11.590)	11.590	14.30	
1061	9'-10	Spr(-19.283)	19.283	18.44	
1062	8'-7	Spr(-15.169)	15.169	16.36	
1067	8'-2	Spr(-16.004)	16.004	16.80	
41	8'-10	T(5'-0), Tr(1'-0)	9.511		
42	8'-10	T(5'-0), Tr(1'-0)	9.660		
43	8'-10	T(5'-0), Tr(1'-0)	12.041		
44	8'-10	T(5'-0), Tr(1'-0)	13.027		
66	8'-10	T(5'-0), Tr(1'-0)	15.749		
148	8'-10	T(5'-0), Tr(1'-0)	16.389		
167	8'-10	T(6'-0), Tr(1'-0)	17.261		
168	8'-10	T(5'-0), Tr(1'-0)	20.758		
266	6'-0	PO(10'-0)	98.208		
297	8'-5	T(8'-0)	93.181		
304	8'-5	T(5'-0), Tr(1'-0)	85.242		
318	8'-5	b(1'-0)	82.482		
429	7'-0½	cplg(0'-10)	95.886		
434	8'-5	E(11'-0)	94.765		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •								
DR	1.1010	12.19	4.11	150		0.027232	10'-11	Pf 0.651
959	9'-10	12.19	4.2	8.426		Sprinkler,	13'-0	Pe 0.434
41	8'-10			9.511		E(7'-0), T(5'-0), Tr(1'-0)	23'-11	Pv
BL	1.1010	24.57	8.28	150		0.099597	0'-6	Pf 0.149
41	8'-10	12.38		9.511		Flow (q) from Route 2	1'-0	Pe
42	8'-10			9.660		Tr(1'-0)	1'-6	Pv
BL	1.1010	37.39	12.60	150		0.216516	10'-0	Pf 2.381
42	8'-10	12.82		9.660		Flow (q) from Route 3	1'-0	Pe
43	8'-10			12.041		Tr(1'-0)	11'-0	Pv
BL	1.1010	51.69	17.42	150		0.394155	1'-6	Pf 0.986
43	8'-10	14.30		12.041		Flow (q) from Route 4	1'-0	Pe
44	8'-10			13.027		Tr(1'-0)	2'-6	Pv
BL	1.5980	66.28	10.60	150		0.101751	22'-7½	Pf 4.234
44	8'-10	14.59		13.027		Flow (q) from Route 5	19'-0	Pe
167	8'-10			17.261		2E(9'-0), Tr(1'-0)	41'-7½	Pv
BL	1.5980	115.33	18.45	150		0.283484	11'-4	Pf 3.497
167	8'-10	49.05		17.261		Flow (q) from Route 7	1'-0	Pe
168	8'-10			20.758		Tr(1'-0)	12'-4	Pv
BL	1.5980	133.77	21.40	150		0.373009	111'-0	Pf 61.544
168	8'-10	18.44		20.758		Flow (q) from Route 6	54'-0	Pe 0.181
318	8'-5			82.482		4E(9'-0), 9Tr(1'-0), C(8'-0), b(1'-0)	165'-0	Pv
BL	1.3940	133.77	28.12	150		0.725401	2'-9½	Pf 2.760
318	8'-5			82.482			1'-0	Pe
304	8'-5			85.242		Tr(1'-0)	3'-9½	Pv
BL	1.5980	133.77	21.40	150		0.373009	3'-3½	Pf 7.938
304	8'-5			85.242			18'-0	Pe
297	8'-5			93.181		Tr(1'-0), E(9'-0), T(8'-0)	21'-3½	Pv
CM	2.0030	133.77	13.62	150		0.124151	0'-9	Pf 1.584
297	8'-5			93.181			12'-0	Pe -0.000
434	8'-5			94.765		cplg(1'-0), E(11'-0)	12'-9	Pv
FR	1.9850	133.77	13.87	120		0.196032	1'-1	Pf 0.534
434	8'-5			94.765			1'-7½	Pe 0.587
429	7'-0½			95.886		2cplg(0'-10), 2f(-0.000)	2'-8½	Pv
CM	2.0670	133.77	12.79	120		0.160958	1'-6½	Pf 1.861
429	7'-0½			95.886			10'-0	Pe 0.461
266	6'-0			98.208		PRV, PO(10'-0)	11'-6½	Pv
FM	4.2600	133.77	3.01	120		0.004756	5'-6	Pf 0.026
266	6'-0			98.208				Pe 2.384
4	0'-6			100.619		S	5'-6	Pv
		100.00				Hose Allowance At Source		
4		233.77						
• • • • • Route 2 • • • • •								
DR	1.1010	12.38	4.17	150		0.028025	1'-9	Pf 0.385
1050	9'-10	12.38	4.2	8.692		Sprinkler,	12'-0	Pe 0.434
41	8'-10			9.511		E(7'-0), T(5'-0)	13'-9	Pv
• • • • • Route 3 • • • • •								
DR	1.1010	12.82	4.32	150		0.029874	3'-6½	Pf 0.464
1059	8'-7	12.82	4.2	9.313		Sprinkler,	12'-0	Pe -0.117
42	8'-10			9.660		E(7'-0), T(5'-0)	15'-6½	Pv
• • • • • Route 4 • • • • •								
DR	1.1010	14.30	4.82	150		0.036573	3'-6½	Pf 0.568
1060	8'-7	14.30	4.2	11.590		Sprinkler,	12'-0	Pe -0.117
43	8'-10			12.041		E(7'-0), T(5'-0)	15'-6½	Pv
• • • • • Route 5 • • • • •								
DR	1.1010	14.59	4.92	150		0.037976	1'-9	Pf 0.522
1051	9'-10	14.59	4.2	12.072		Sprinkler,	12'-0	Pe 0.434
44	8'-10			13.027		E(7'-0), T(5'-0)	13'-9	Pv
• • • • • Route 6 • • • • •								
DR	1.1010	18.44	6.22	150		0.058567	5'-9½	Pf 1.042
1061	9'-10	18.44	4.2	19.283		Sprinkler,	12'-0	Pe 0.434
168	8'-10			20.758		E(7'-0), T(5'-0)	17'-9½	Pv
• • • • • Route 7 • • • • •								
SP	1.1010	15.89	5.35	150		0.044432	7'-9	Pf 1.011
1052	9'-10	15.89	4.2	14.305		Sprinkler,	15'-0	Pe 0.434
66	8'-10			15.749		2E(7'-0), Tr(1'-0)	22'-9	Pv

Hydraulic Analysis

Job Number: S1ST-52
Report Description: Residential (#1)

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
BL	1.1010	32.24	10.87	150		0.164615	2'-10½	Pf 0.640
66	8'-10	16.36		15.749		Flow (q) from Route 8	1'-0	Pe
148	8'-10			16.389		Tr(1'-0)	3'-10½	Pv
BL	1.3940	49.05	10.31	150		0.113348	1'-8½	Pf 0.873
148	8'-10	16.80		16.389		Flow (q) from Route 9	6'-0	Pe
167	8'-10			17.261		T(6'-0)	7'-8½	Pv
• • • • • Route 8 • • • • •								
DR	1.1010	16.36	5.51	150		0.046910	2'-10½	Pf 0.697
1062	8'-7	16.36	4.2	15.169		Sprinkler,	12'-0	Pe -0.117
66	8'-10			15.749		E(7'-0), T(5'-0)	14'-10½	Pv
• • • • • Route 9 • • • • •								
DR	1.1010	16.80	5.66	150		0.049294	1'-8	Pf 0.674
1067	8'-2	16.80	4.2	16.004		Sprinkler,	12'-0	Pe -0.289
148	8'-10			16.389		E(7'-0), T(5'-0)	13'-8	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Hydraulic Summary

Job Number: S1ST-52
Report Description: Ordinary Group I (#2)

Job

Job Number: S1ST-52	Design Engineer: Crown Fire System Design
Job Name: Mercantile Library Building	State Certification/License Number:
Address 1: 414 Walnut Street	AHJ:
Address 2: Cincinnati, OH 45202	Job Site/Building:
Address 3:	Drawing Name: Library Bldg

System

Most Demanding Sprinkler Data: 5.6 K-Factor 18.00 at 10.332

Hose Allowance At Source: 250.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 250.00

System Flow Demand	Total Water Required (Including Hose Allowance)
183.03	433.03

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 16.07 between nodes 19 and 23

Maximum Velocity Under Ground:

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
1476.15gal	

Remote Area(s)

Occupancy	Job Suffix
Ordinary Group I	

Density	Area of Application
0.15gpm/ft²	1500ft² (Actual 922ft²)

Number Of Sprinklers Calculated	Number Of Nozzles Calculated	Coverage Per Sprinkler
9	0	120ft²

AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area: Right: 30.887

Supplies

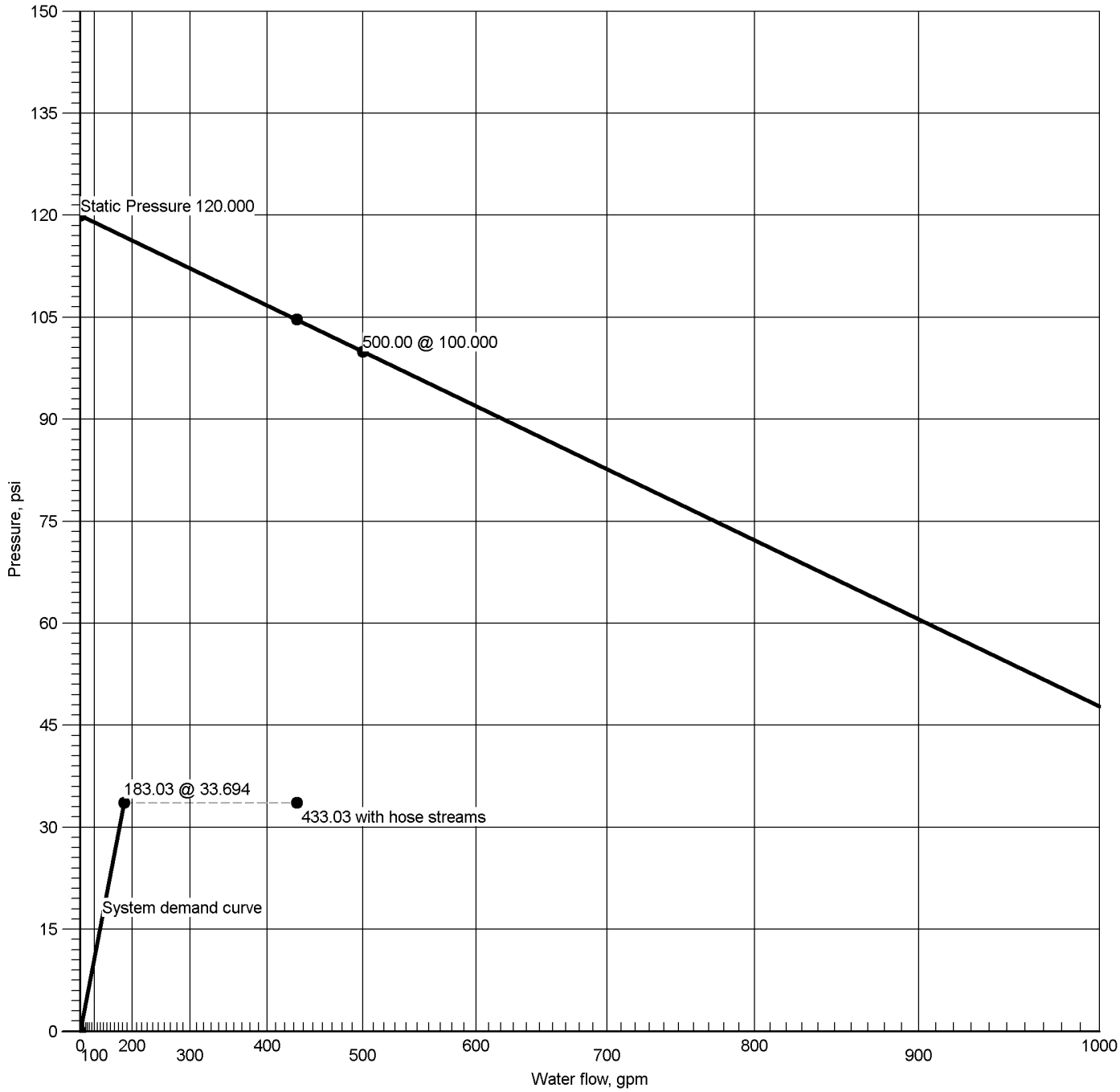
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
3	Water Supply	250.00	120.000	100.000		500.00	113.762		433.03	33.694	80.068

Pumps: Static = Churn (Pressure @ Zero Flow)

Contractor

	Contractor Number: S1ST	Contact Name: Guss Cox	Contact Title: VP Operations
Name of Contractor: Safety First Fire Protection		Phone: 859-291-1585	Extension:
Address 1: PO Box 530		FAX: 859-291-4111	
Address 2: Independence, KY 41051		E-mail: guss@safety1stfire.com	
Address 3:		Web-Site:	

Water Supply at Node 3



Hydraulic Graph	Water Supply at Node 3
Static: Pressure	120.000
Residual: Pressure	100.000 @ 500.00
Available Pressure at Time of Test	113.762 @ 433.03
System Demand	33.694 @ 183.03
System Demand (Including Hose Allowance at Source)	33.694 @ 433.03

Summary Of Outflowing Devices

Job Number: S1ST-52
Report Description: Ordinary Group I (#2)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	1007	23.90	18.00	5.6	18.214		
Sprinkler	1008	20.07	18.00	5.6	12.842		
Sprinkler	1009	18.93	18.00	5.6	11.431		
Sprinkler	1022	22.92	18.00	5.6	16.755		
Sprinkler	1023	19.23	18.00	5.6	11.792		
Sprinkler	1024	18.14	18.00	5.6	10.489		
Sprinkler	1040	22.76	18.00	5.6	16.511		
Sprinkler	1041	19.09	18.00	5.6	11.617		
⇨ **Sprinkler**	**1042**	**18.00**	**18.00**	**5.6**	**10.332**		

⇨ Most Demanding Sprinkler Data

Node Analysis

Job Number: S1ST-52
Report Description: Ordinary Group I (#2)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
3	8'-11	S	33.694	183.03	
1007	8'-5	Spr(-18.214)	18.214	23.90	
1008	8'-5	Spr(-12.842)	12.842	20.07	
1009	8'-5	Spr(-11.431)	11.431	18.93	
1022	8'-5	Spr(-16.755)	16.755	22.92	
1023	8'-5	Spr(-11.792)	11.792	19.23	
1024	8'-5	Spr(-10.489)	10.489	18.14	
1040	8'-5	Spr(-16.511)	16.511	22.76	
1041	8'-5	Spr(-11.617)	11.617	19.09	
1042	8'-5	Spr(-10.332)	10.332	18.00	
7	8'-5	PO(6'-0)	22.245		
19	8'-5	PO(12'-3½)	33.906		
23	8'-5	fT(12'-3½)	22.697		
26	8'-5	PO(6'-0)	20.483		
31	8'-5	PO(6'-0)	20.187		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •								
BL	1.0490	18.00	6.68	120		0.107085	12'-0	Pf 1.285
1042	8'-5	18.00	5.6	10.332		Sprinkler		Pe
1041	8'-5			11.617			12'-0	Pv
BL	1.0490	37.09	13.77	120		0.407876	12'-0	Pf 4.895
1041	8'-5	19.09	5.6	11.617		Sprinkler		Pe
1040	8'-5			16.511			12'-0	Pv
BL	1.3800	59.84	12.84	120		0.259955	8'-1½	Pf 3.676
1040	8'-5	22.76	5.6	16.511		Sprinkler,	6'-0	Pe
31	8'-5			20.187		PO(6'-0)	14'-1½	Pv
CM	2.1570	59.84	5.25	120		0.029530	10'-0	Pf 0.295
31	8'-5			20.187				Pe
26	8'-5			20.483			10'-0	Pv
CM	2.1570	120.13	10.55	120		0.107193	8'-4	Pf 2.214
26	8'-5	60.29		20.483		Flow (q) from Route 2	12'-3½	Pe
23	8'-5			22.697		fT(12'-3½)	20'-8	Pv
CM	2.1570	183.03	16.07	120		0.233601	35'-8	Pf 11.209
23	8'-5	62.90		22.697		Flow (q) from Route 3	12'-3½	Pe
19	8'-5			33.906		f(-0.000), PO(12'-3½)	48'-0	Pv
FM	4.2600	183.03	4.12	120		0.008494	0'-6	Pf 0.004
19	8'-5			33.906				Pe -0.217
3	8'-11			33.694		Water Supply	0'-6	Pv
		250.00				Hose Allowance At Source		
3		433.03						
• • • • • Route 2 • • • • •								
BL	1.0490	18.14	6.73	120		0.108594	12'-0	Pf 1.303
1024	8'-5	18.14	5.6	10.489		Sprinkler		Pe
1023	8'-5			11.792			12'-0	Pv
BL	1.0490	37.37	13.87	120		0.413598	12'-0	Pf 4.963
1023	8'-5	19.23	5.6	11.792		Sprinkler		Pe
1022	8'-5			16.755			12'-0	Pv
BL	1.3800	60.29	12.93	120		0.263567	8'-1½	Pf 3.727
1022	8'-5	22.92	5.6	16.755		Sprinkler,	6'-0	Pe
26	8'-5			20.483		PO(6'-0)	14'-1½	Pv
• • • • • Route 3 • • • • •								
BL	1.0490	18.93	7.03	120		0.117581	12'-0	Pf 1.411
1009	8'-5	18.93	5.6	11.431		Sprinkler		Pe
1008	8'-5			12.842			12'-0	Pv
BL	1.0490	39.00	14.48	120		0.447674	12'-0	Pf 5.372
1008	8'-5	20.07	5.6	12.842		Sprinkler		Pe
1007	8'-5			18.214			12'-0	Pv
BL	1.3800	62.90	13.49	120		0.285067	8'-1½	Pf 4.031
1007	8'-5	23.90	5.6	18.214		Sprinkler,	6'-0	Pe
7	8'-5			22.245		PO(6'-0)	14'-1½	Pv
CM	2.1570	62.90	5.52	120		0.032382	1'-8	Pf 0.452
7	8'-5			22.245			12'-3½	Pe
23	8'-5			22.697		fT(12'-3½)	13'-11½	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Hydraulic Summary

Job Number: S1ST-52
Report Description:

Job

Job Number: S1ST-52	Design Engineer: Crown Fire System Design
Job Name: Mercantile Library Building	State Certification/License Number:
Address 1: 414 Walnut Street	AHJ:
Address 2: Cincinnati, OH 45202	Job Site/Building:
Address 3:	Drawing Name: Library Bldg

System

Most Demanding Sprinkler Data: K-Factor at

Hose Allowance At Source: 0.00

Additional Hose Supplies

Node	Flow(gpm)
Hose At Node 86	250.00
Hose At Node 87	250.00

Total Hose Streams: 500.00

System Flow Demand: 512.48

Total Water Required (Including Hose Allowance): 512.48

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 22.24 between nodes 147 and 149

Maximum Velocity Under Ground: 3.29 between nodes 1 and 5

Volume capacity of Wet Pipes: 1476.15gal

Volume capacity of Dry Pipes:

Remote Area(s)

Occupancy: NA		Job Suffix: Manually Flowing
Density: NA		Area of Application: NA
Number Of Sprinklers Calculated: 0	Number Of Nozzles Calculated: 0	Coverage Per Sprinkler: NA

AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area

Supplies

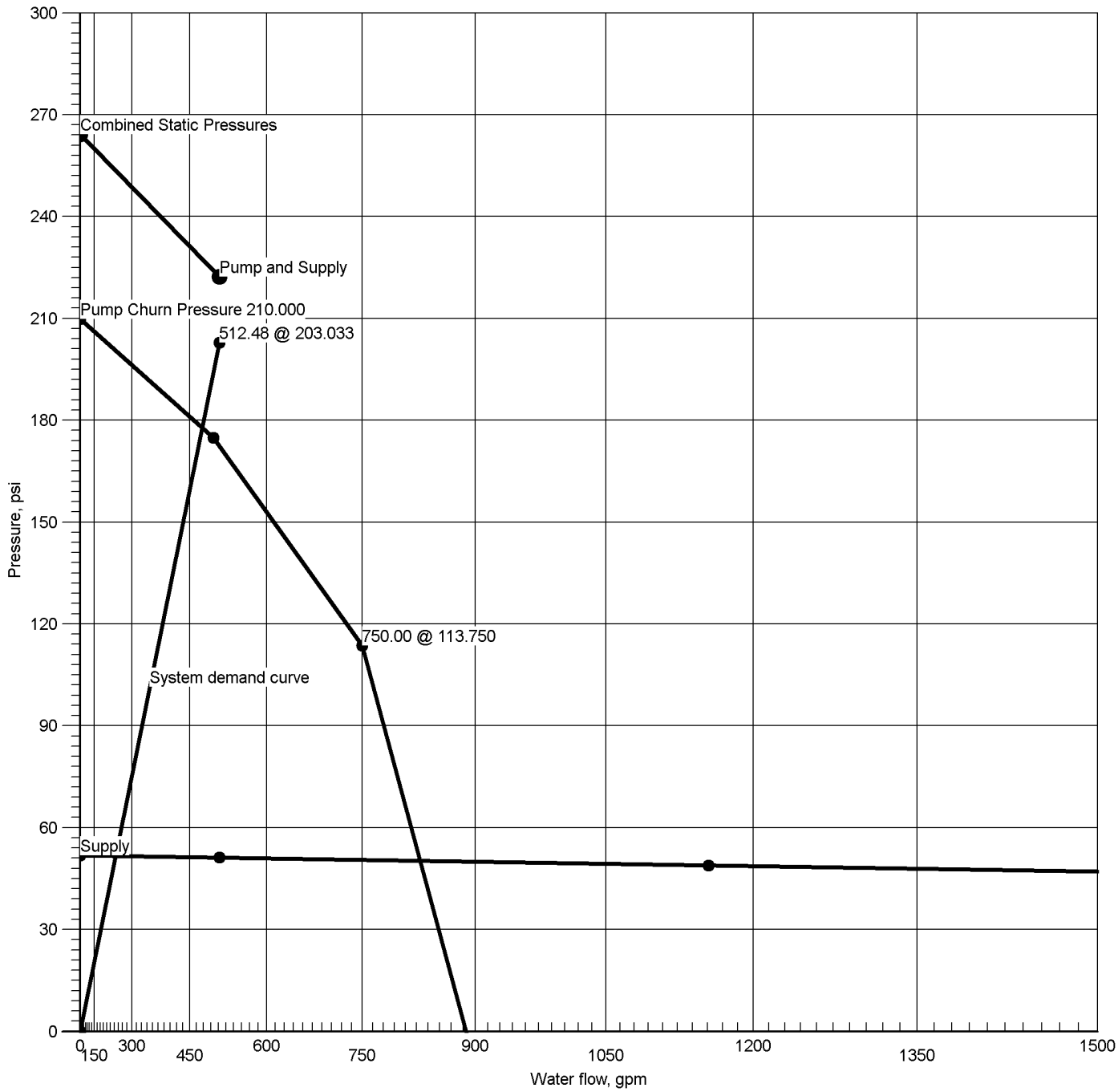
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
147	Pump		210.000	175.000		500.00	222.459		512.48	203.033	19.426

Pumps: Static = Churn (Pressure @ Zero Flow)

Contractor

	Contractor Number: S1ST	Contact Name: Guss Cox	Contact Title: VP Operations
Name of Contractor: Safety First Fire Protection		Phone: 859-291-1585	Extension:
Address 1: PO Box 530		FAX: 859-291-4111	
Address 2: Independence, KY 41051		E-mail: guss@safety1stfire.com	
Address 3:		Web-Site:	

Pump at Node 147



Hydraulic Graph	Static + Churn Pressure	Rated Pump Pressure
Pump at Node 147	264.475	175.000 @ 500.00
Static: Pressure	**Churn Pressure**	
52.000	210.000	
Residual: Pressure		
49.000 @ 512.48		
Available Pressure at Time of Test	**Available Pressure at Pump Discharge**	
51.334 @ 512.48	222.459 @ 512.48	
System Demand		
203.033 @ 512.48		

Summary Of Outflowing Devices

Job Number: S1ST-52
Report Description:

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Hose	86	262.48	250.00	25.65	104.715		
Hose	87	250.00	250.00	25	100.000		

Most Demanding Sprinkler Data

Node Analysis

Job Number: S1ST-52
Report Description:

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
1	-5'-11½	S	31.908	512.48	
86	154'-6	Hose(-104.715)(31'-0)	104.715	262.48	
87	167'-0	Hose(-100.000)(31'-0)	100.000	250.00	
5	-5'-11½		31.785		
63	154'-6	PO(12'-0)	115.086		
67	167'-0	PO(12'-0)	109.478		
145	-11'-8		30.591		
146	-11'-8	P1	30.591		
147	-11'-8	P2(-172.442)	203.033		
149	-11'-8		203.033		
333	-1'-10	LtE(7'-11)	197.105		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •								
CM	2.4690	250.00	16.75	120		0.215409	1'-0	Pf 9.478
87	167'-0	250.00		100.000		Hose(-100.000)(31'-0)	43'-0	Pe
67	167'-0			109.478		PO(12'-0)	44'-0	Pv
FR	4.2600	250.00	5.63	120		0.015122	12'-6	Pf 0.189
67	167'-0			109.478				Pe 5.419
63	154'-6			115.086			12'-6	Pv
FR	4.2600	512.48	11.54	120		0.057059	194'-4	Pf 14.245
63	154'-6	262.48		115.086		Flow (q) from Route 2	55'-3½	Pe 67.775
333	-1'-10			197.105		7LtE(7'-11)	249'-7½	Pv
CM	6.3570	512.48	5.18	120		0.008123	50'-2	Pf 1.669
333	-1'-10			197.105			155'-4	Pe 4.258
149	-11'-8			203.033		4LtE(11'-4), ALV(12'-0), 2GV(3'-9½), T(37'-8½), PrV(12'-7), sCV (40'-3)	205'-6	Pv
DY	3.0680	512.48	22.24	120		0.282205	0'-0	Pf 0.000
149	-11'-8			203.033				Pe
147	-11'-8			203.033			0'-0	Pv
Pump			**Velocity**					
147		512.48		203.033		Rating: 175.000 @ 500.00		
146		Q=512.48	12.92	30.591		Churn Pressure: 210.000		
DY	4.0260	512.48	12.92	120		0.075130	0'-0	Pf 0.000
146	-11'-8			30.591				Pe
145	-11'-8			30.591			0'-0	Pv
DY	6.3570	512.48	5.18	120		0.008123	29'-6	Pf 3.669
145	-11'-8			30.591			52'-9½	Pe -2.475
5	-5'-11½			31.785		2GV(3'-9½), 4LtE(11'-4), BFP(-3.000)	82'-4	Pv
UG	7.9800	512.48	3.29	150		0.001776	42'-0	Pf 0.123
5	-5'-11½			31.785			27'-2	Pe
1	-5'-11½			31.908		E(27'-2), S	69'-2	Pv
		0.00				Hose Allowance At Source		
1		512.48						
• • • • • Route 2 • • • • •								
CM	2.4690	262.48	17.59	120		0.235718	1'-0	Pf 10.372
86	154'-6	262.48		104.715		Hose(-104.715)(31'-0)	43'-0	Pe
63	154'-6			115.086		PO(12'-0)	44'-0	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap