Hydraulic Summary

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

Job Number: 2-11-12042
Report Description: Light Hazard

Job

Job Number: 2-11-12042	Design Engineer: KEVIN RIDER
Job Name: GOLDFISH	State Certification/License Number: FIRESWI140B1
Address 1: 3500 SOUTH MERIDAN UNIT 900-30	AHJ: CITY OF PUYALLUP
Address 2: PUYALLUP, WA 98373	Job Site/Building:
Address 3:	Drawing Name: 2-11-12042_Rev00_(Goldfish)

System

Most Demanding Sprinkler Data: 5.6 K-Factor 22.50 at 16.143

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)
158.83	258.83

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 13.06 between nodes 11 and 27

Maximum Velocity Under Ground	
0.92 between nodes 1 and 2	

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
1132.74gal	

Remote Area(s)

Occupancy	Job Suffix
Light Hazard	

Density	Area of Application
0.10gpm/ft²	1500ft² (Actual 394ft²)

Number Of Sprinklers Calculated	Number Of Nozzles Calculated	Coverage Per Sprinkler
7	0	225ft²

Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi) @ Flow (gpm)	Available (psi) @ Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	100.00	55.000	46.000 @ 1030.00	54.301 @ 258.83	44.866	9.435

Contractor

	Contractor Number	Contact Name	Contact Title
		KEVIN RIDER	DESIGNER

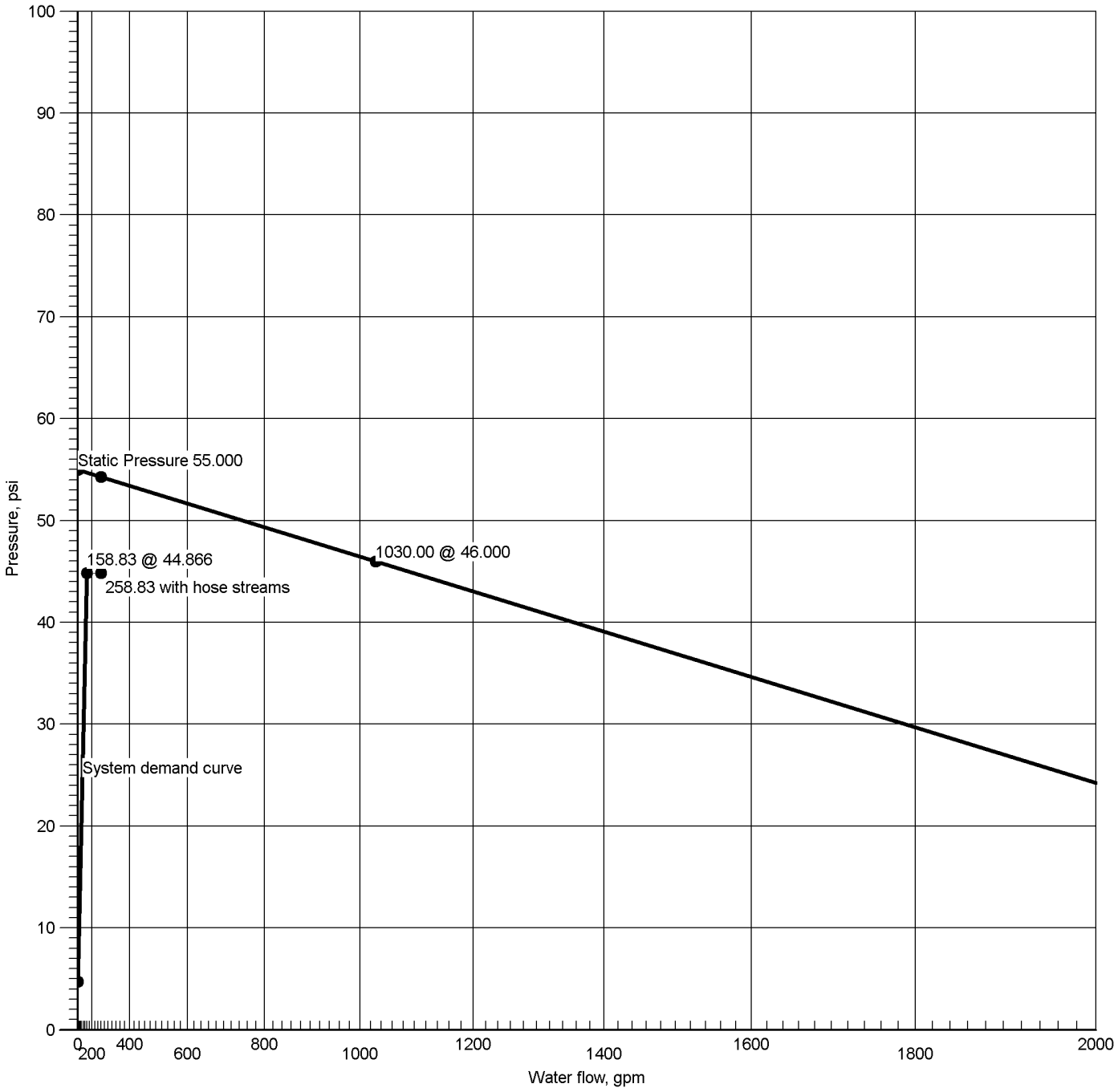
Name of Contractor:	Phone	Extension
FIRE SYSTEMS WEST	253-833-1248	

Address 1	FAX
206 FRONTAGE RD N, SUITE C	

Address 2	E-mail
PACIFIC, WA 98047	kevinr@firesystemswest.com

Address 3	Web-Site

Water Supply at Node 1



Hydraulic Graph	Water Supply at Node 1
Static: Pressure	55.000
Residual: Pressure	46.000 @ 1030.00
Available Pressure at Time of Test	54.301 @ 258.83
System Demand	44.866 @ 158.83
System Demand (Including Hose Allowance at Source)	44.866 @ 258.83

Summary Of Outflowing Devices

Job Number: 2-11-12042
Report Description: Light Hazard

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		Coverage (Foot)
Sprinkler	1001	23.21	22.50	5.6	17.183		N/A
Sprinkler	1002	22.77	22.50	5.6	16.534		N/A
Sprinkler	1003	22.56	22.50	5.6	16.228		N/A
Sprinkler	**1004**	**22.50**	**22.50**	**5.6**	**16.143**		N/A
Sprinkler	1005	22.50	22.50	5.6	16.143		N/A
Sprinkler	1006	22.55	22.50	5.6	16.215		N/A
Sprinkler	1007	22.73	22.50	5.6	16.478		N/A

Most Demanding Sprinkler Data

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
42	15'-11	PO(9'-11)	32.003		
43	17'-10½	T(9'-11)	31.108		
44	9'-0½	PO(5'-0)	16.576		
45	9'-0½	PO(5'-0)	16.851		
46	15'-11	PO(9'-11)	32.065		
47	15'-11	PO(9'-11)	31.276		
48	15'-11	PO(9'-11)	31.998		
49	18'-2	T(9'-11)	30.971		
50	15'-11	PO(9'-11)	32.035		
51	15'-11	PO(9'-11)	31.198		
52	15'-11	PO(9'-11)	31.995		
53	18'-8½	T(9'-11)	30.722		
54	15'-11	PO(9'-11)	32.012		
55	15'-11	PO(9'-11)	31.030		
56	15'-11	PO(9'-11)	31.994		
57	18'-9	T(9'-11)	30.688		
58	15'-11	PO(9'-11)	31.997		
59	15'-11	mecT(13'-7½)	30.834		
60	15'-11	PO(12'-3½)	30.873		
61	15'-11	PO(9'-11)	31.986		
62	15'-11	PO(9'-11)	31.978		
63	15'-11	PO(9'-11)	31.974		
64	15'-11	PO(9'-11)	31.973		
1	-3'-0	S	44.866	158.83	
1001	8'-0	Spr(-17.183), fd	17.183	23.21	
1002	8'-0	Spr(-16.534), fd	16.534	22.77	
1003	8'-0	Spr(-16.228), fd	16.228	22.56	
1004	8'-0	Spr(-16.143), fd	16.143	22.50	
1005	8'-0	Spr(-16.143), fd	16.143	22.50	
1006	8'-0	Spr(-16.215), fd	16.215	22.55	
1007	8'-0	Spr(-16.478), fd	16.478	22.73	
2	0'-6		39.579		
3	15'-11	PO(9'-11)	32.555		
4	15'-11	PO(9'-11)	32.555		
5	15'-11	PO(9'-11)	32.555		
6	15'-11	PO(9'-11)	32.556		
7	15'-11	T(26'-4)	32.560		
8	15'-11	PO(9'-11)	32.402		
9	15'-11	PO(9'-11)	32.337		
10	15'-11	PO(9'-11)	32.275		
11	18'-6	T(9'-11)	26.455		
12	15'-11	PO(9'-11)	32.094		
13	18'-6	T(9'-11)	30.342		
14	18'-6	T(9'-11)	27.616		
15	15'-11	PO(12'-3½)	32.414		
16	18'-6	T(9'-11)	28.303		
17	15'-11	PO(9'-11)	32.407		
18	15'-11	PO(9'-11)	32.064		
19	17'-11½	T(9'-11)	31.128		
20	15'-11	PO(9'-11)	30.949		
21	15'-11	PO(9'-11)	32.395		
22	15'-11	PO(9'-11)	32.041		
23	17'-5	T(9'-11)	31.342		
24	15'-11	PO(9'-11)	31.114		
25	15'-11	PO(9'-11)	32.370		
26	15'-11	PO(9'-11)	32.326		
27	9'-0½	PO(5'-0)	17.588		
28	15'-11	PO(12'-3½)	31.265		
29	15'-11	PO(9'-11)	32.024		
30	16'-11	T(9'-11)	31.547		
31	9'-0½	PO(5'-0)	16.909		
32	15'-11	PO(9'-11)	32.267		

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
33	9'-0½	PO(5'-0)	16.590		
34	15'-11	PO(9'-11)	32.012		
35	15'-11	PO(12'-3½)	31.321		
36	17'-3½	T(9'-11)	31.371		
37	15'-11	PO(9'-11)	32.192		
38	9'-0½	PO(5'-0)	16.501		
39	9'-0½	PO(5'-0)	16.501		
40	15'-11	PO(12'-3½)	31.321		
41	15'-11	PO(9'-11)	32.106		

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	22.50	8.35	120		0.161813	0'-0	Pf 0.809
1004	8'-0	22.50	5.6	16.143		Sprinkler,	5'-0	Pe -0.452
38	9'-0½			16.501		PO(5'-0), fd	5'-0	Pv
BL	1.6820	21.92	3.16	120		0.015466	5'-9	Pf 0.089
38	9'-0½			16.501				Pe
33	9'-0½			16.590			5'-9	Pv
BL	1.6820	44.48	6.42	120		0.057272	5'-7	Pf 0.320
33	9'-0½	22.56		16.590		Flow (q) from Route 4		Pe
31	9'-0½			16.909			5'-7	Pv
BL	1.6820	67.25	9.71	120		0.123053	5'-6	Pf 0.679
31	9'-0½	22.77		16.909		Flow (q) from Route 6		Pe
27	9'-0½			17.588			5'-6	Pv
BL	1.6820	90.46	13.06	120		0.212979	48'-6	Pf 12.968
27	9'-0½	23.21		17.588		Flow (q) from Route 7	12'-4½	Pe -4.100
11	18'-6			26.455		LtE(2'-5½), T(9'-11)	60'-10½	Pv
BL	1.6820	51.76	7.47	120		0.075811	41'-4½	Pf 3.886
11	18'-6			26.455			9'-11	Pe
13	18'-6			30.342		T(9'-11)	51'-3	Pv
BL	1.6820	41.61	6.01	120		0.050622	2'-7	Pf 0.632
13	18'-6			30.342			9'-11	Pe 1.120
12	15'-11			32.094		PO(9'-11)	12'-6	Pv
CM	4.2600	130.88	2.95	120		0.004567	13'-4	Pf 0.181
12	15'-11	89.28		32.094		Flow (q) from Route 8	26'-4	Pe
10	15'-11			32.275		2E(13'-2)	39'-8	Pv
CM	4.2600	134.13	3.02	120		0.004779	13'-0	Pf 0.062
10	15'-11	3.25		32.275		Flow (q) from Route 2		Pe
9	15'-11			32.337			13'-0	Pv
CM	4.2600	137.11	3.09	120		0.004977	13'-0	Pf 0.065
9	15'-11	2.97		32.337		Flow (q) from Route 9		Pe
8	15'-11			32.402			13'-0	Pv
CM	4.2600	140.21	3.16	120		0.005188	4'-3½	Pf 0.159
8	15'-11	3.10		32.402		Flow (q) from Route 10	26'-4	Pe
7	15'-11			32.560		T(26'-4)	30'-7½	Pv
CM	4.2600	158.83	3.58	120		0.006533	22'-4½	Pf 0.335
7	15'-11	18.61		32.560		Flow (q) from Route 11	28'-11½	Pe 6.684
2	0'-6			39.579		E(13'-2), BV(15'-9½)	51'-4	Pv
UG	8.3900	158.83	0.92	140		0.000181	167'-8½	Pf 3.770
2	0'-6			39.579			61'-1	Pe 1.517
1	-3'-0			44.866		2E(30'-6½), BFP(-3.728), S	228'-9½	Pv
		100.00				Hose Allowance At Source		
1		258.83						
• • • • • Route 2 • • • • •								
DY	1.0490	22.50	8.35	120		0.161814	0'-0	Pf 0.809
1005	8'-0	22.50	5.6	16.143		Sprinkler,	5'-0	Pe -0.452
39	9'-0½			16.501		PO(5'-0), fd	5'-0	Pv
BL	1.6820	23.08	3.33	120		0.017018	4'-5	Pf 0.075
39	9'-0½	0.58		16.501		Flow (q) from Route 31		Pe
44	9'-0½			16.576			4'-5	Pv
BL	1.6820	45.63	6.59	120		0.060052	4'-7	Pf 0.275
44	9'-0½	22.55		16.576		Flow (q) from Route 3		Pe
45	9'-0½			16.851			4'-7	Pv
BL	1.6820	68.36	9.87	120		0.126856	105'-3	Pf 16.964
45	9'-0½	22.73		16.851		Flow (q) from Route 5	28'-5½	Pe -2.981
59	15'-11			30.834		6LtE(2'-5½), mecT(13'-7½)	133'-8½	Pv
CM	2.1570	52.36	4.60	120		0.023065	8'-6	Pf 0.196
59	15'-11			30.834				Pe
55	15'-11			31.030			8'-6	Pv
BL	1.6820	14.18	2.05	120		0.006908	108'-3	Pf 0.902
55	15'-11			31.030		PO(9'-11)	22'-3½	Pe -1.210
53	18'-8½			30.722		LtE(2'-5½), T(9'-11)	130'-6½	Pv
BL	1.6820	2.32	0.34	120		0.000244	148'-5½	Pf 0.042
53	18'-8½			30.722		T(9'-11)	24'-9	Pe 1.210
63	15'-11			31.974		E(4'-11½), PO(9'-11)	173'-2½	Pv
CM	2.1570	5.05	0.44	120		0.000305	13'-0	Pf 0.004
63	15'-11	2.73		31.974		Flow (q) from Route 15		Pe
62	15'-11			31.978			13'-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
CM	2.1570	7.05	0.62	120	0.000564	13'-0	Pf 0.007
62	15'-11	1.99		31.978	Flow (q) from Route 16		Pe
61	15'-11			31.986		13'-0	Pv
CM	2.1570	8.92	0.78	120	0.000873	13'-0	Pf 0.011
61	15'-11	1.87		31.986	Flow (q) from Route 17		Pe
58	15'-11			31.997		13'-0	Pv
CM	2.1570	10.85	0.95	120	0.001254	12'-2	Pf 0.015
58	15'-11	1.93		31.997	Flow (q) from Route 18		Pe
54	15'-11			32.012		12'-2	Pv
CM	2.1570	12.87	1.13	120	0.001719	13'-0	Pf 0.022
54	15'-11	2.02		32.012	Flow (q) from Route 19		Pe
50	15'-11			32.035		13'-0	Pv
CM	2.1570	15.19	1.33	120	0.002338	13'-0	Pf 0.030
50	15'-11	2.33		32.035	Flow (q) from Route 20		Pe
46	15'-11			32.065		13'-0	Pv
CM	2.1570	17.79	1.56	120	0.003131	13'-0	Pf 0.041
46	15'-11	2.60		32.065	Flow (q) from Route 22		Pe
41	15'-11			32.106		13'-0	Pv
CM	2.1570	27.94	2.45	120	0.007217	12'-0	Pf 0.087
41	15'-11	10.15		32.106	Flow (q) from Route 23		Pe
37	15'-11			32.192		12'-0	Pv
BL	1.6820	3.25	0.47	120	0.000453	152'-6	Pf 0.082
37	15'-11			32.192	PO(9'-11)	29'-8½	Pe -0.000
10	15'-11			32.275	2E(4'-11½), PO(9'-11)	182'-2½	Pv
• • • • • Route 3 • • • • •							
DY	1.0490	22.55	8.37	120	0.162483	0'-0	Pf 0.812
1006	8'-0	22.55	5.6	16.215	Sprinkler,	5'-0	Pe -0.452
44	9'-0½			16.576	PO(5'-0), fd	5'-0	Pv
• • • • • Route 4 • • • • •							
DY	1.0490	22.56	8.37	120	0.162602	0'-0	Pf 0.813
1003	8'-0	22.56	5.6	16.228	Sprinkler,	5'-0	Pe -0.452
33	9'-0½			16.590	PO(5'-0), fd	5'-0	Pv
• • • • • Route 5 • • • • •							
DY	1.0490	22.73	8.44	120	0.164915	0'-0	Pf 0.825
1007	8'-0	22.73	5.6	16.478	Sprinkler,	5'-0	Pe -0.452
45	9'-0½			16.851	PO(5'-0), fd	5'-0	Pv
• • • • • Route 6 • • • • •							
DY	1.0490	22.77	8.45	120	0.165431	0'-0	Pf 0.827
1002	8'-0	22.77	5.6	16.534	Sprinkler,	5'-0	Pe -0.452
31	9'-0½			16.909	PO(5'-0), fd	5'-0	Pv
• • • • • Route 7 • • • • •							
DY	1.0490	23.21	8.62	120	0.171427	0'-0	Pf 0.857
1001	8'-0	23.21	5.6	17.183	Sprinkler,	5'-0	Pe -0.452
27	9'-0½			17.588	PO(5'-0), fd	5'-0	Pv
• • • • • Route 8 • • • • •							
CM	2.1570	38.70	3.40	120	0.013187	12'-6½	Pf 0.165
20	15'-11	38.70		30.949	Flow (q) from Route 36		Pe
24	15'-11			31.114		12'-6½	Pv
CM	2.1570	25.19	2.21	120	0.005956	13'-0	Pf 0.151
24	15'-11			31.114		12'-3½	Pe
28	15'-11			31.265	PO(12'-3½)	25'-3½	Pv
BL	1.6820	13.25	1.91	120	0.006099	106'-11½	Pf 0.728
28	15'-11			31.265		12'-4½	Pe -0.650
23	17'-5			31.342	LtE(2'-5½), T(9'-11)	119'-4	Pv
BL	1.6820	10.93	1.58	120	0.004268	1'-6	Pf 0.049
23	17'-5			31.342		9'-11	Pe 0.650
22	15'-11			32.041	PO(9'-11)	11'-5	Pv
CM	4.2600	78.36	1.76	120	0.001768	13'-0	Pf 0.023
22	15'-11	67.43		32.041	Flow (q) from Route 25		Pe
18	15'-11			32.064		13'-0	Pv
CM	4.2600	89.28	2.01	120	0.002251	13'-0	Pf 0.029
18	15'-11	10.92		32.064	Flow (q) from Route 21		Pe
12	15'-11			32.094		13'-0	Pv
• • • • • Route 9 • • • • •							
CM	2.1570	24.69	2.17	120	0.005741	13'-0	Pf 0.075
37	15'-11	3.25		32.192	Flow (q) from Route 2		Pe
32	15'-11			32.267		13'-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
BL	1.6820	2.97	0.43	120		0.000384	152'-6	Pf 0.070
32	15'-11			32.267		PO(9'-11)	29'-8½	Pe -0.000
9	15'-11			32.337		2E(4'-11½), PO(9'-11)	182'-2½	Pv
• • • • • Route 10 • • • • •								
CM	2.1570	21.72	1.91	120		0.004528	13'-0	Pf 0.059
32	15'-11	2.97		32.267		Flow (q) from Route 9		Pe
26	15'-11			32.326			13'-0	Pv
BL	1.6820	3.10	0.45	120		0.000416	152'-6	Pf 0.076
26	15'-11			32.326		PO(9'-11)	29'-8½	Pe -0.000
8	15'-11			32.402		2E(4'-11½), PO(9'-11)	182'-2½	Pv
• • • • • Route 11 • • • • •								
CM	2.1570	18.61	1.63	120		0.003404	13'-0	Pf 0.044
26	15'-11	3.10		32.326		Flow (q) from Route 10		Pe
25	15'-11			32.370			13'-0	Pv
BL	1.6820	5.04	0.73	120		0.001021	152'-6	Pf 0.186
25	15'-11			32.370		PO(9'-11)	29'-8½	Pe -0.000
6	15'-11			32.556		2E(4'-11½), PO(9'-11)	182'-2½	Pv
CM	4.2600	18.61	0.42	120		0.000124	8'-8½	Pf 0.004
6	15'-11	13.57		32.556		Flow (q) from Route 12	26'-4	Pe
7	15'-11			32.560		T(26'-4)	35'-0½	Pv
• • • • • Route 12 • • • • •								
CM	2.1570	13.57	1.19	120		0.001897	13'-3½	Pf 0.025
25	15'-11	5.04		32.370		Flow (q) from Route 11		Pe
21	15'-11			32.395			13'-3½	Pv
BL	1.6820	4.65	0.67	120		0.000878	152'-6	Pf 0.160
21	15'-11			32.395		PO(9'-11)	29'-8½	Pe -0.000
5	15'-11			32.555		2E(4'-11½), PO(9'-11)	182'-2½	Pv
CM	4.2600	13.57	0.31	120		0.000069	13'-3½	Pf 0.001
5	15'-11	8.92		32.555		Flow (q) from Route 13		Pe
6	15'-11			32.556			13'-3½	Pv
• • • • • Route 13 • • • • •								
CM	2.1570	8.92	0.78	120		0.000873	13'-10½	Pf 0.012
21	15'-11	4.65		32.395		Flow (q) from Route 12		Pe
17	15'-11			32.407			13'-10½	Pv
BL	1.6820	4.45	0.64	120		0.000809	152'-6	Pf 0.147
17	15'-11			32.407		PO(9'-11)	29'-8½	Pe -0.000
4	15'-11			32.555		2E(4'-11½), PO(9'-11)	182'-2½	Pv
CM	4.2600	8.92	0.20	120		0.000032	13'-10½	Pf 0.000
4	15'-11	4.47		32.555		Flow (q) from Route 14		Pe
5	15'-11			32.555			13'-10½	Pv
• • • • • Route 14 • • • • •								
BL	1.6820	4.47	0.65	120		0.000817	152'-6	Pf 0.141
15	15'-11	4.47		32.414		Flow (q) from Route 24	19'-9½	Pe
3	15'-11			32.555		2E(4'-11½), PO(9'-11)	172'-3½	Pv
CM	4.2600	4.47	0.10	120		0.000009	14'-1½	Pf 0.000
3	15'-11			32.555				Pe
4	15'-11			32.555			14'-1½	Pv
• • • • • Route 15 • • • • •								
BL	1.6820	2.73	0.39	120		0.000328	148'-6	Pf 0.057
57	18'-9	16.00		30.688		T(9'-11), Flow (q) from Route 32	24'-9	Pe 1.228
64	15'-11			31.973		E(4'-11½), PO(9'-11)	173'-3	Pv
CM	2.1570	2.73	0.24	120		0.000098	11'-4	Pf 0.001
64	15'-11			31.973				Pe
63	15'-11			31.974			11'-4	Pv
• • • • • Route 16 • • • • •								
BL	1.6820	1.99	0.29	120		0.000183	147'-11	Pf 0.032
49	18'-2	12.85		30.971		T(9'-11), Flow (q) from Route 33	24'-9	Pe 0.975
62	15'-11			31.978		E(4'-11½), PO(9'-11)	172'-8	Pv
• • • • • Route 17 • • • • •								
BL	1.6820	1.87	0.27	120		0.000163	147'-7½	Pf 0.028
43	17'-10½			31.108		T(9'-11)	24'-9	Pe 0.849
61	15'-11			31.986		E(4'-11½), PO(9'-11)	172'-4½	Pv
• • • • • Route 18 • • • • •								
BL	1.6820	1.93	0.28	120		0.000173	147'-0½	Pf 0.030
36	17'-3½	12.44		31.371		T(9'-11), Flow (q) from Route 34	24'-9	Pe 0.596
58	15'-11			31.997		E(4'-11½), PO(9'-11)	171'-9½	Pv
• • • • • Route 19 • • • • •								

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	1.6820	2.02	0.29	120	0.000187	146'-8	Pf 0.032
30	16'-11	12.59		31.547	T(9'-11), Flow (q) from Route 35	24'-9	Pe 0.434
54	15'-11			32.012	E(4'-11½), PO(9'-11)	171'-5	Pv
• • • • • Route 20 • • • • •							
BL	1.6820	2.33	0.34	120	0.000244	147'-2	Pf 0.042
23	17'-5			31.342	T(9'-11)	24'-9	Pe 0.650
50	15'-11			32.035	E(4'-11½), PO(9'-11)	171'-11	Pv
• • • • • Route 21 • • • • •							
BL	1.6820	10.92	1.58	120	0.004262	2'-0½	Pf 0.051
19	17'-11½	13.52		31.128	Flow (q) from Route 38	9'-11	Pe 0.885
18	15'-11			32.064	PO(9'-11)	11'-11½	Pv
• • • • • Route 22 • • • • •							
BL	1.6820	2.60	0.38	120	0.000299	147'-8½	Pf 0.052
19	17'-11½	13.52		31.128	T(9'-11), Flow (q) from Route 38	24'-9	Pe 0.885
46	15'-11			32.065	E(4'-11½), PO(9'-11)	172'-5½	Pv
• • • • • Route 23 • • • • •							
BL	1.6820	10.15	1.47	120	0.003723	148'-3	Pf 0.644
13	18'-6			30.342	T(9'-11)	24'-9	Pe 1.120
41	15'-11			32.106	E(4'-11½), PO(9'-11)	173'-0	Pv
• • • • • Route 24 • • • • •							
CM	2.1570	4.47	0.39	120	0.000243	14'-1½	Pf 0.006
17	15'-11	4.45		32.407	Flow (q) from Route 13	12'-3½	Pe -0.000
15	15'-11			32.414	PO(12'-3½)	26'-5	Pv
• • • • • Route 25 • • • • •							
BL	1.6820	13.28	1.92	120	0.006117	2'-10	Pf 0.078
57	18'-9	16.00		30.688	Flow (q) from Route 32	9'-11	Pe 1.228
56	15'-11			31.994	PO(9'-11)	12'-9	Pv
CM	4.2600	13.28	0.30	120	0.000066	11'-4	Pf 0.001
56	15'-11			31.994			Pe
52	15'-11			31.995		11'-4	Pv
CM	4.2600	25.13	0.57	120	0.000216	13'-0	Pf 0.003
52	15'-11	11.85		31.995	Flow (q) from Route 26		Pe
48	15'-11			31.998		13'-0	Pv
CM	4.2600	35.99	0.81	120	0.000419	13'-0	Pf 0.005
48	15'-11	10.86		31.998	Flow (q) from Route 27		Pe
42	15'-11			32.003		13'-0	Pv
CM	4.2600	46.35	1.04	120	0.000669	13'-0	Pf 0.009
42	15'-11	10.36		32.003	Flow (q) from Route 28		Pe
34	15'-11			32.012		13'-0	Pv
CM	4.2600	56.85	1.28	120	0.000977	12'-2	Pf 0.012
34	15'-11	10.51		32.012	Flow (q) from Route 29		Pe
29	15'-11			32.024		12'-2	Pv
CM	4.2600	67.43	1.52	120	0.001339	13'-0	Pf 0.017
29	15'-11	10.57		32.024	Flow (q) from Route 30		Pe
22	15'-11			32.041		13'-0	Pv
• • • • • Route 26 • • • • •							
BL	1.6820	11.85	1.71	120	0.004960	2'-9½	Pf 0.063
53	18'-8½	2.32		30.722	Flow (q) from Route 2	9'-11	Pe 1.210
52	15'-11			31.995	PO(9'-11)	12'-8½	Pv
• • • • • Route 27 • • • • •							
BL	1.6820	10.86	1.57	120	0.004219	2'-3	Pf 0.051
49	18'-2	12.85		30.971	Flow (q) from Route 33	9'-11	Pe 0.975
48	15'-11			31.998	PO(9'-11)	12'-2	Pv
• • • • • Route 28 • • • • •							
CM	2.1570	38.18	3.35	120	0.012860	13'-0	Pf 0.167
55	15'-11	14.18		31.030	Flow (q) from Route 2		Pe
51	15'-11			31.198		13'-0	Pv
CM	2.1570	25.33	2.22	120	0.006018	13'-0	Pf 0.078
51	15'-11			31.198			Pe
47	15'-11			31.276		13'-0	Pv
BL	1.6820	12.23	1.77	120	0.005256	107'-5	Pf 0.682
47	15'-11			31.276	PO(9'-11)	22'-3½	Pe -0.849
43	17'-10½			31.108	LtE(2'-5½), T(9'-11)	129'-8½	Pv
BL	1.6820	10.36	1.50	120	0.003865	1'-11½	Pf 0.046
43	17'-10½	1.87		31.108	Flow (q) from Route 17	9'-11	Pe 0.849
42	15'-11			32.003	PO(9'-11)	11'-10½	Pv
• • • • • Route 29 • • • • •							

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	1.6820	10.51	1.52	120		0.003969	1'-4½	Pf	0.045
36	17'-3½	12.44		31.371		Flow (q) from Route 34	9'-11	Pe	0.596
34	15'-11			32.012		PO(9'-11)	11'-3½	Pv	
• • • • • Route 30 • • • • •									
BL	1.6820	10.57	1.53	120		0.004016	1'-0	Pf	0.044
30	16'-11	12.59		31.547		Flow (q) from Route 35	9'-11	Pe	0.434
29	15'-11			32.024		PO(9'-11)	10'-11	Pv	
• • • • • Route 31 • • • • •									
BL	1.6820	0.58	0.08	120		0.000019	5'-0½	Pf	0.000
38	9'-0½	21.92		16.501		Flow (q) from Route 1		Pe	
39	9'-0½			16.501			5'-0½	Pv	
• • • • • Route 32 • • • • •									
CM	2.1570	16.00	1.41	120		0.002574	2'-10	Pf	0.039
59	15'-11	52.36		30.834		Flow (q) from Route 2	12'-3½	Pe	
60	15'-11			30.873		PO(12'-3½)	15'-1½	Pv	
BL	1.6820	16.00	2.31	120		0.008644	108'-3½	Pf	1.043
60	15'-11			30.873			12'-4½	Pe	-1.228
57	18'-9			30.688		LtE(2'-5½), T(9'-11)	120'-8	Pv	
• • • • • Route 33 • • • • •									
BL	1.6820	12.85	1.86	120		0.005762	107'-8½	Pf	0.749
51	15'-11			31.198		PO(9'-11)	22'-3½	Pe	-0.975
49	18'-2			30.971		LtE(2'-5½), T(9'-11)	130'-0	Pv	
• • • • • Route 34 • • • • •									
CM	2.1570	13.10	1.15	120		0.001777	13'-0	Pf	0.045
47	15'-11	12.23		31.276		Flow (q) from Route 28	12'-3½	Pe	
40	15'-11			31.321		PO(12'-3½)	25'-3½	Pv	
BL	1.6820	12.44	1.80	120		0.005423	106'-10	Pf	0.647
40	15'-11			31.321			12'-4½	Pe	-0.596
36	17'-3½			31.371		LtE(2'-5½), T(9'-11)	119'-2½	Pv	
• • • • • Route 35 • • • • •									
CM	2.1570	11.93	1.05	120		0.001495	13'-0	Pf	0.056
28	15'-11			31.265		PO(12'-3½)	24'-7½	Pe	
35	15'-11			31.321		PO(12'-3½)	37'-7½	Pv	
BL	1.6820	12.59	1.82	120		0.005546	106'-5½	Pf	0.659
35	15'-11	0.66		31.321		Flow (q) from Route 39	12'-4½	Pe	-0.434
30	16'-11			31.547		LtE(2'-5½), T(9'-11)	118'-10	Pv	
• • • • • Route 36 • • • • •									
BL	1.6820	38.70	5.59	120		0.044282	16'-3½	Pf	1.160
11	18'-6	51.76		26.455		Flow (q) from Route 1	9'-11	Pe	
14	18'-6			27.616		T(9'-11)	26'-2½	Pv	
BL	1.6820	19.52	2.82	120		0.012485	35'-3	Pf	0.687
14	18'-6			27.616			19'-9½	Pe	
16	18'-6			28.303		4LtE(2'-5½), T(9'-11)	55'-1	Pv	
BL	1.6820	38.70	5.59	120		0.044282	19'-7	Pf	1.525
16	18'-6	19.18		28.303		Flow (q) from Route 37	14'-10	Pe	1.120
20	15'-11			30.949		2LtE(2'-5½), PO(9'-11)	34'-5½	Pv	
• • • • • Route 37 • • • • •									
BL	1.6820	19.18	2.77	120		0.012083	37'-1	Pf	0.687
14	18'-6	19.52		27.616		Flow (q) from Route 36	19'-9½	Pe	
16	18'-6			28.303		4LtE(2'-5½), T(9'-11)	56'-11	Pv	
• • • • • Route 38 • • • • •									
BL	1.6820	13.52	1.95	120		0.006325	110'-0	Pf	0.899
24	15'-11			31.114		PO(9'-11)	32'-2	Pe	-0.885
19	17'-11½			31.128		5LtE(2'-5½), T(9'-11)	142'-2½	Pv	
• • • • • Route 39 • • • • •									
CM	2.1570	0.66	0.06	120		0.000007	12'-2	Pf	0.000
40	15'-11			31.321		PO(12'-3½)	24'-7½	Pe	
35	15'-11			31.321		PO(12'-3½)	36'-9½	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 Relief Valve
PRV	Pressure Reducing Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
SFx	Seismic Flex
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap