Minor Losses

Here are some sample loss coefficients for various minor loss components. More values are listed in Table 8-4 of the Çengel-Cimbala textbook:

Pipe Inlet

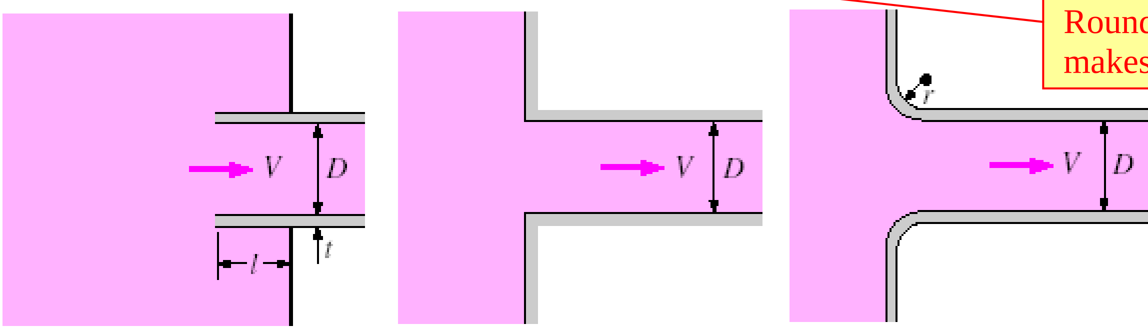
Reentrant: $K_L = 0.80$ ($t \ll D$ and $l \approx 0.1D$)

Sharp-edged: $K_L = 0.50$

Well-rounded ($r/D > 0.2$): $K_L = 0.03$

Slightly rounded ($r/D = 0.1$): $K_L = 0.12$ (see Fig. 8–36)

Rounding of an inlet makes a big difference.



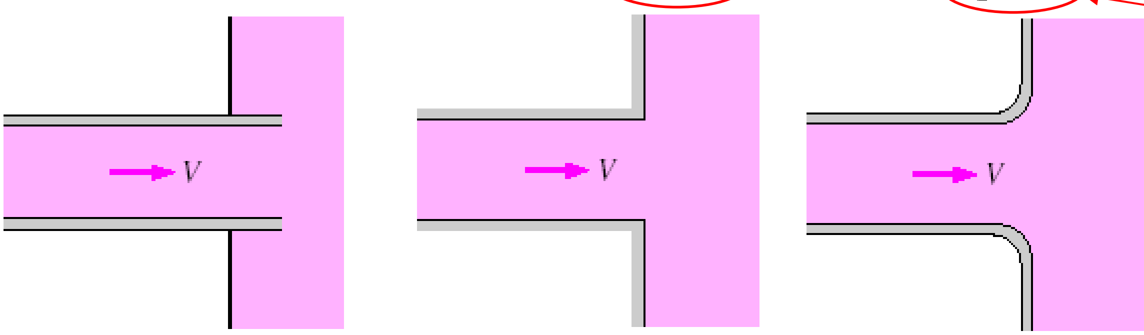
Pipe Exit

Reentrant: $K_L = \alpha$

Sharp-edged: $K_L = \alpha$

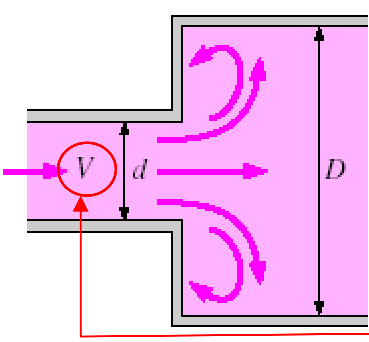
Rounded: $K_L = \alpha$

Rounding of an outlet makes no difference.



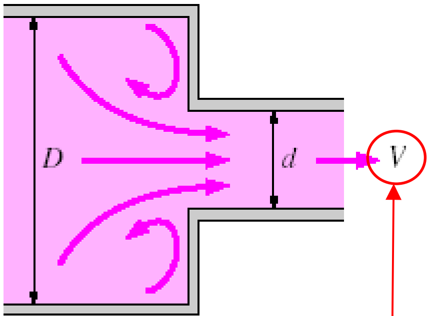
Sudden Expansion and Contraction (based on the velocity in the smaller-diameter pipe)

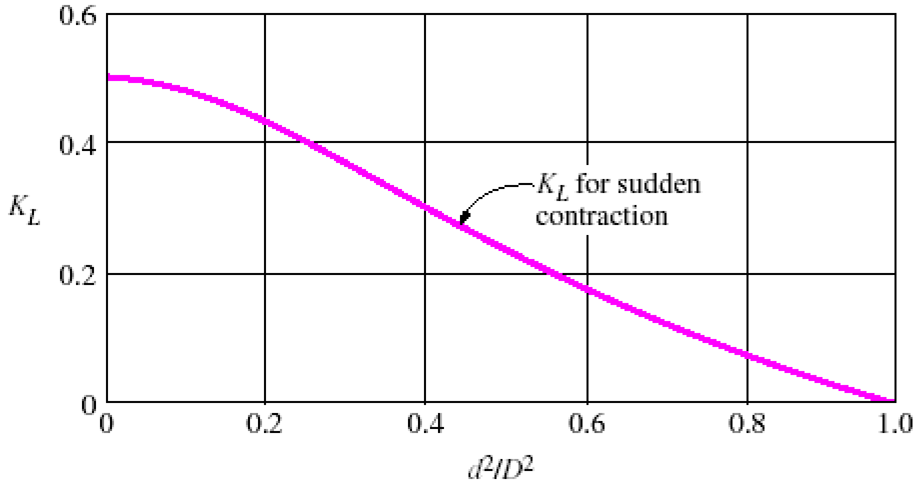
Sudden expansion: $K_L = \left(1 - \frac{d^2}{D^2}\right)^2 \alpha$



Note that the *larger velocity* (the velocity associated with the *smaller pipe section*) is used by convention in the equation for minor head loss, i.e., $h_{L,\text{ minor}} = K_L \frac{V^2}{2g}$.

Sudden contraction: See chart.





Note again that the *larger velocity* (the velocity associated with the *smaller pipe section*) is used by convention in the equation for minor head loss, i.e., $h_{L,\,\text{minor}} = K_L \dfrac{V^2}{2g}$.

Gradual Expansion and Contraction (based on the velocity in the smaller-diameter pipe)

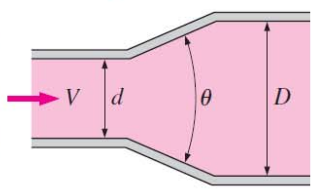
Expansion (for $\theta = 20°$):

$K_L = 0.30$ for $d/D = 0.2$

$K_L = 0.25$ for $d/D = 0.4$

$K_L = 0.15$ for $d/D = 0.6$

$K_L = 0.10$ for $d/D = 0.8$

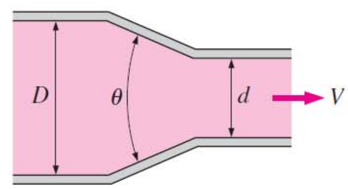


Contraction:

$K_L = 0.02$ for $\theta = 30°$

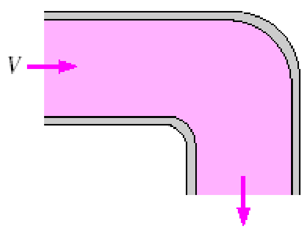
$K_L = 0.04$ for $\theta = 45°$

$K_L = 0.07$ for $\theta = 60°$

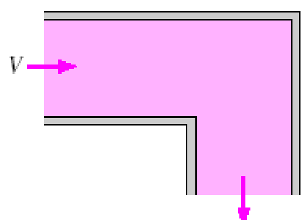


Bends and Branches

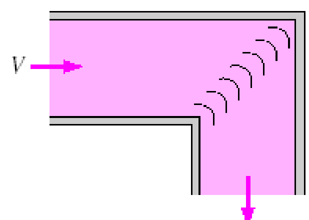
90° smooth bend:
Flanged: $K_L = 0.3$
Threaded: $K_L = 0.9$



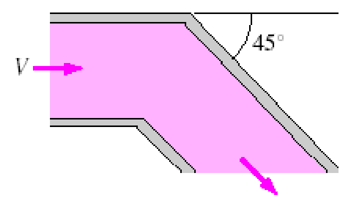
90° miter bend
(without vanes): $K_L = 1.1$



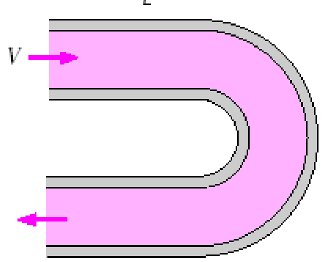
90° miter bend
(with vanes): $K_L = 0.2$



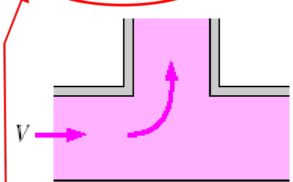
45° threaded elbow:
$K_L = 0.4$



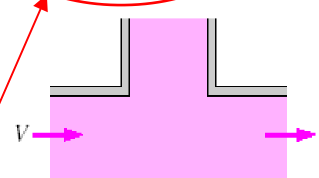
180° return bend:
Flanged: $K_L = 0.2$
Threaded: $K_L = 1.5$



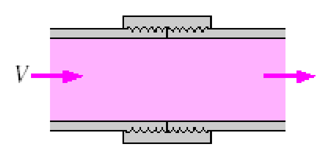
Tee (branch flow):
Flanged: $K_L = 1.0$
Threaded: $K_L = 2.0$



Tee (line flow):
Flanged: $K_L = 0.2$
Threaded: $K_L = 0.9$



Threaded union:
$K_L = 0.08$



For tees, there are two values of K_L, one for *branch flow* and one for *line flow*.