Friction Loss in Pipe Fittings - Plastic Pipe, Schedule 40

Fitting	Condition	L_E/d	Friction Loss for Water in Terms of Equivalent Length of Straight Pipe - feet												
			Nominal Pipe Size, inch												
			1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	3-1/2	4	5
			Actual Inside Pipe Diameter, inch												
			0.364	0.493	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	3.548	4.026	5.047
90° Standard Elbow	- - -	30	0.91	1.23	1.56	2.06	2.62	3.45	4.03	5.17	6.17	7.67	8.87	10.1	12.6
90° Long Radius Elbow	- - -	18	0.55	0.74	0.93	1.24	1.57	2.07	2.42	3.10	3.70	4.60	5.32	6.04	7.57
90° Sharp Elbow	- - -	60	1.82	2.47	3.11	4.12	5.25	6.90	8.05	10.3	12.3	15.3	17.7	20.1	25.2
90° Street Elbow	- - -	50	1.52	2.05	2.59	3.43	4.37	5.75	6.71	8.61	10.3	12.8	14.8	16.8	21.0
90° Sharp Corner Street Elbow	- - -	57	1.73	2.34	2.95	3.91	4.98	6.56	7.65	9.82	11.7	14.6	16.9	19.1	24.0
45° Standard Elbow	- - -	15	0.46	0.62	0.78	1.03	1.31	1.73	2.01	2.58	3.09	3.84	4.44	5.03	6.31
45° Street Elbow	- - -	26	0.79	1.07	1.35	1.79	2.27	2.99	3.49	4.48	5.35	6.65	7.69	8.72	10.9
90° Bends, Pipe Bends, Flanged Elbows, Butt-welded Elbows r/d = bend radius/ pipe diameter	r/d = 1	18	0.55	0.74	0.93	1.24	1.57	2.07	2.42	3.10	3.70	4.60	5.32	6.04	7.57
	r/d = 1-1/2	12	0.36	0.49	0.62	0.82	1.05	1.38	1.61	2.07	2.47	3.07	3.55	4.03	5.05
	r/d = 2	10	0.30	0.41	0.52	0.69	0.87	1.15	1.34	1.72	2.06	2.56	2.96	3.36	4.21
	r/d = 3	11	0.33	0.45	0.57	0.76	0.96	1.27	1.48	1.89	2.26	2.81	3.25	3.69	4.63
	r/d = 4	11	0.33	0.45	0.57	0.76	0.96	1.27	1.48	1.89	2.26	2.81	3.25	3.69	4.63
	r/d = 6	13	0.39	0.53	0.67	0.89	1.14	1.50	1.74	2.24	2.67	3.32	3.84	4.36	5.47
	r/d = 8	16	0.49	0.66	0.83	1.10	1.40	1.84	2.15	2.76	3.29	4.09	4.73	5.37	6.7
	r/d = 10	30	0.91	1.23	1.56	2.06	2.62	3.45	4.03	5.17	6.17	7.67	8.87	10.1	12.6
	r/d = 12	34	1.03	1.40	1.76	2.33	2.97	3.91	4.56	5.86	7.00	8.69	10.1	11.4	14.3
	r/d = 14	38	1.15	1.56	1.97	2.61	3.32	4.37	5.10	6.55	7.82	9.72	11.2	12.7	16.0
90° Bends, Pipe Bends, Flanged Elbows, Butt-welded Elbows	r/d = 16	42	1.27	1.73	2.18	2.88	3.67	4.83	5.64	7.23	8.64	10.7	12.4	14.1	17.7
	r/d = 18	45	1.37	1.85	2.33	3.09	3.93	5.18	6.04	7.75	9.26	11.5	13.3	15.1	18.9
	r/d = 20	50	1.52	2.05	2.59	3.43	4.37	5.75	6.71	8.61	10.3	12.8	14.8	16.8	21.0
Mitre Bends	a = 0°	2	0.06	0.08	0.10	0.14	0.17	0.23	0.27	0.34	0.41	0.51	0.59	0.67	0.84
	a = 15°	4	0.12	0.16	0.21	0.27	0.35	0.46	0.54	0.69	0.82	1.02	1.18	1.34	1.68
	a = 30°	8	0.24	0.33	0.41	0.55	0.70	0.92	1.07	1.38	1.65	2.05	2.37	2.68	3.36
	a = 45°	15	0.46	0.62	0.78	1.03	1.31	1.73	2.01	2.58	3.09	3.84	4.44	5.03	6.31
	a = 60°	27	0.82	1.11	1.40	1.85	2.36	3.11	3.62	4.65	5.56	6.90	7.98	9.06	11.4
	a = 75°	40	1.21	1.64	2.07	2.75	3.50	4.60	5.37	6.89	8.23	10.2	11.8	13.4	16.8
	a = 90°	60	1.82	2.47	3.11	4.12	5.25	6.90	8.05	10.34	12.3	15.3	17.7	20.1	25.2
	2-90°	20	0.61	0.82	1.04	1.37	1.75	2.30	2.68	3.45	4.12	5.11	5.91	6.71	8.41
	3-90°	15	0.46	0.62	0.78	1.03	1.31	1.73	2.01	2.58	3.09	3.84	4.44	5.03	6.31
180° Bend (Close Return Bend)	Small Radius	75	2.28	3.08	3.89	5.15	6.56	8.63	10.1	12.9	15.4	19.2	22.2	25.2	31.5
	Large Radius	50	1.52	2.05	2.59	3.43	4.37	5.75	6.71	8.61	10.3	12.8	14.8	16.8	21.0
Standard Tee	Thru Flow	20	0.61	0.82	1.04	1.37	1.75	2.30	2.68	3.45	4.12	5.11	5.91	6.71	8.41
	Branch Flow	60	1.82	2.47	3.11	4.12	5.25	6.90	8.05	10.3	12.3	15.3	17.7	20.1	25.2
Welding Tee	Forged	45	1.37	1.85	2.33	3.09	3.93	5.18	6.04	7.75	9.26	11.5	13.3	15.1	18.9
	Mitre	60	1.82	2.47	3.11	4.12	5.25	6.90	8.05	10.3	12.3	15.3	17.7	20.1	25.2
Angle Valve	Full Open	158	4.79	6.49	8.19	10.8	13.8	18.2	21.2	27.2	32.5	40.4	46.7	53.0	66.5
	Full Open - Disc	200	6.07	8.22	10.4	13.7	17.5	23.0	26.8	34.5	41.2	51.1	59.1	67.1	84.1