

Friction Loss											
New Galvanized Steel Pipe, Sch 40											
IPS Size											
1/2"				3/4"				1"			
O.D.= 0.84				O.D.= 1.05				O.D.= 1.315			
Wall= 0.109				Wall= 0.113				Wall= 0.133			
I.D.= 0.622				I.D.= 0.824				I.D.= 1.049			
GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')
0.5	0.53	0.00	0.4	1.5	0.90	0.01	0.8	2	0.74	0.01	0.4
1	1.06	0.02	1.5	2.0	1.20	0.02	1.4	3	1.11	0.02	0.9
1.5	1.58	0.04	3.2	2.5	1.50	0.04	2.1	4	1.49	0.03	1.5
2	2.11	0.07	5.4	3.0	1.81	0.05	2.9	5	1.86	0.05	2.3
2.5	2.64	0.11	8.2	3.5	2.11	0.07	3.9	6	2.23	0.08	3.3
3	3.17	0.16	11.5	4.0	2.41	0.09	5.0	8	2.97	0.14	5.5
3.5	3.70	0.21	15.2	4.5	2.71	0.11	6.2	10	3.71	0.21	8.4
4	4.22	0.28	19.5	5.0	3.01	0.14	7.5	12	4.46	0.31	11.7
4.5	4.75	0.35	24.3	6.0	3.61	0.20	10.5	14	5.20	0.42	15.6
5	5.28	0.43	29.5	7.0	4.21	0.28	14.0	16	5.94	0.55	20.0
5.5	5.81	0.53	35.2	8.0	4.81	0.36	17.9	18	6.68	0.70	24.9
6	6.34	0.63	41.4	9.0	5.42	0.46	22.3	20	7.43	0.86	30.2
6.5	6.86	0.73	48.0	10.0	6.02	0.56	27.1	22	8.17	1.04	36.1
7	7.39	0.85	55.0	11.0	6.62	0.68	32.4	24	8.91	1.24	42.4
7.5	7.92	0.98	62.5	12.0	7.22	0.81	38.0	26	9.65	1.45	49.2
8	8.45	1.11	70.5	13.0	7.82	0.95	44.1	28	10.40	1.68	56.4
8.5	8.98	1.26	78.9	14.0	8.43	1.11	50.6	30	11.14	1.93	64.1
9	9.51	1.41	87.7	16.0	9.63	1.44	64.8	35	13.00	2.63	85.3
9.5	10.03	1.57	96.9	18.0	10.83	1.83	80.5	40	14.85	3.44	109.2
10	10.56	1.74	106.5	20.0	12.04	2.26	97.9	45	16.71	4.35	135.8

Friction head loss in pipes from William & Hazen Equation.

C= 120

Friction Loss											
New Galvanized Steel Pipe, Sch 40											
IPS Size											
1-1/4"				1-1/2"				2"			
O.D.= 1.660				O.D.= 1.900				O.D.= 2.375			
Wall= 0.140				Wall= 0.145				Wall= 0.154			
I.D.= 1.380				I.D.= 1.610				I.D.= 2.067			
GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')
4.0	0.86	0.01	0.4	6	0.95	0.01	0.4	10	0.96	0.01	0.3
5.0	1.07	0.02	0.6	8	1.26	0.02	0.7	12	1.15	0.02	0.4
6.0	1.29	0.03	0.9	10	1.58	0.04	1.0	14	1.34	0.03	0.6
7.0	1.50	0.04	1.1	12	1.89	0.06	1.5	16	1.53	0.04	0.7
8.0	1.72	0.05	1.5	14	2.21	0.08	1.9	18	1.72	0.05	0.9
10.0	2.15	0.07	2.2	16	2.52	0.10	2.5	20	1.91	0.06	1.1
12.0	2.57	0.10	3.1	18	2.84	0.13	3.1	22	2.10	0.07	1.3
14.0	3.00	0.14	4.1	20	3.15	0.15	3.8	24	2.30	0.08	1.6
16.0	3.43	0.18	5.3	22	3.47	0.19	4.5	26	2.49	0.10	1.8
18.0	3.86	0.23	6.6	24	3.78	0.22	5.3	28	2.68	0.11	2.1
20.0	4.29	0.29	8.0	26	4.10	0.26	6.1	30	2.87	0.13	2.4
25.0	5.36	0.45	12.0	28	4.41	0.30	7.0	35	3.35	0.17	3.1
30.0	6.44	0.65	16.9	30	4.73	0.35	8.0	40	3.83	0.23	4.0
35.0	7.51	0.88	22.5	32	5.04	0.40	9.0	45	4.30	0.29	5.0
40.0	8.58	1.15	28.8	34	5.36	0.45	10.1	50	4.78	0.36	6.1
50.0	10.7	1.79	43.5	36	5.67	0.50	11.2	55	5.26	0.43	7.3
60.0	12.9	2.58	60.9	38	5.99	0.56	12.3	60	5.74	0.51	8.5
70.0	15.0	3.51	81.0	40	6.31	0.62	13.6	65	6.22	0.60	9.9
80.0	17.2	4.59	103.8	42	6.62	0.68	14.9	70	6.69	0.70	11.4
90.0	19.3	5.81	129.1	44	6.94	0.75	16.2	75	7.17	0.80	12.9
				46	7.25	0.82	17.6	80	7.65	0.91	14.5
				48	7.57	0.89	19.0	85	8.13	1.03	16.3
				50	7.88	0.97	20.5	90	8.61	1.15	18.1
				55	8.67	1.17	24.5	95	9.09	1.29	20.0
				60	9.46	1.39	28.8	100	9.56	1.42	22.0
				65	10.2	1.64	33.4	110	10.5	1.72	26.2
				70	11.0	1.90	38.3	120	11.5	2.05	30.8
				75	11.8	2.18	43.5	130	12.4	2.41	35.7
				80	12.6	2.48	49.0	140	13.4	2.79	41.0
				85	13.4	2.80	54.9	150	14.3	3.21	46.6
				90	14.2	3.14	61.0				

Friction head loss in pipes from William & Hazen Equation.

C= 120

Friction Loss											
New Galvanized Steel Pipe, Sch 40											
IPS Size											
2-1/2"				3"				4"			
O.D.= 2.875				O.D.= 3.500				O.D.= 4.5			
Wall= 0.203				Wall= 0.216				Wall= 0.237			
I.D.= 2.469				I.D.= 3.068				I.D.= 4.026			
GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')
20	1.34	0.03	0.5	30	1.30	0.03	0.35	60	1.51	0.04	0.3
25	1.68	0.04	0.7	35	1.52	0.04	0.46	80	2.02	0.06	0.6
30	2.01	0.06	1.0	40	1.74	0.05	0.59	100	2.52	0.10	0.9
35	2.35	0.09	1.3	45	1.95	0.06	0.73	120	3.03	0.14	1.2
40	2.68	0.11	1.7	50	2.17	0.07	0.89	140	3.53	0.19	1.6
45	3.02	0.14	2.1	60	2.60	0.11	1.25	160	4.03	0.25	2.0
50	3.35	0.17	2.6	70	3.04	0.14	1.66	180	4.54	0.32	2.5
55	3.69	0.21	3.1	80	3.47	0.19	2.13	200	5.04	0.40	3.1
60	4.02	0.25	3.6	90	3.91	0.24	2.65	220	5.55	0.48	3.7
65	4.36	0.30	4.2	100	4.34	0.29	3.22	240	6.05	0.57	4.3
70	4.69	0.34	4.8	120	5.21	0.42	4.51	260	6.55	0.67	5.0
75	5.03	0.39	5.4	140	6.08	0.58	6.00	280	7.06	0.78	5.8
80	5.36	0.45	6.1	160	6.95	0.75	7.7	300	7.56	0.89	6.6
85	5.70	0.51	6.8	180	7.81	0.95	9.6	320	8.07	1.01	7.4
90	6.03	0.57	7.6	200	8.68	1.17	11.6	340	8.57	1.14	8.3
95	6.4	0.63	8.4	220	9.55	1.42	13.9	360	9.08	1.28	9.2
100	6.7	0.70	9.3	240	10.42	1.69	16.3	380	9.58	1.43	10.2
110	7.4	0.85	11.0	260	11.29	1.98	18.9	400	10.1	1.58	11.2
120	8.0	1.01	13.0	280	12.15	2.30	21.7	420	10.6	1.75	12.2
130	8.7	1.18	15.0	300	13.02	2.64	24.6	460	11.6	2.09	14.5
140	9.4	1.37	17.3	320	13.89	3.01	27.7	500	12.6	2.47	16.9
160	10.7	1.79	22.1	340	14.76	3.39	31.0	550	13.9	2.99	20.2
180	12.1	2.27	27.5	360	15.63	3.80	34.5	600	15.1	3.56	23.7
200	13.4	2.80	33.4	380	16.50	4.24	38.1	650	16.4	4.18	27.5
220	14.7	3.39	39.9	400	17.36	4.70	41.9	700	17.6	4.85	31.5
240	16.1	4.03	46.8	420	18.2	5.18	45.9	750	18.9	5.57	35.8

Friction head loss in pipes from William & Hazen Equation.

C= 120

Friction Loss											
New Galvanized Steel Pipe, Sch 40											
IPS Size											
5"				6"				8"			
O.D.= 5.563				O.D.= 6.625				O.D.= 8.625			
Wall= 0.258				Wall= 0.280				Wall= 0.322			
I.D.= 5.047				I.D.= 6.065				I.D.= 7.981			
GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')
100	1.60	0.04	0.3	200	2.22	0.08	0.42	400	2.57	0.10	0.4
120	1.92	0.06	0.4	250	2.78	0.12	0.64	450	2.89	0.13	0.5
160	2.57	0.10	0.7	300	3.33	0.17	0.89	500	3.21	0.16	0.6
200	3.21	0.16	1.0	350	3.89	0.24	1.19	550	3.53	0.19	0.7
250	4.01	0.25	1.6	400	4.44	0.31	1.52	600	3.85	0.23	0.8
300	4.81	0.36	2.2	450	5.00	0.39	1.89	650	4.17	0.27	1.0
350	5.61	0.49	2.9	500	5.55	0.48	2.30	700	4.49	0.31	1.1
400	6.42	0.64	3.7	550	6.11	0.58	2.74	750	4.81	0.36	1.3
450	7.22	0.81	4.6	600	6.66	0.69	3.22	800	5.13	0.41	1.4
500	8.02	1.00	5.6	650	7.22	0.81	3.74	900	5.77	0.52	1.8
550	8.82	1.21	6.7	700	7.78	0.94	4.29	1000	6.41	0.64	2.2
600	9.62	1.44	7.9	750	8.33	1.08	4.87	1100	7.06	0.78	2.6
650	10.43	1.69	9.1	800	8.89	1.23	5.5	1200	7.70	0.92	3.1
700	11.23	1.96	10.5	850	9.44	1.39	6.1	1300	8.34	1.08	3.6
750	12.03	2.25	11.9	900	10.0	1.56	6.8	1400	8.98	1.26	4.1
800	12.8	2.57	13.4	950	10.6	1.73	7.6	1500	9.62	1.44	4.6
850	13.6	2.90	15.0	1000	11.1	1.92	8.3	1600	10.26	1.64	5.2
900	14.4	3.25	16.7	1100	12.2	2.33	9.9	1800	11.5	2.08	6.5
950	15.2	3.62	18.5	1200	13.3	2.77	11.6	2000	12.8	2.56	7.9
1000	16.0	4.01	20.3	1300	14.4	3.25	13.5	2200	14.1	3.10	9.4
1100	17.6	4.85	24.2	1400	15.6	3.77	15.5	2400	15.4	3.69	11.1
1200	19.2	5.77	28.5	1600	17.8	4.92	19.8	2600	16.7	4.33	12.8
1300	20.9	6.77	33.0	1800	20.0	6.23	24.7	2800	18.0	5.03	14.7
1400	22.5	7.86	37.9	2000	22.2	7.69	30.0	3000	19.2	5.77	16.7
1500	24.1	9.02	43.0	2200	24.4	9.30	35.8	3500	22.5	7.85	22.2
1600	25.7	10.26	48.5	2400	26.7	11.07	42.0	4000	25.7	10.26	28.5

Friction head loss in pipes from William & Hazen Equation.

C= 120

Friction Loss											
New Galvanized Steel Pipe, Sch 40											
IPS Size											
10"				12"				14"			
O.D.= 10.750				O.D.= 12.750				O.D.= 14.000			
Wall= 0.365				Wall= 0.406				Wall= 0.437			
I.D.= 10.020				I.D.= 11.938				I.D.= 13.126			
GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')	GPM	Velocity (ft/s)	Velocity Head (ft)	Friction Loss (ft/100')
700	2.85	0.13	0.4	1000	2.87	0.13	0.31	700	1.66	0.04	0.1
800	3.26	0.17	0.5	1100	3.15	0.15	0.37	800	1.90	0.06	0.1
900	3.66	0.21	0.6	1200	3.44	0.18	0.43	900	2.13	0.07	0.2
1000	4.07	0.26	0.7	1300	3.73	0.22	0.50	1000	2.37	0.09	0.2
1100	4.48	0.31	0.9	1400	4.01	0.25	0.57	1100	2.61	0.11	0.2
1200	4.88	0.37	1.0	1500	4.30	0.29	0.65	1200	2.85	0.13	0.3
1300	5.29	0.44	1.2	1600	4.59	0.33	0.74	1300	3.08	0.15	0.3
1400	5.70	0.51	1.3	1800	5.16	0.41	0.91	1400	3.32	0.17	0.4
1500	6.10	0.58	1.5	2000	5.73	0.51	1.11	1500	3.56	0.20	0.4
1600	6.51	0.66	1.7	2200	6.31	0.62	1.33	1600	3.79	0.22	0.5
1800	7.33	0.84	2.1	2400	6.88	0.74	1.56	1700	4.03	0.25	0.5
2000	8.14	1.03	2.6	2600	7.45	0.87	1.81	1800	4.27	0.28	0.6
2200	8.95	1.25	3.1	2800	8.03	1.00	2.07	1900	4.51	0.32	0.6
2400	9.77	1.49	3.7	3000	8.60	1.15	2.36	2000	4.74	0.35	0.7
2600	10.58	1.74	4.2	3500	10.0	1.57	3.13	2500	5.93	0.55	1.1
2800	11.4	2.02	4.9	4000	11.5	2.05	4.01	3000	7.11	0.79	1.5
3000	12.2	2.32	5.5	4500	12.9	2.59	4.99	3500	8.30	1.07	2.0
3200	13.0	2.64	6.2	5000	14.3	3.20	6.07	4000	9.49	1.40	2.5
3400	13.8	2.98	7.0	5500	15.8	3.87	7.24	4500	10.7	1.77	3.1
3600	14.7	3.34	7.7	6000	17.2	4.61	8.5	5000	11.9	2.19	3.8
3800	15.5	3.73	8.6	6500	18.6	5.41	9.9	6000	14.2	3.15	5.4
4000	16.3	4.13	9.4	7000	20.1	6.27	11.3	7000	16.6	4.29	7.1
4500	18.3	5.22	11.7	7500	21.5	7.20	12.9	8000	19.0	5.61	9.1
5000	20.3	6.45	14.2	8000	22.9	8.19	14.5	9000	21.3	7.10	11.4
5500	22.4	7.80	17.0	8500	24.4	9.25	16.2	10000	23.7	8.76	13.8
6000	24.4	9.29	19.9	9000	25.8	10.37	18.0	11000	26.1	10.60	16.5

Friction head loss in pipes from William & Hazen Equation.

C= 120