Hydraulic Overview

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	Phone: (541) 848-1798 FAX
Address 1: Wallowa County Health Care District	State Certification/License Number
Address 2: Enterprise, Oregon, 97828	AHJ
Address 3	Job Site/Building

System

Density: 0.100gpm/ft²	Area of Application: 1500.00ft² (Actual 927.97ft²)
Most Demanding Sprinkler Data: 5.6 K-Factor 14.82 at 7.000	Hose Streams: 100.00
Coverage Per Sprinkler: 100.00ft²	Number Of Sprinklers Calculated: 12
System Pressure Demand: 47.595	System Flow Demand: 189.46
Total Demand: 289.46 @ 47.595	Pressure Result: +30.964 (39.4%)

Supplies

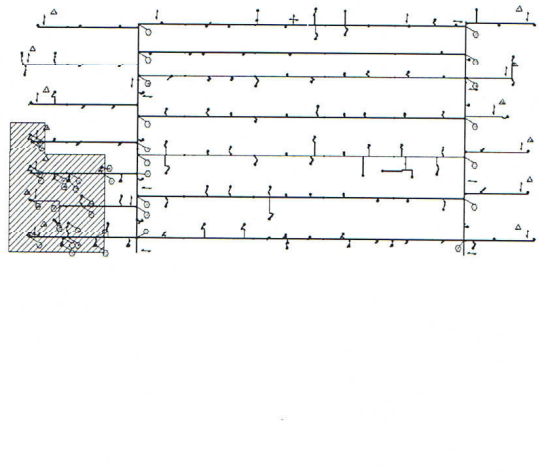
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
51	Water Supply	1200.00	100.00	80.000	60.000

Check Point Gauges

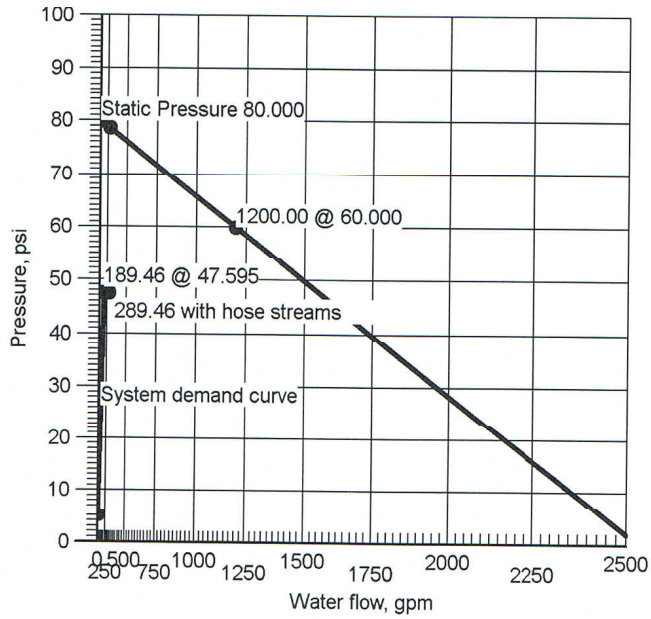
Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

REGISTERED PROFESSIONAL ENGINEER
84637PE
OREGON
Nov. 19 2110
FRANKLIN D. CALLFAS
Expires _____

Wallowa Rev-0b



Water Supply at Node 51 (1200.00, 100.00, 80.000, 60.000)



Hydraulic Summary

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	State Certification/License Number:
Address 1: Wallowa County Health Care District	AHJ:
Address 2: Enterprise, Oregon, 97828	Job Site/Building:
Address 3:	Drawing Name: Wallowa Rev-0b

System

Most Demanding Sprinkler Data: 5.6 K-Factor 14.82 at 7.000

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)
189.46	289.46

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 18.11 between nodes 47 and 46

Maximum Velocity Under Ground: 4.35 between nodes 51 and 50

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
219.89gal	259.11gal

Remote Area(s)

Occupancy	Job Suffix
Light Hazard (Lower Wet Calcs)	
Density	**Area of Application**
0.100gpm/ft²	1500.00ft² (Actual 927.97ft²)
Number Of Sprinklers Calculated	**Coverage Per Sprinkler**
12	100.00ft²

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

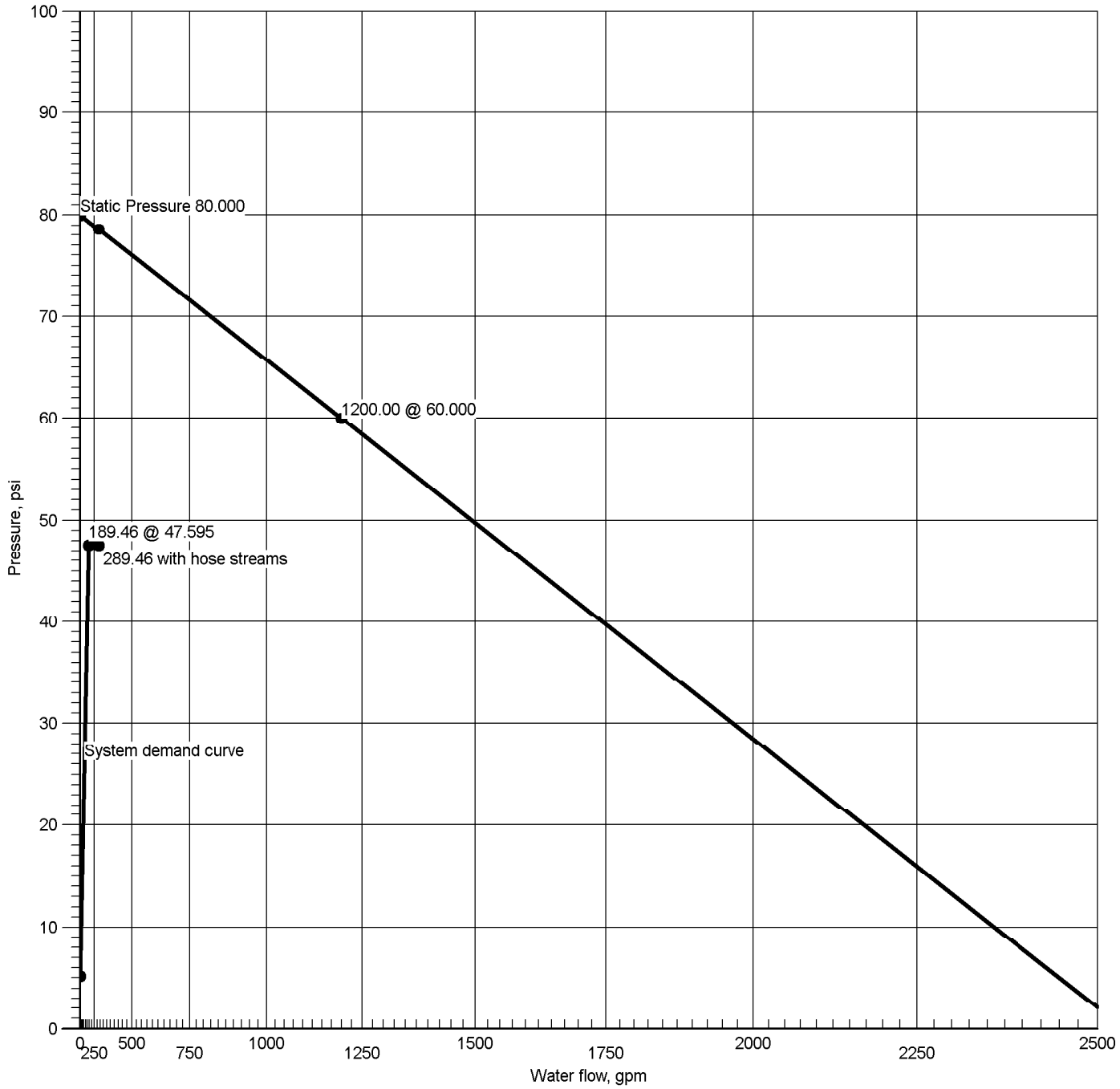
Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
51	Water Supply	100.00	80.000	60.000		1200.00	78.560		289.46	47.595	30.964

Contractor

	Contractor Number	Contact Name	Contact Title
Name of Contractor:		Phone	Extension
Address 1		FAX	
Address 2		E-mail	
Address 3		Web-Site	

Water Supply at Node 51



Hydraulic Graph	Water Supply at Node 51
Static: Pressure	80.000
Residual: Pressure	60.000 @ 1200.00
Available Pressure at Time of Test	78.560 @ 289.46
System Demand	47.595 @ 189.46
System Demand (Including Hose Allowance at Source)	47.595 @ 289.46

Summary Of Outflowing Devices

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**101**	**14.82**	**10.00**	**5.6**	**7.000**		
Sprinkler	102	14.91	10.00	5.6	7.090		
Sprinkler	103	14.93	10.00	5.6	7.107		
Sprinkler	104	15.08	10.00	5.6	7.249		
Sprinkler	105	15.22	10.00	5.6	7.386		
Sprinkler	106	15.30	10.00	5.6	7.464		
Sprinkler	107	15.49	10.00	5.6	7.648		
Sprinkler	108	15.71	10.00	5.6	7.875		
Sprinkler	109	15.96	10.00	5.6	8.120		
Sprinkler	110	16.35	10.00	5.6	8.527		
Sprinkler	111	16.47	10.00	5.6	8.645		
Sprinkler	112	19.23	10.00	5.6	11.788		

Most Demanding Sprinkler Data

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
51	-3'-0	S	47.595	189.46	
101	9'-0	Spr(-7.000), fd(41'-0)	7.000	14.82	
102	9'-0	Spr(-7.090), fd(41'-0)	7.090	14.91	
103	9'-0	Spr(-7.107), fd(41'-0)	7.107	14.93	
104	9'-0	Spr(-7.249), fd(29'-2¾)	7.249	15.08	
105	9'-0	Spr(-7.386), fd(41'-0)	7.386	15.22	
106	9'-0	Spr(-7.464), fd(41'-0)	7.464	15.30	
107	9'-0	Spr(-7.648), fd(41'-0)	7.648	15.49	
108	9'-0	Spr(-7.875), fd(41'-0)	7.875	15.71	
109	9'-0	Spr(-8.120), fd(41'-0)	8.120	15.96	
110	9'-0	Spr(-8.527), fd(41'-0)	8.527	16.35	
111	9'-0	Spr(-8.645), fd(41'-0)	8.645	16.47	
112	9'-0	Spr(-11.788), fd(41'-0)	11.788	19.23	
2	10'-0	PO(5'-0)	10.001		
5	10'-0	PO(5'-0)	10.156		
19	10'-0	PO(5'-0)	10.251		
32	10'-0	PO(5'-0)	11.271		
34	10'-0	PO(7'-5¼)	15.486		
35	10'-0	PO(7'-5¼)	15.686		
36	10'-0	PO(7'-5¼)	15.945		
37	10'-0	PO(7'-5¼)	16.318		
38	10'-0	PO(7'-5¼)	17.318		
39	10'-0	PO(7'-5¼)	17.924		
40	10'-0	PO(7'-5¼)	19.449		
41	10'-0	PO(7'-5¼)	21.453		
42	10'-0	PO(7'-5¼)	22.541		
43	10'-0	E(4'-4¾)	24.045		
44	10'-0	T(7'-1½)	32.630		
45	10'-0	LtE(5'-6)	33.307		
46	5'-11¼		35.608		
47	5'-8		37.562		
48	5'-6½		37.616		
49	3'-1	BFP(-5.000)	44.171		
50	0'-0		45.543		
52	10'-0	T(5'-0)	11.969		
53	10'-0	PO(5'-0)	12.386		
54	10'-0	PO(5'-0)	10.561		
55	10'-0	PO(5'-0)	10.675		
56	10'-0	PO(5'-0)	10.941		
57	10'-0	PO(5'-0)	12.216		
58	10'-0	PO(5'-0)	16.917		
59	10'-0	PO(7'-5¼)	19.152		
60	10'-0	PO(7'-5¼)	20.420		
61	10'-0	PO(7'-5¼)	22.213		
62	10'-0	PO(7'-5¼)	23.663		
63	10'-0	T(7'-0¾)	27.534		
64	10'-0	PO(7'-5¼)	18.480		
65	10'-0	PO(7'-5¼)	18.276		
531	12'-10½	PO(6'-0)	34.929		
532	12'-10¾	PO(6'-0)	34.914		
546	12'-10½	PO(6'-0)	34.924		

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 • • • • •									
DY	1.0490	14.82	5.50	120		0.074703	0'-0	Pf	3.436
101	9'-0	14.82	5.6	7.000			46'-0	Pe	-0.436
2	10'-0			10.001		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.4420	14.82	2.91	120		0.015862	9'-9¾	Pf	0.156
2	10'-0	14.93		10.001				Pe	
5	10'-0			10.156			9'-9¾	Pv	
BL	1.4420	29.75	5.84	120		0.057586	1'-7¾	Pf	0.095
5	10'-0	14.91		10.156				Pe	
19	10'-0			10.251			1'-7¾	Pv	
BL	1.4420	44.66	8.77	120		0.122118	8'-4¼	Pf	1.019
19	10'-0	15.71		10.251				Pe	
32	10'-0			11.271			8'-4¼	Pv	
BL	1.4420	60.37	11.86	120		0.213318	12'-4	Pf	4.215
32	10'-0			11.271			7'-5¼	Pe	
34	10'-0			15.486		PO(7'-5¼)	19'-9	Pv	
FR	2.1570	41.58	3.65	100		0.021096	9'-6	Pf	0.200
34	10'-0	47.50		15.486				Pe	
35	10'-0			15.686			9'-6	Pv	
FR	2.1570	89.08	7.82	100		0.086372	3'-0	Pf	0.259
35	10'-0			15.686				Pe	
36	10'-0			15.945			3'-0	Pv	
FR	2.1570	71.24	6.25	100		0.057123	6'-6¼	Pf	0.373
36	10'-0	62.36		15.945				Pe	
37	10'-0			16.318			6'-6¼	Pv	
FR	2.1570	133.60	11.73	100		0.182813	5'-5¾	Pf	1.000
37	10'-0			16.318				Pe	
38	10'-0			17.318			5'-5¾	Pv	
FR	2.1570	118.62	10.41	100		0.146713	4'-1½	Pf	0.606
38	10'-0	19.23		17.318				Pe	
39	10'-0			17.924			4'-1½	Pv	
FR	2.1570	137.84	12.10	100		0.193713	7'-10½	Pf	1.524
39	10'-0			17.924				Pe	
40	10'-0			19.449			7'-10½	Pv	
FR	2.1570	127.22	11.17	100		0.166999	12'-0	Pf	2.004
40	10'-0			19.449				Pe	
41	10'-0			21.453			12'-0	Pv	
FR	2.1570	117.91	10.35	100		0.145105	7'-6	Pf	1.088
41	10'-0			21.453				Pe	
42	10'-0			22.541			7'-6	Pv	
FR	2.1570	106.43	9.34	100		0.120047	8'-1¾	Pf	1.504
42	10'-0			22.541			4'-4¾	Pe	
43	10'-0			24.045		E(4'-4¾)	12'-6½	Pv	
BL	2.0670	106.43	10.18	100		0.147738	50'-11¾	Pf	8.585
43	10'-0	83.03		24.045			7'-1½	Pe	
44	10'-0			32.630		T(7'-1½)	58'-1¼	Pv	
BL	2.6350	189.46	11.15	120		0.093938	1'-8½	Pf	0.676
44	10'-0			32.630			5'-6	Pe	
45	10'-0			33.307		LtE(5'-6)	7'-2½	Pv	
FR	2.6350	189.46	11.15	100		0.131621	4'-0¾	Pf	0.536
45	10'-0			33.307				Pe	1.766
46	5'-11¼			35.608			4'-0¾	Pv	
DY	2.0670	189.46	18.11	120		0.306431	0'-0	Pf	1.839
46	5'-11¼			35.608			6'-0	Pe	0.115
47	5'-8			37.562		BV(6'-0)	6'-0	Pv	
DY	2.4690	189.46	12.70	120		0.128963	0'-0	Pf	0.000
47	5'-8			37.562				Pe	0.054
48	5'-6½			37.616			0'-0	Pv	
DY	4.2600	189.46	4.26	120		0.009053	1'-4	Pf	5.489
48	5'-6½			37.616			52'-8	Pe	1.066
49	3'-1			44.171		2T(26'-4), BFP(-5.000)	54'-0	Pv	
FR	4.2600	189.46	4.26	100		0.012685	3'-1	Pf	0.039
49	3'-1			44.171				Pe	1.333
50	0'-0			45.543			3'-1	Pv	
UG	4.2200	189.46	4.35	140		0.007127	88'-3	Pf	0.748
50	0'-0			45.543			16'-8¾	Pe	1.304
51	-3'-0			47.595		E(16'-8¾), S	104'-11¾	Pv	
		100.00				Hose Allowance At Source			
51		289.46							
• • • • • Route 2 • • • • •									

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	1.0490	14.91	5.54	120		0.075594	1'-7	Pf	3.597
102	9'-0	14.91	5.6	7.090			46'-0	Pe	-0.436
19	10'-0			10.251		PO(5'-0), fd(41'-0)	47'-7	Pv	
• • • • • Route 3 • • • • •									
DY	1.0490	14.93	5.54	120		0.075759	0'-0	Pf	3.485
103	9'-0	14.93	5.6	7.107			46'-0	Pe	-0.436
5	10'-0			10.156		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 4 • • • • •									
BL	1.0490	15.08	5.60	100		0.108116	9'-10¾	Pf	5.155
104	9'-0	15.96	5.6	7.249		Sprinkler, Flow (q) from Route 9	37'-9½	Pe	-0.436
52	10'-0			11.969		PO(3'-6¾), E(1'-5), T(3'-6¾), fd(29'-2¾)	47'-8¼	Pv	
BL	1.4420	31.04	6.10	120		0.062290	6'-8½	Pf	0.418
52	10'-0	16.47		11.969				Pe	
53	10'-0			12.386			6'-8½	Pv	
BL	1.4420	47.50	9.33	120		0.136892	16'-8	Pf	3.300
53	10'-0			12.386			7'-5¼	Pe	
35	10'-0			15.686		PO(7'-5¼)	24'-1¼	Pv	
• • • • • Route 5 • • • • •									
DY	1.0490	15.22	5.65	120		0.078504	0'-0	Pf	3.611
105	9'-0	15.22	5.6	7.386			46'-0	Pe	-0.436
54	10'-0			10.561		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.4420	15.22	2.99	120		0.016669	6'-10	Pf	0.114
54	10'-0	15.30		10.561				Pe	
55	10'-0			10.675			6'-10	Pv	
BL	1.4420	30.52	6.00	120		0.060387	4'-5	Pf	0.266
55	10'-0	15.49		10.675				Pe	
56	10'-0			10.941			4'-5	Pv	
BL	1.4420	46.01	9.04	120		0.129028	9'-10½	Pf	1.274
56	10'-0	16.35		10.941				Pe	
57	10'-0			12.216			9'-10½	Pv	
BL	1.4420	62.36	12.25	120		0.226484	10'-8¼	Pf	4.103
57	10'-0			12.216			7'-5¼	Pe	
37	10'-0			16.318		PO(7'-5¼)	18'-1¼	Pv	
• • • • • Route 6 • • • • •									
DY	1.0490	15.30	5.68	120		0.079276	0'-0	Pf	3.647
106	9'-0	15.30	5.6	7.464			46'-0	Pe	-0.436
55	10'-0			10.675		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 7 • • • • •									
DY	1.0490	15.49	5.75	120		0.081075	0'-0	Pf	3.729
107	9'-0	15.49	5.6	7.648			46'-0	Pe	-0.436
56	10'-0			10.941		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 8 • • • • •									
DY	1.0490	15.71	5.83	120		0.083298	0'-0	Pf	3.832
108	9'-0	15.71	5.6	7.875			46'-0	Pe	-0.436
32	10'-0			11.271		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 9 • • • • •									
BL	1.0490	15.96	5.92	120		0.085694	4'-0	Pf	4.285
109	9'-0	15.96	5.6	8.120			46'-0	Pe	-0.436
52	10'-0			11.969		T(5'-0), fd(41'-0)	50'-0	Pv	
• • • • • Route 10 • • • • •									
DY	1.0490	16.35	6.07	120		0.089661	0'-0	Pf	4.124
110	9'-0	16.35	5.6	8.527			46'-0	Pe	-0.436
57	10'-0			12.216		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 11 • • • • •									
DY	1.0490	16.47	6.11	120		0.090807	0'-0	Pf	4.177
111	9'-0	16.47	5.6	8.645			46'-0	Pe	-0.436
53	10'-0			12.386		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 12 • • • • •									
DY	1.0490	19.23	7.14	120		0.120974	0'-0	Pf	5.565
112	9'-0	19.23	5.6	11.788			46'-0	Pe	-0.436
58	10'-0			16.917		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.4420	19.23	3.78	120		0.025687	31'-9½	Pf	1.008
58	10'-0			16.917			7'-5¼	Pe	
39	10'-0			17.924		PO(7'-5¼)	39'-2¾	Pv	
• • • • • Route 13 • • • • •									
FR	1.6820	51.61	7.45	100		0.105666	12'-0	Pf	1.268
59	10'-0	10.62		19.152				Pe	
60	10'-0			20.420			12'-0	Pv	
FR	1.6820	62.24	8.99	100		0.149395	12'-0	Pf	1.793
60	10'-0	9.31		20.420				Pe	
61	10'-0			22.213			12'-0	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
FR	1.6820	71.54	10.33	100		0.193331	7'-6	Pf	1.450
61	10'-0	11.48		22.213				Pe	
62	10'-0			23.663			7'-6	Pv	
FR	1.6820	83.03	11.99	100		0.254633	8'-1¾	Pf	3.871
62	10'-0			23.663			7'-0¾	Pe	
63	10'-0			27.534		T(7'-0¾)	15'-2½	Pv	
BL	2.0670	83.03	7.94	100		0.093321	47'-5¾	Pf	5.096
63	10'-0			27.534			7'-1½	Pe	
44	10'-0			32.630		T(7'-1½)	54'-7¼	Pv	
• • • • • Route 14 • • • • •									
FR	1.6820	36.63	5.29	100		0.056043	12'-0	Pf	0.673
64	10'-0			18.480				Pe	
59	10'-0			19.152			12'-0	Pv	
• • • • • Route 15 • • • • •									
BL	1.4420	17.84	3.50	120		0.022366	98'-5½	Pf	2.535
36	10'-0			15.945			14'-10¼	Pe	
64	10'-0			18.480		PO(7'-5¼)	113'-3¾	Pv	
• • • • • Route 16 • • • • •									
BL	1.4420	9.31	1.83	120		0.006710	98'-5½	Pf	0.760
41	10'-0			21.453			14'-10¼	Pe	
61	10'-0			22.213		PO(7'-5¼)	113'-3¾	Pv	
• • • • • Route 17 • • • • •									
BL	1.4420	10.62	2.09	120		0.008574	98'-5½	Pf	0.972
40	10'-0			19.449			14'-10¼	Pe	
60	10'-0			20.420		PO(7'-5¼)	113'-3¾	Pv	
• • • • • Route 18 • • • • •									
FR	1.6820	18.79	2.71	100		0.016301	12'-6	Pf	0.204
65	10'-0	17.84		18.276				Pe	
64	10'-0			18.480			12'-6	Pv	
• • • • • Route 19 • • • • •									
BL	1.4420	18.79	3.69	120		0.024623	98'-5½	Pf	2.790
34	10'-0			15.486			14'-10¼	Pe	
65	10'-0			18.276		PO(7'-5¼)	113'-3¾	Pv	
• • • • • Route 20 • • • • •									
BL	1.4420	11.48	2.26	120		0.009902	98'-5½	Pf	1.122
42	10'-0			22.541			14'-10¼	Pe	
62	10'-0			23.663		PO(7'-5¼)	113'-3¾	Pv	
• • • • • Route 21 • • • • •									
BL	1.4420	14.98	2.94	120		0.016184	98'-5½	Pf	1.834
38	10'-0	36.63		17.318		PO(7'-5¼) Flow (q) from Route 14	14'-10¼	Pe	
59	10'-0			19.152		PO(7'-5¼)	113'-3¾	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

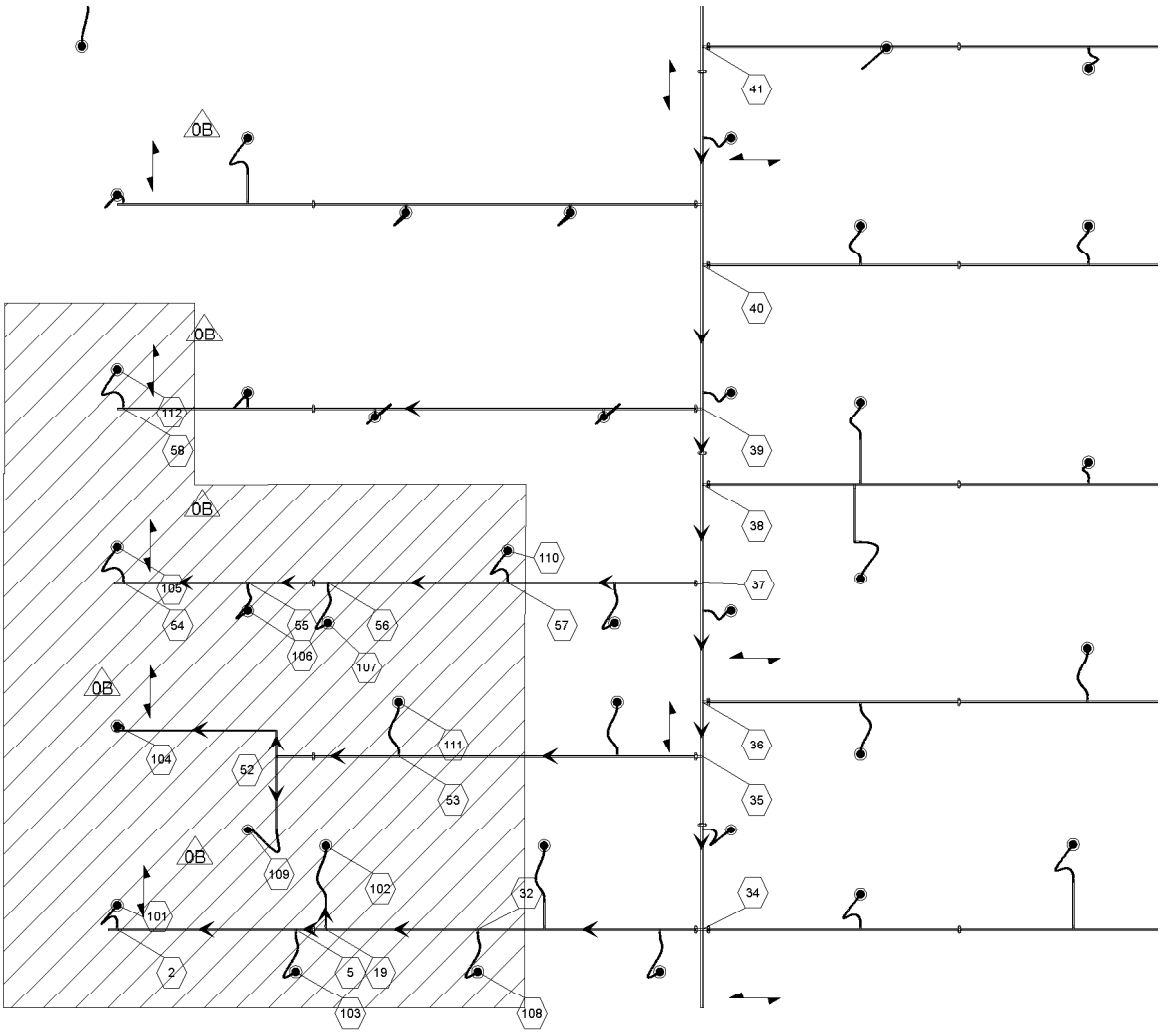
AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

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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