Equivalent Length of Straight Pipe for Various Fittings
Turbulent Flow Only

FITTINGS			PIPE SIZE											
			1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5
REGULAR 90° ELL	SCREWED	STEEL	2.3	3.1	3.6	4.4	5.2	6.6	7.4	8.5	9.3	11.0	13.0	
		C.I.										9.0	11.0	
	FLANGED	STEEL			.92	1.2	1.6	2.1	2.4	3.1	3.6	4.4	5.9	7.3
		C.I.										3.6	4.8	
LONG RADIUS 90° ELL	SCREWED	STEEL	1.5	2.0	2.2	2.3	2.7	3.2	3.4	3.6	3.6	4.0	4.6	
		C.I.										3.3	3.7	
	FLANGED	STEEL			1.1	1.3	1.6	2.0	2.3	2.7	2.9	3.4	4.2	5.0
		C.I.										2.8	3.4	
REGULAR 45° ELL	SCREWED	STEEL	.34	.52	.71	.92	1.3	1.7	2.1	2.7	3.2	4.0	5.5	
		C.I.										3.3	4.5	
	FLANGED	STEEL			.45	.59	.81	1.1	1.3	1.7	2.0	2.6	3.5	4.5
		C.I.										2.1	2.9	
TEE-LINE FLOW	SCREWED	STEEL	.79	1.2	1.7	2.4	3.2	4.6	5.6	7.7	9.3	12.0	17.0	
		C.I.										9.9	14.0	
	FLANGED	STEEL			.69	.82	1.0	1.3	1.5	1.8	1.9	2.2	2.8	3.3
		C.I.										1.9	2.2	
TEE-BRANCH FLOW	SCREWED	STEEL	2.4	3.5	4.2	5.3	6.6	8.7	9.9	12.0	13.0	17.0	21.0	
		C.I.										14.0	17.0	
	FLANGED	STEEL			2.0	2.6	3.3	4.4	5.2	6.6	7.5	9.4	12.0	15.0
		C.I.										7.7	10.0	
180° RETURN BEND	SCREWED	STEEL	2.3	3.1	3.6	4.4	5.2	6.6	7.4	8.5	9.3	11.0	13.0	
		C.I.										9.0	11.0	
	REG FLANGED	STEEL			.92	1.2	1.6	2.1	2.4	3.1	3.6	4.4	5.9	7.3
		C.I.										3.6	4.8	
	LONG RAD. FLANGED	STEEL			1.1	1.3	1.6	2.0	2.3	2.7	2.9	3.4	4.2	5.0
		C.I.										2.8	3.4	
GLOBE VALVE	SCREWED	STEEL	21.0	22.0	22.0	24.0	29.0	37.0	42.0	54.0	62.0	79.0	110.0	
		C.I.										65.0	86.0	
	FLANGED	STEEL			38.0	40.0	45.0	54.0	59.0	70.0	77.0	94.0	120.0	150.0
		C.I.										77.0	99.0	
GATE VALVE	SCREWED	STEEL	.32	.45	.56	.67	.84	1.1	1.2	1.5	1.7	1.9	2.5	
		C.I.										1.6	2.0	
	FLANGED	STEEL								2.6	2.7	2.8	2.9	3.1
		C.I.										2.3	2.4	
ANGLE VALVE	SCREWED	STEEL	12.8	15.0	15.0	15.0	17.0	18.0	18.0	18.0	18.0	18.0	18.0	
		C.I.										15.0	15.0	
	FLANGED	STEEL			15.0	15.0	17.0	18.0	18.0	21.0	22.0	28.0	38.0	50.0
		C.I.										23.0	31.0	
SWING CHECK VALVE	SCREWED	STEEL	7.2	7.3	8.0	8.8	11.0	13.0	15.0	19.0	22.0	27.0	38.0	
		C.I.										22.0	31.0	
	FLANGED	STEEL			3.8	5.3	7.2	10.0	12.0	17.0	21.0	27.0	38.0	50.0
		C.I.										22.0	31.0	
COUPLING OR UNION	SCREWED	STEEL	.14	.18	.21	.24	.29	.36	.39	.45	.47	.53	.65	
		C.I.										.44	.52	
	BELL MOUTH INLET	STEEL	.04	.07	.10	.13	.18	.26	.31	.43	.52	.67	.95	1.3
		C.I.										.55	.77	
	SQUARE MOUTH INLET	STEEL	.44	.68	.96	1.3	1.8	2.6	3.1	4.3	5.2	6.7	9.5	13.0
		C.I.										5.5	7.7	
	RE-ENTRANT PIPE	STEEL	.88	1.4	1.9	2.6	3.6	5.1	6.2	8.5	10.0	13.0	19.0	25.0
		C.I.										11.0	15.0	
	SUDDEN ENLARGEMENT	$h = \frac{(V_1 - V_2)^2}{2g}$ FEET OF FLUID; IF V^2 - 0 $h = \frac{V_1^2}{2g}$ FEET OF FLUID												