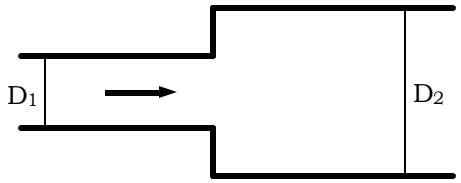
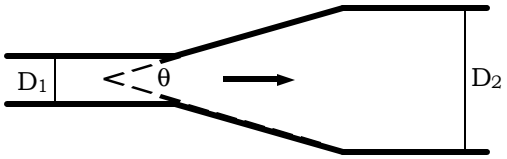
PÉRDIDAS SINGULARES EN TUBERÍAS

ENSANCHE BRUSCO

$$\Lambda = k\frac{v_1^2}{2g}, \quad k = \left(1-\beta^2\right)^2, \quad \beta = \frac{D_1}{D_2}$$



ENSANCHE PAULATINO



$\theta < 45°$ $\quad Re_1 < 4000 \quad k = 5{,}2\left(1-\beta^4\right)sen\left(\frac{\theta}{2}\right)$

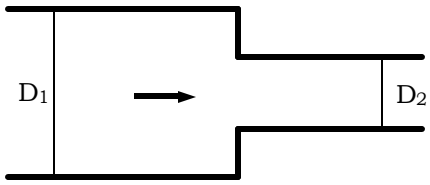
$\quad Re_1 > 4000 \quad k = 2{,}6\left(1+3{,}2f_1\right)\left(1-\beta^2\right)sen\left(\frac{\theta}{2}\right)$

$45° < \theta < 180°$ $\quad Re_1 < 4000 \quad k = 2\left(1-\beta^4\right)$

$\quad Re_1 > 4000 \quad k = \left(1+3{,}2f_1\right)\left(1-\beta^2\right)$

f_1 es el factor de fricción de la tubería con diámetro D_1

CONTRACCIÓN BRUSCA



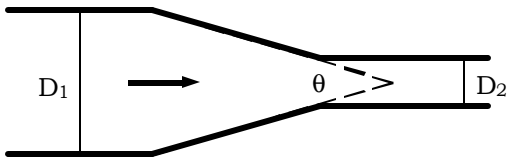
$Re_1 < 2500 \quad k = \left(1{,}2+\frac{160}{Re_1}\right)\left(\beta^4-1\right)$

$Re_1 > 2500 \quad k = \left(0{,}6+0{,}8f_1\right)\left(\beta^2-1\right)\beta^2$

CONTRACCIÓN REDONDEADA

$$k = \left(0{,}1+\frac{50}{Re_1}\right)\left(\beta^4-1\right)$$

CONTRACCIÓN PAULATINA



$\theta < 45°$ $\quad Re_1 < 2500 \quad k = 1{,}6\left(1{,}2 + \frac{160}{Re_1}\right)(\beta^4 - 1)\,sen\left(\frac{\theta}{2}\right)$

$\quad Re_1 > 2500 \quad k = 1{,}6(0{,}6 + 1{,}92 f_1)\beta^2(\beta^2 - 1)\,sen\left(\frac{\theta}{2}\right)$

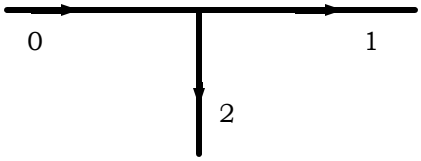
$45° < \theta < 180°$ $\quad Re_1 < 2500 \quad k = \left(1{,}2 + \frac{160}{Re_1}\right)(\beta^4 - 1)\sqrt{sen\left(\frac{\theta}{2}\right)}$

$\quad Re_1 > 2500 \quad k = (0{,}6 + 1{,}92 f_1)\beta^2(\beta^2 - 1)\sqrt{sen\left(\frac{\theta}{2}\right)}$

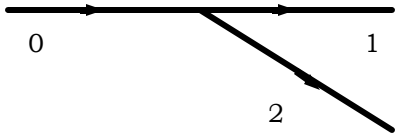
DERIVACIONES

$$\Lambda_{0-1} = k_1 \frac{v_0^2}{2g} \qquad \Lambda_{0-2} = k_2 \frac{v_0^2}{2g}$$

$T_{90°}$



$T_{45°}$

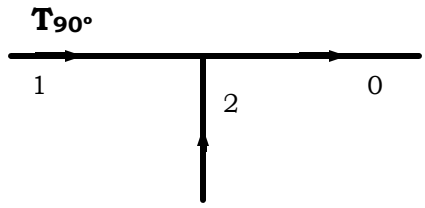


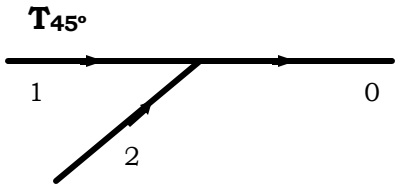
	Q_1/Q_0	0,0	0,2	0,4	0,6	0,8	1,0
	Q_2/Q_0	1,0	0,8	0,6	0,4	0,2	0,0
$T_{90°}$	k_1	0,40	0,35	0,20	0,10	0,05	0,05
	k_2	1,30	1,10	0,96	0,90	0,88	0,96
$T_{45°}$	k_1	0,45	0,40	0,25	0,15	0,10	0,08
	k_2	0,35	0,30	0,33	0,47	0,66	0,90

Todos las tuberías son de igual diámetro

CONFLUENCIAS

$$\Lambda_{1-0} = k_1 \frac{v_0^2}{2g} \qquad \Lambda_{2-0} = k_2 \frac{v_0^2}{2g}$$





	Q_1/Q_0	0,0	0,2	0,4	0,6	0,8	1,0
	Q_2/Q_0	1,0	0,8	0,6	0,4	0,2	0,0
$T_{90°}$	k_1	0,60	0,50	0,40	0,30	0,18	0,05
	k_2	0,91	0,72	0,47	0,30	0,10	0,00
$T_{45°}$	k_1	0,60	0,50	0,40	0,30	0,18	0,05
	k_2	0,50	0,40	0,25	0,20	0,10	0,00