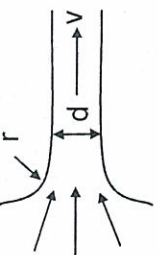
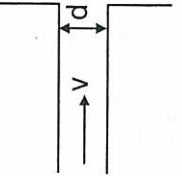
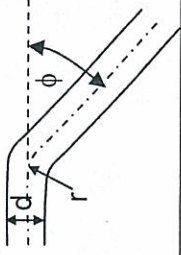
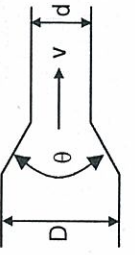
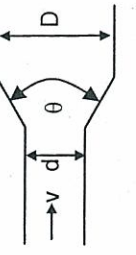


Appendix A1

Loss Coefficients For Minor Losses

DESCRIPTION AND FORMULA	SKETCH	OPTION	K
Pipe Entrance $h_f = K \frac{v^2}{2g}$		r/d 0.0 0.1 >0.2 Protruding	0.5 0.12 0.03 0.8
Pipe Exit $h_f = K \frac{v^2}{2g}$		Sharp Protruding Rounded	1.0 1.0 0.2
Bends $h_f = K \frac{v^2}{2g}$		r/d Sharp 1 2 6	$\Phi=30^\circ$ 0.16 0.07 0.07 0.06 45° 0.32 0.13 0.10 0.08 60° 0.68 0.18 0.12 0.08 90° 1.27 0.22 0.13 0.08
Contraction $h_f = K \frac{v^2}{2g}$		d/D 0.0 0.2 0.4 0.6 0.8 0.9	$\theta = 60^\circ$ 0.08 0.08 0.07 0.06 0.05 0.04 $\theta = 180^\circ$ 0.50 0.49 0.42 0.32 0.18 0.10
Expansion $h_f = K \frac{v^2}{2g}$		d/D 0.0 0.2 0.4 0.6 0.8	$\theta = 10^\circ$ 1.00 0.13 0.11 0.06 0.03 $\theta = 180^\circ$ 1.00 0.92 0.72 0.42 0.16
Valves	Sluice	Opening $\frac{1}{4}$	$\frac{3}{4}$ full
	Butterfly	24	5.6 1.0 0.2
	Globe	120	7.5 1.2 0.3
	Needle	160	40 20 10
	Reflux	4	1 0.6 0.5
Threaded pipe fittings			1-2 1/2
	Globe valve	open	10
	Gate (sluice)	open	0.2
	Return Bend		2.2
	T-piece		1.8
	90° elbow		0.9
	45° elbow		0.4