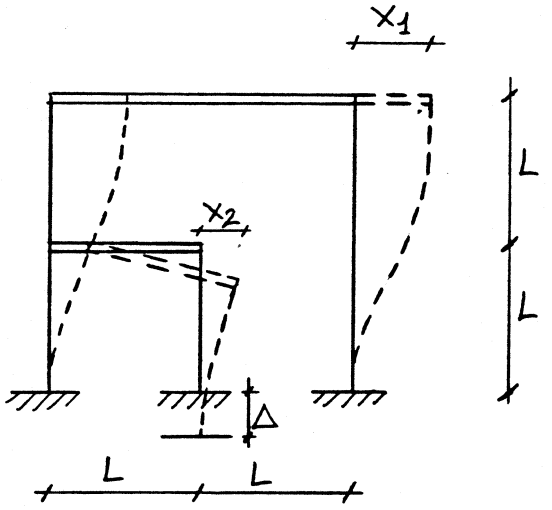
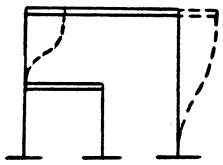
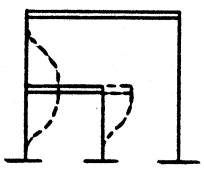
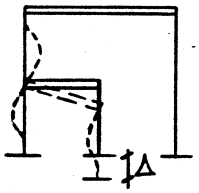
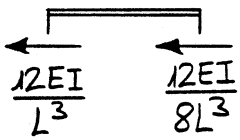
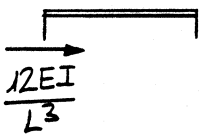
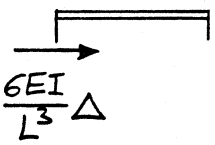
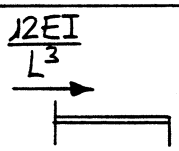
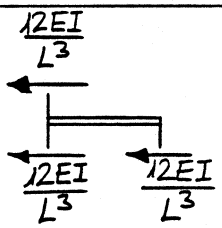
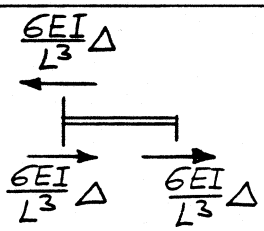
Structure à 2 degrés de liberté en translation:



causes / effets	$X_1 = 1$	$X_2 = 1$	
			
Forces selon X_1	 $\frac{12EI}{L^3}$ $\frac{12EI}{8L^3}$	 $\frac{12EI}{L^3}$	 $\frac{6EI}{L^3}\Delta$
Forces selon X_2	 $\frac{12EI}{L^3}$	 $\frac{12EI}{L^3}$ $\frac{12EI}{L^3}$ $\frac{12EI}{L^3}$	 $\frac{6EI}{L^3}\Delta$ $\frac{6EI}{L^3}\Delta$ $\frac{6EI}{L^3}\Delta$

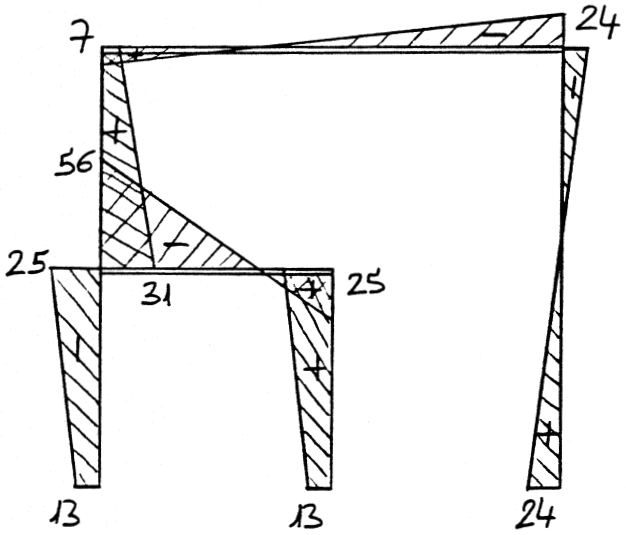
Conditions d'équilibre:

$$\frac{27EI}{2L^3}X_1 - \frac{12EI}{L^3}X_2 - \frac{6EI}{L^3}\Delta = 0$$

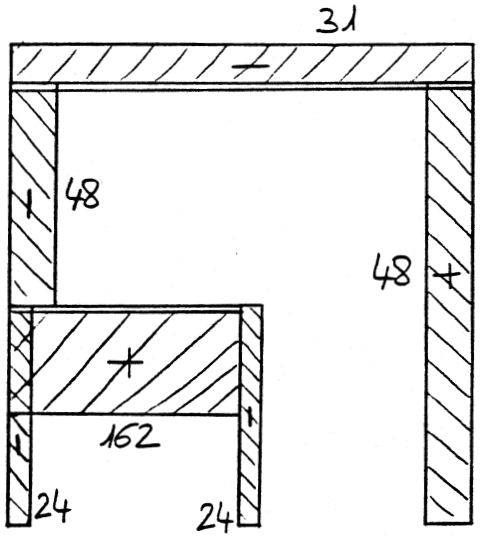
$$-\frac{12EI}{L^3}X_1 + \frac{36EI}{L^3}X_2 - \frac{6EI}{L^3}\Delta = 0$$

$$\longrightarrow \quad X_1 = \frac{32}{38}\Delta \qquad X_2 = \frac{17}{38}\Delta$$

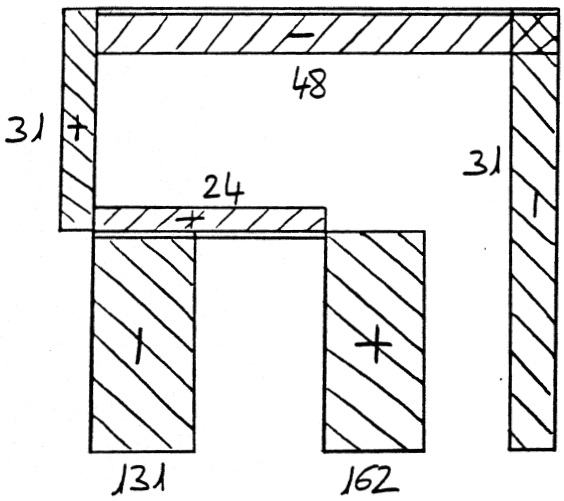
Structure à 2 degrés de liberté en translation:



M $\left[\frac{EI}{19L^2}\Delta\right]$

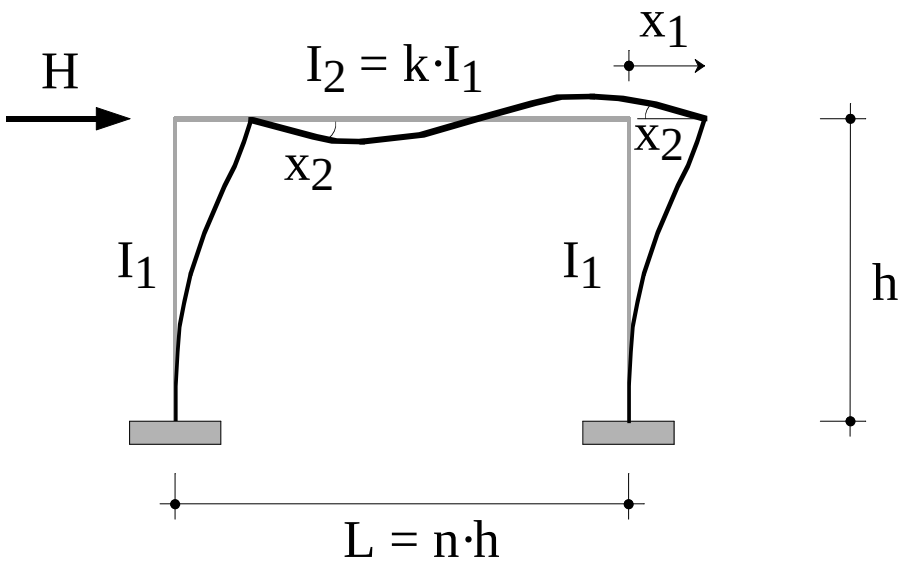


Q $\left[\frac{EI}{38L^3}\Delta\right]$



N $\left[\frac{EI}{38L^3}\Delta\right]$

Cadre bi-encastré sollicité horizontalement:



Causes / Effets	$X_1 = 1$	$X_2 = 1$	H
Forces selon X_1	$\frac{12EI_1}{h^3}$ $\frac{12EI_1}{h^3}$	$\frac{6EI_1}{h^2}$ $\frac{6EI_1}{h^2}$	H
Moments selon X_2	$\frac{6EI_1}{h^2}$	$\frac{4EI_1}{h}$ $\frac{6EI_2}{L}$	

Conditions d'équilibre :

$$-H + \frac{24\,EI_1}{h^3}x_1 - \frac{12\,EI_1}{h^2}x_2 = 0$$

$$-\frac{6\,EI_1}{h^2}x_1 + \left(\frac{6\,EI_2}{L} + \frac{4\,EI_1}{h}\right)x_2 = 0$$

avec: $I_2 = k \cdot I_1$ et $L = n \cdot h$

$$X_1 = \frac{H\,h^3}{24\,EI_1}\left(1 - \frac{3}{6\,\frac{k}{n} + 4}\right)^{-1}$$