

**Université de Batna 2**  
**Faculté de technologie**  
**Département d'hydraulique**



**Module : (ouvrage de prise d'eau et ses dérivations)**

Charge de module Takkouk Saddok

Master 1 option Ouvrage Hydraulique (OH)

Semestre S2

## Chapitre 3

Organes accessoires (pièces spéciales, sectionnement, régulation de débit et de pression etc....)

### Conduites



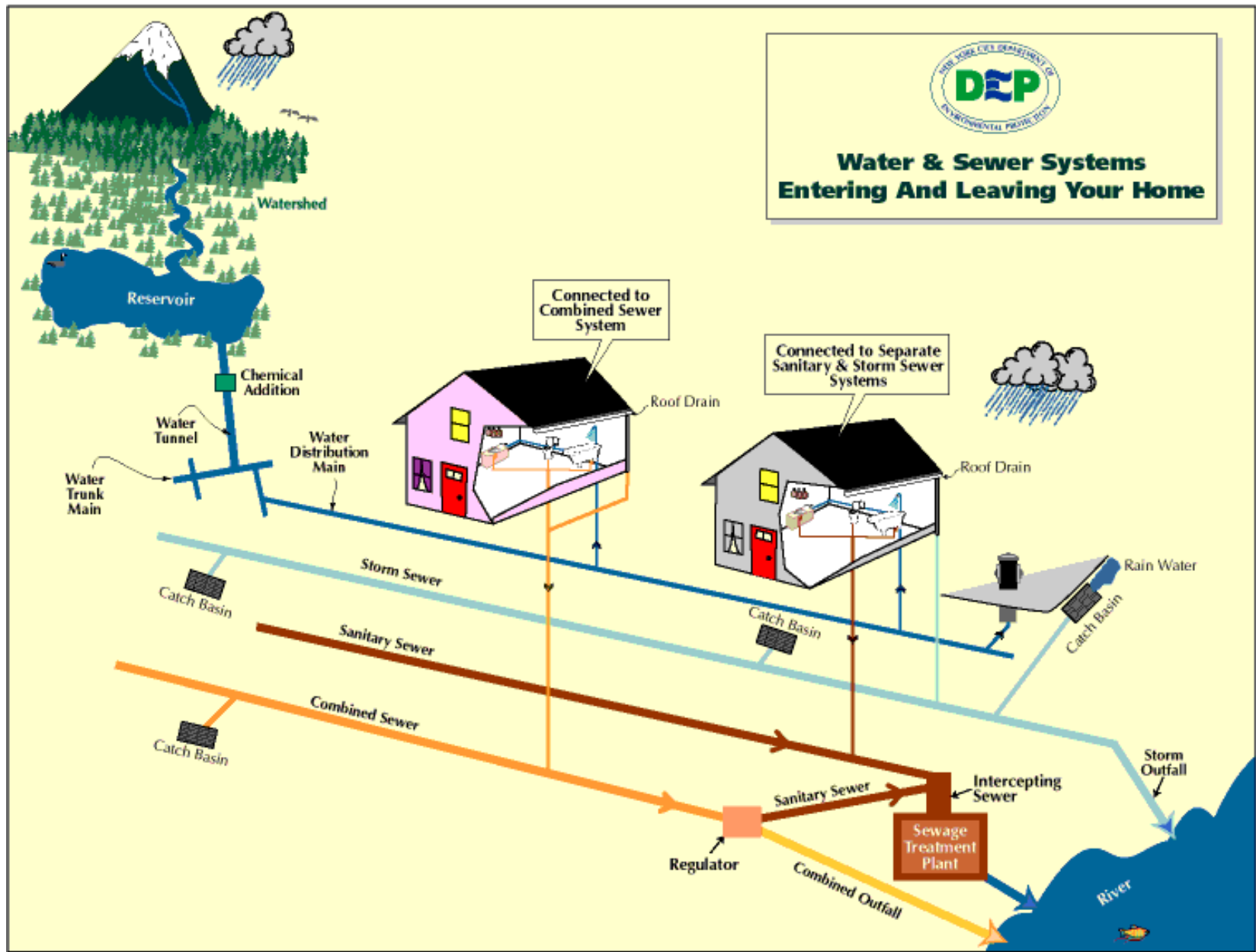
## Technologie des conduits (conduites, galeries et tunnels)



(a)



(b)





## Les Pertes de charge dans les vannes

$$E_v = K \frac{U^2}{2}$$

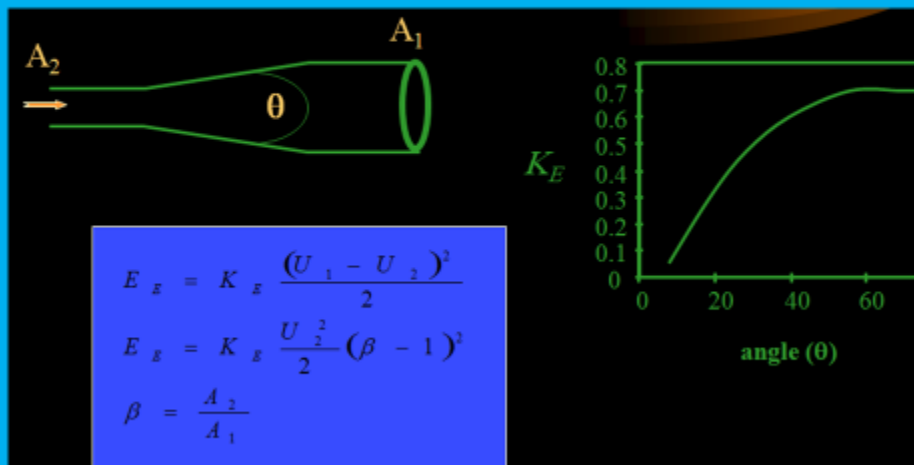
$$h_v = \frac{\Delta p}{\rho} = K_v \frac{U^2}{2} = 2f \frac{L_{eq}}{D} \frac{U^2}{g}$$



## Friction Loss Factors for valves

Valve	K	$L_{eq}/D$
Gate valve, wide open	0.15	7
Gate valve, 3/4 open	0.85	40
Gate valve, 1/2 open	4.4	200
Gate valve, 1/4 open	20	900
Globe valve, wide open	7.5	350

## Pertes de charge due an élargissement

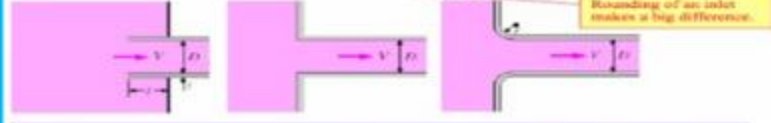


# Pertes de Charges singulieres

## Minor Losses

Here are some sample loss coefficients for various minor loss components. More values are listed in Table 8-4, page 350 of the Çengel-Cimbala textbook:

**Pipe Inlet**  
 Reentrant:  $K_L = 0.80$  ( $L \ll D$  and  $f = 0.1D$ )  
 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)



**Pipe Exit**  
 Reentrant:  $K_L = 0$   
 Sharp-edged:  $K_L = 0$   
 Rounded:  $K_L = 0$



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

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



Note that the larger velocity (the velocity associated with the smaller pipe section) is used by contraction in the equation for minor head loss, i.e.,  $K_L = K_c \frac{v^2}{2g}$ .

11

**Sudden contraction: See chart.**

**Note:** These are backwards. The  $K_L$  values listed for Expansion should be those for Contraction, and vice-versa.

**Note:** Note again that the larger velocity (the velocity associated with the smaller pipe section) is used by contraction in the equation for minor head loss, i.e.,  $K_L = K_c \frac{v^2}{2g}$ .

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

**Expansion:**  
 $K_L = 0.427$  for  $\theta = 20^\circ$   
 $K_L = 0.04$  for  $\theta = 45^\circ$   
 $K_L = 0.427$  for  $\theta = 60^\circ$

**Contraction (for  $\theta = 20^\circ$ ):**  
 $K_L = 0.30$  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  $d/D = 0.8$

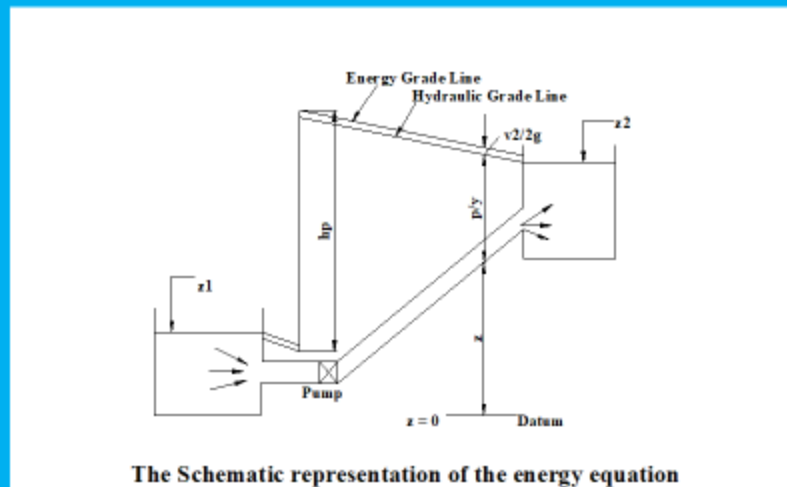
**These are for contractions:**

**These are for expansions:**

<b>Reels and Elbows</b> 90° smooth bend Flanged: $K_L = 0.3$ Threaded: $K_L = 0.9$	90° miter bend (without vane): $K_L = 1.1$	90° miter bend (with vane): $K_L = 0.2$	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: $K_L = 0.06$

**For tees, there are two values of  $K_L$ , use the branch flow and use the line flow.**

**Le schéma représente l'équation d'énergie**



**The Schematic representation of the energy equation**