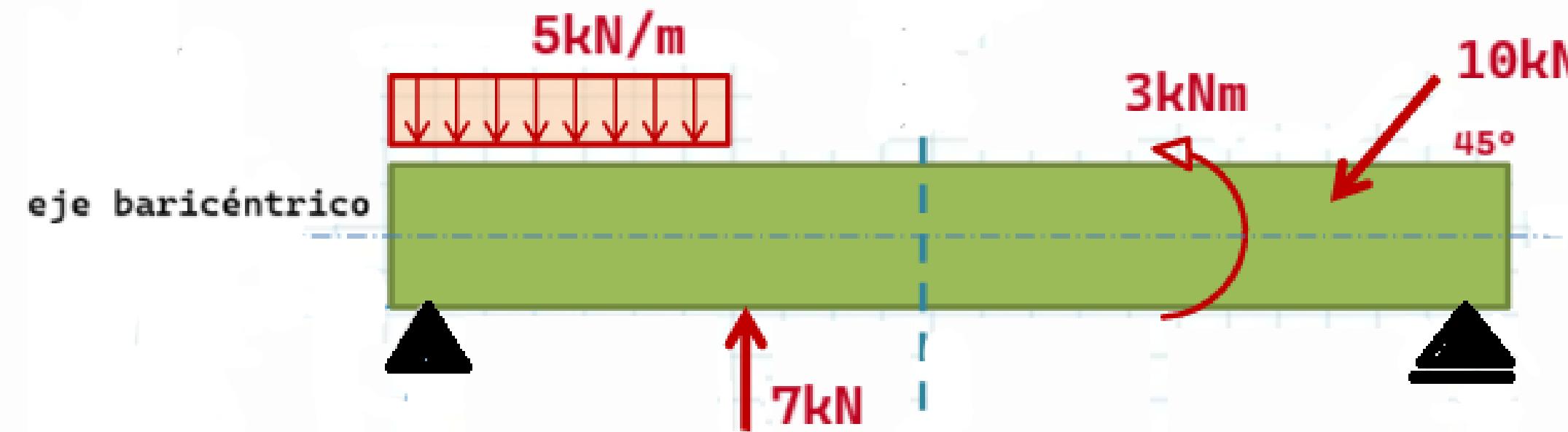


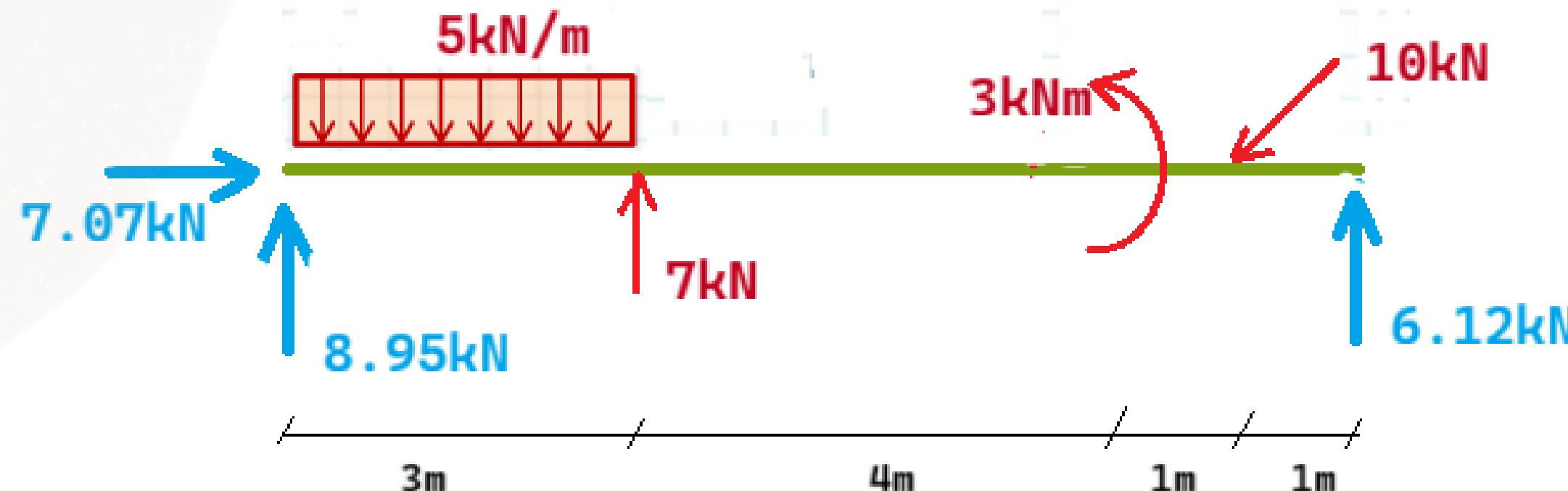
# Presentación ESFUERZOS INTERNAOS

Realizado por:  
Marta

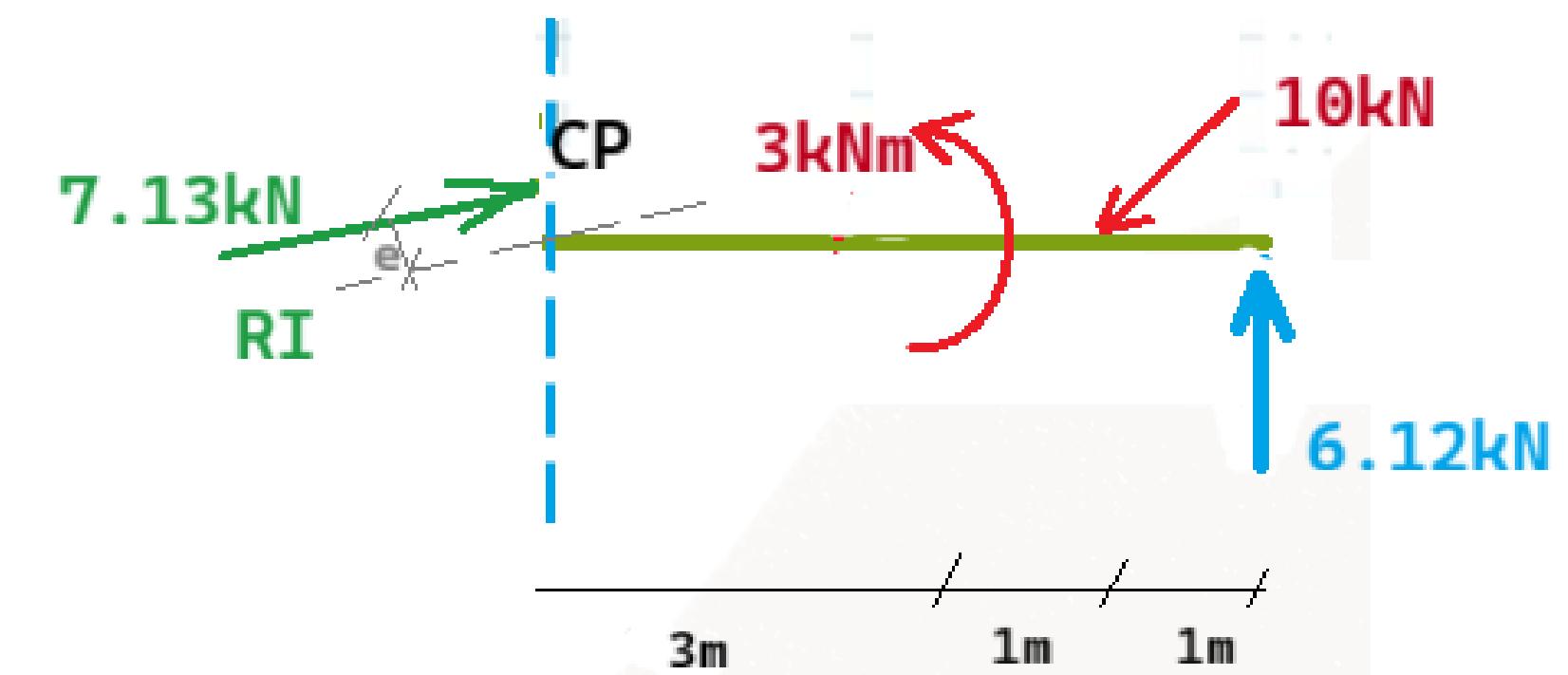
# QUÉ SON LOS ESFUERZOS INTERNOS

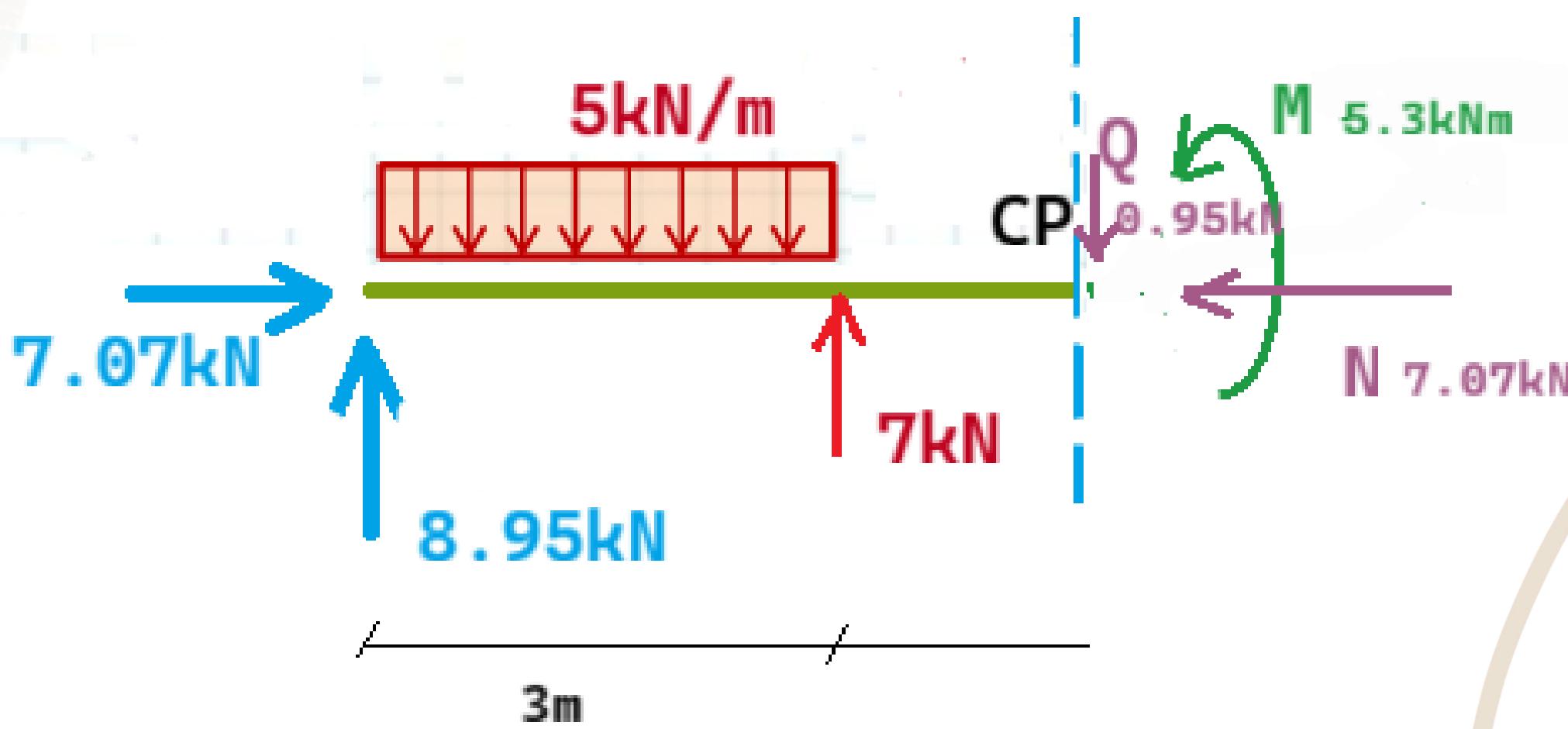
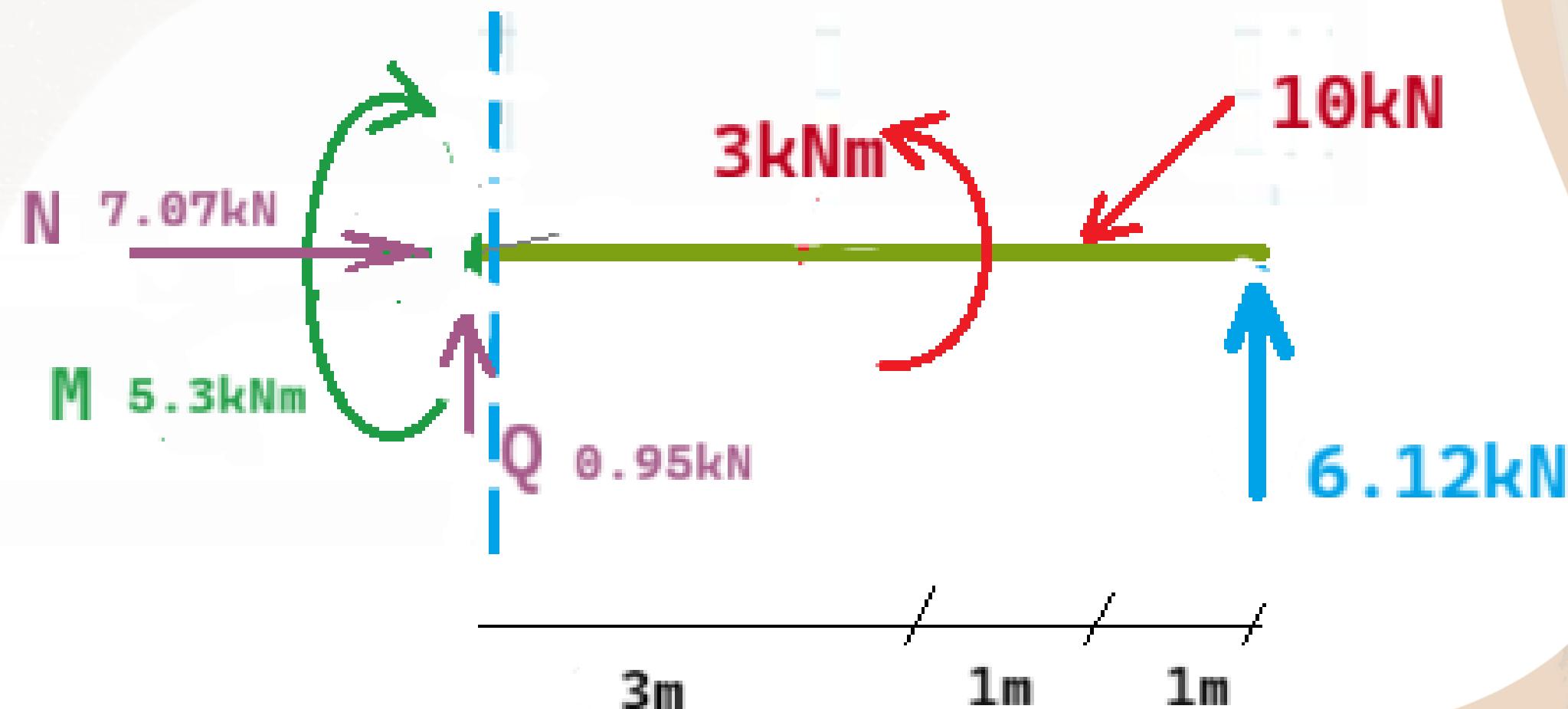


# SI UN SISTEMA ESTÁ EN EQUILIBRIO ...

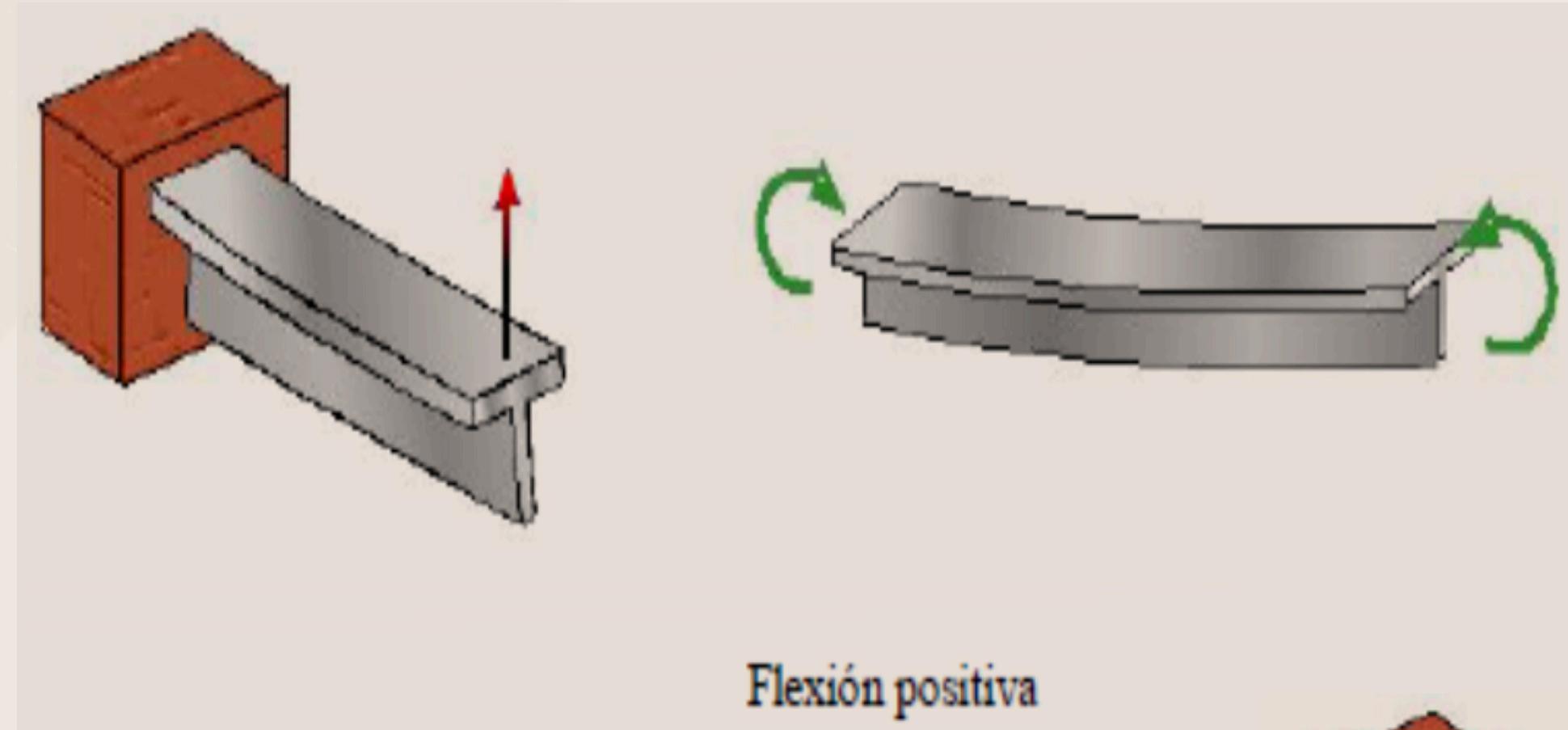


También lo estarán cada una de sus partes

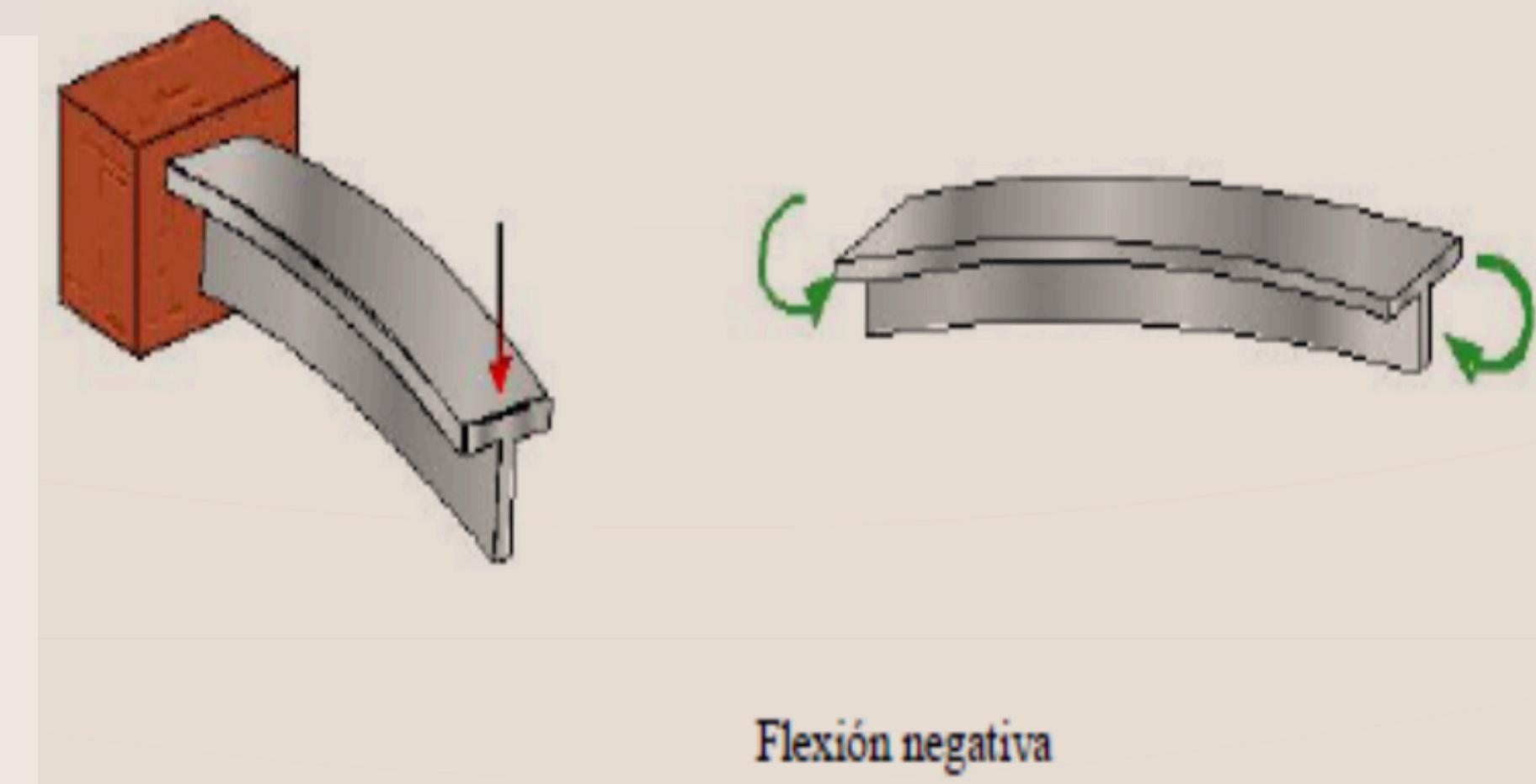




# CONVENCIÓN DE SIGNOS

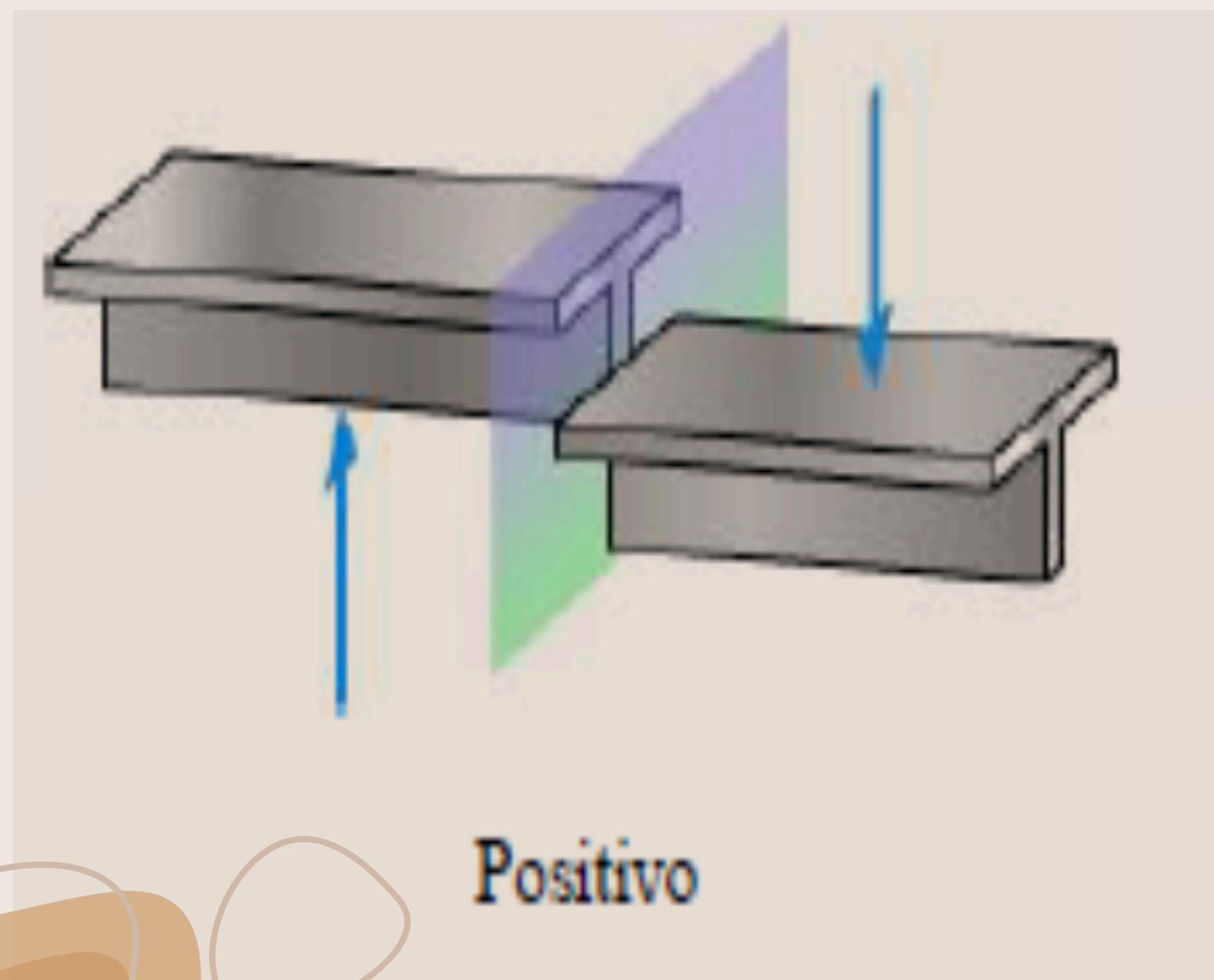


Flexión positiva

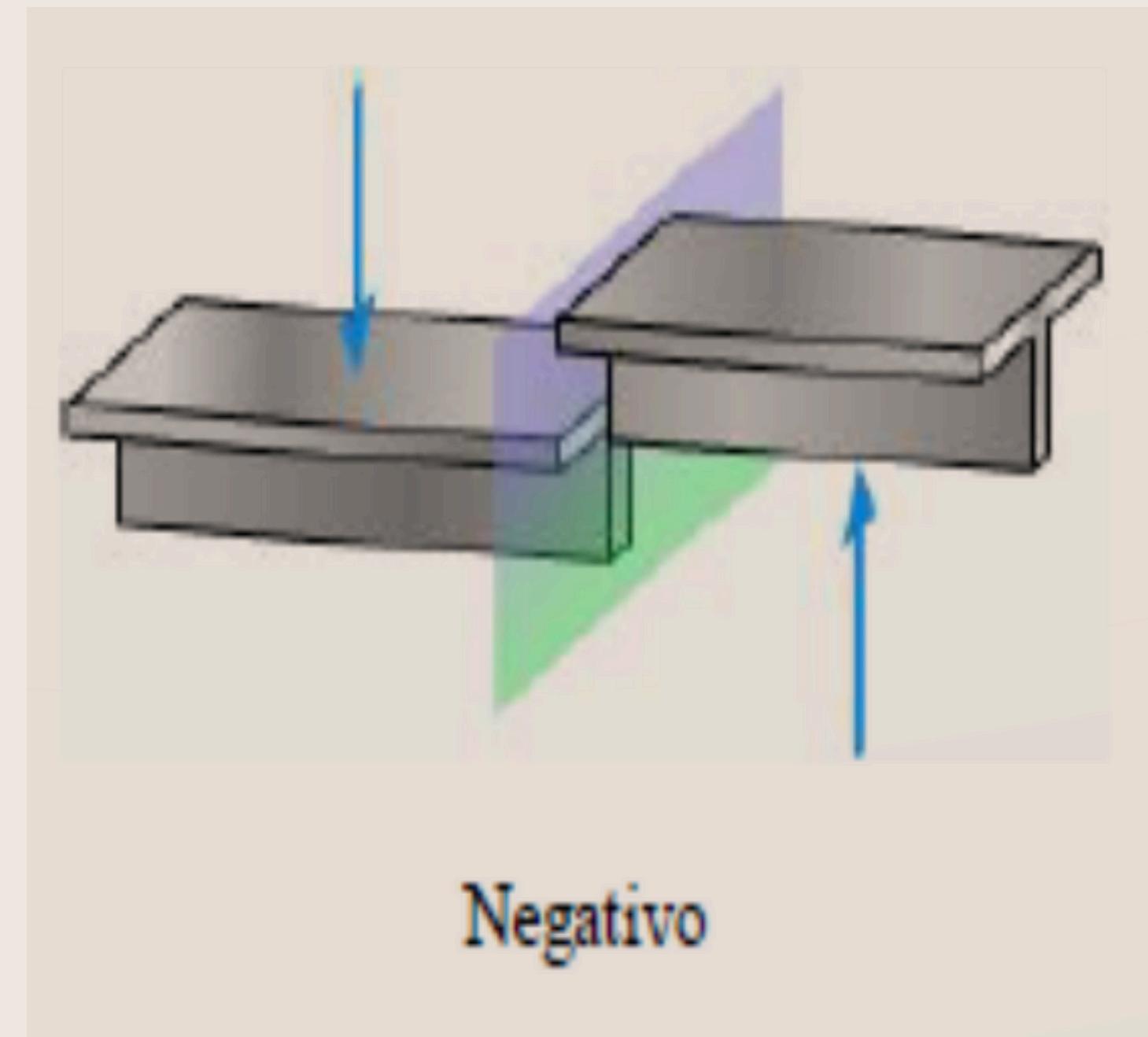


Flexión negativa

# CORTE

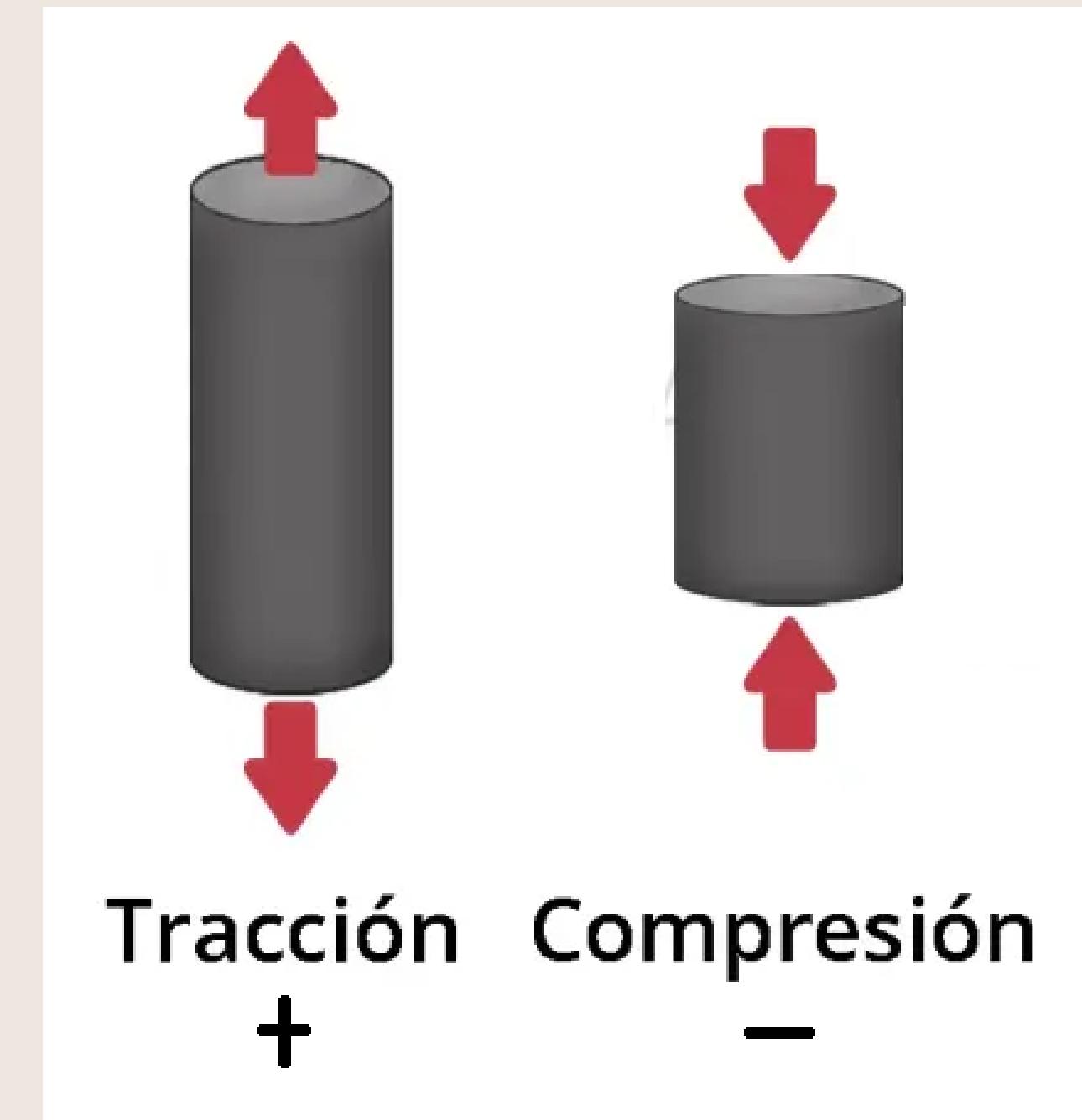


Positivo



Negativo

# ESFUERZOS AXIALES

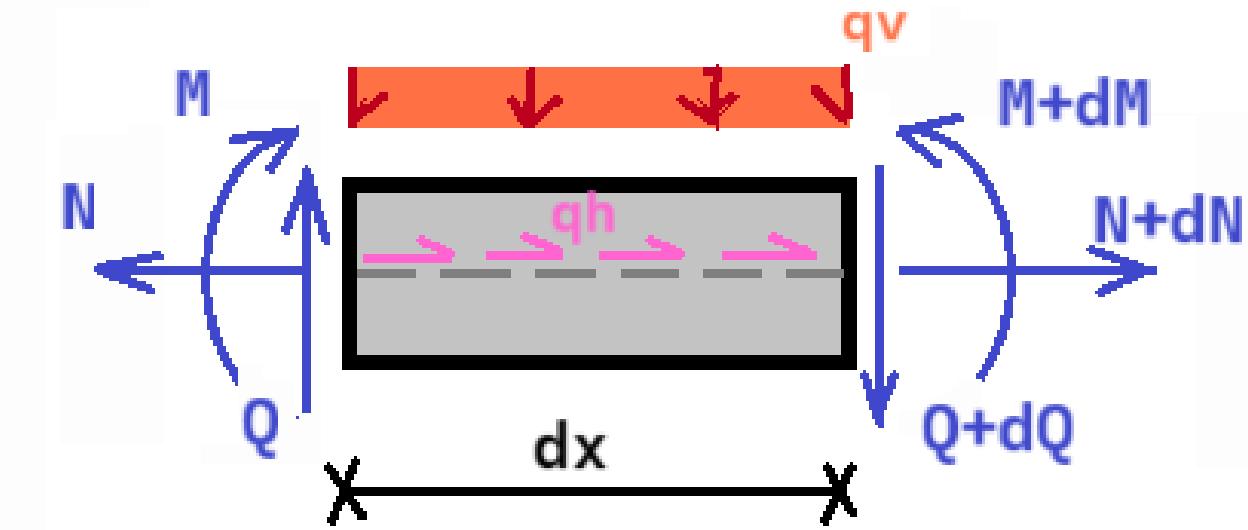


# RELACIÓN ENTRE CARGAS Y ESFUERZOS

$$\sum F_x = 0$$

$$-N + qh \cdot dx + N + dN = 0$$

$$\frac{dN}{dx} = -qh$$



$$\sum F_y = 0$$

$$Q - qv \cdot dx - (Q + dQ) = 0$$

$$\frac{dQ}{dx} = -qv$$

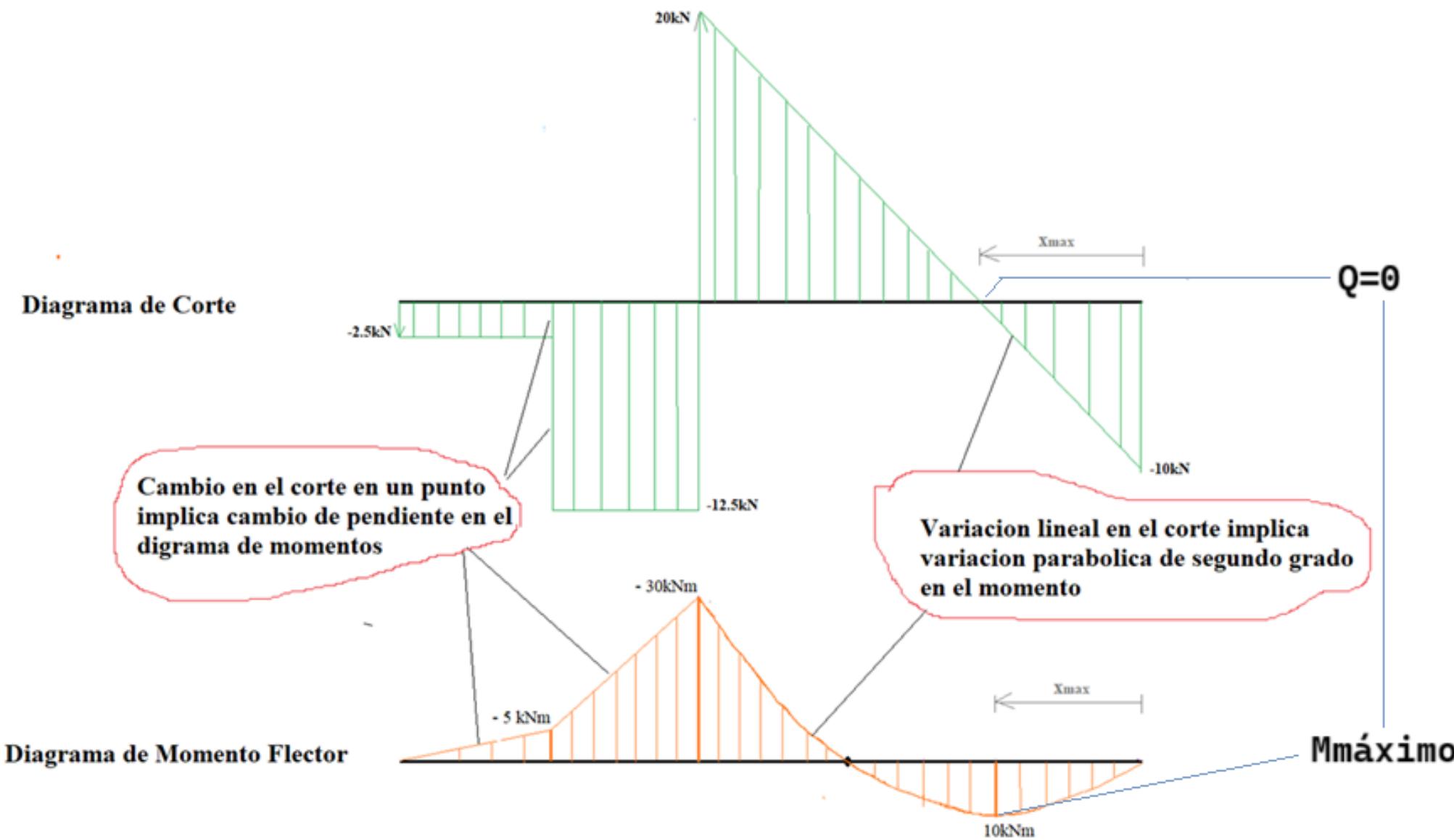
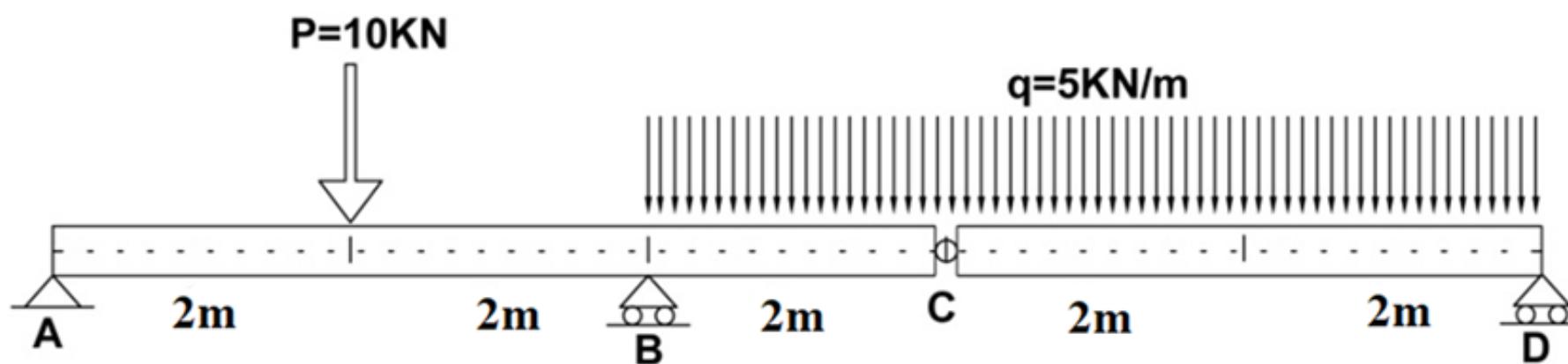
$$\sum M_2 = 0$$

$$M + Q \cdot dx - qv \cdot \frac{dx^2}{2} - (M + dM) = 0$$

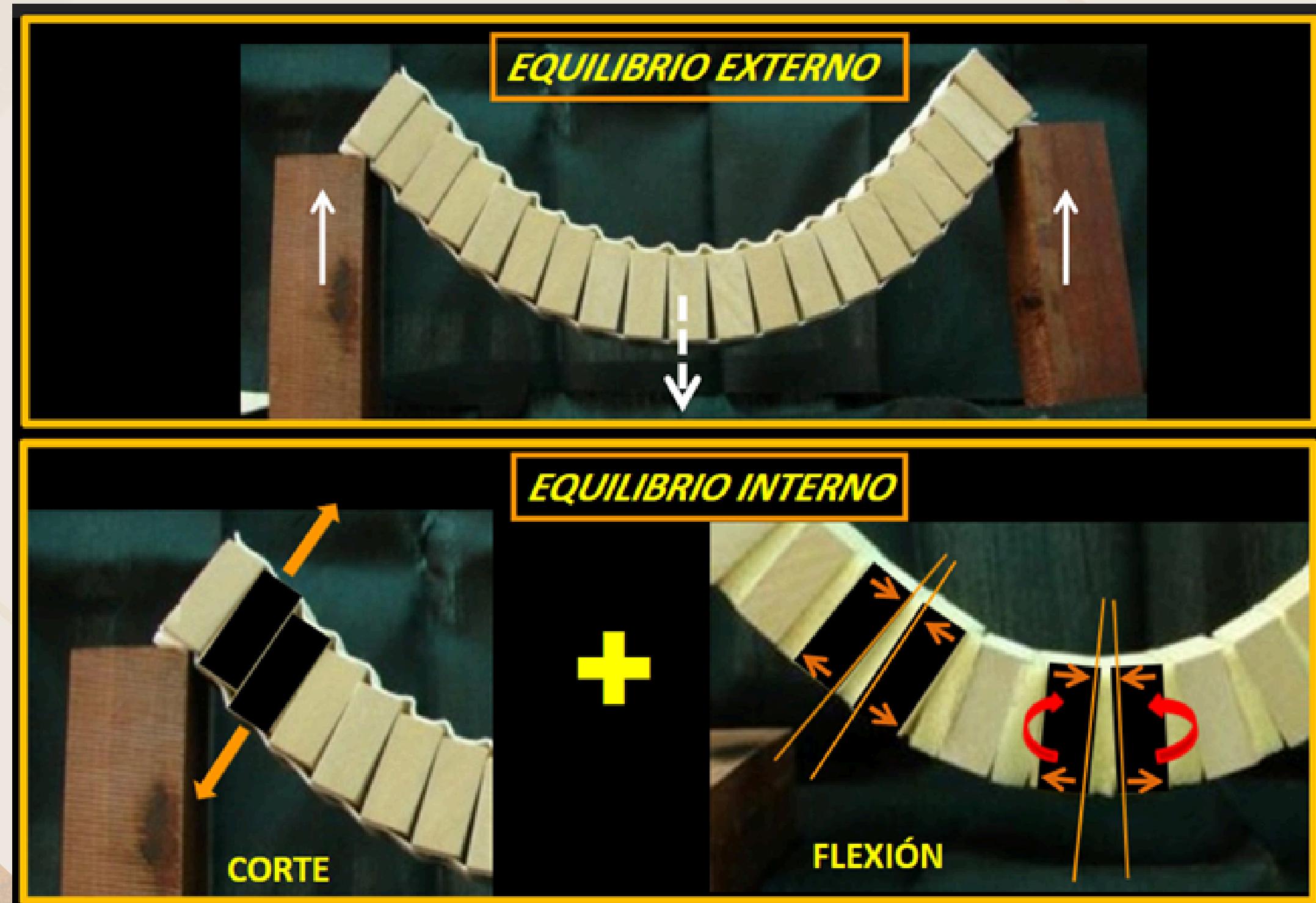
$$\frac{dM}{dx} = Q$$



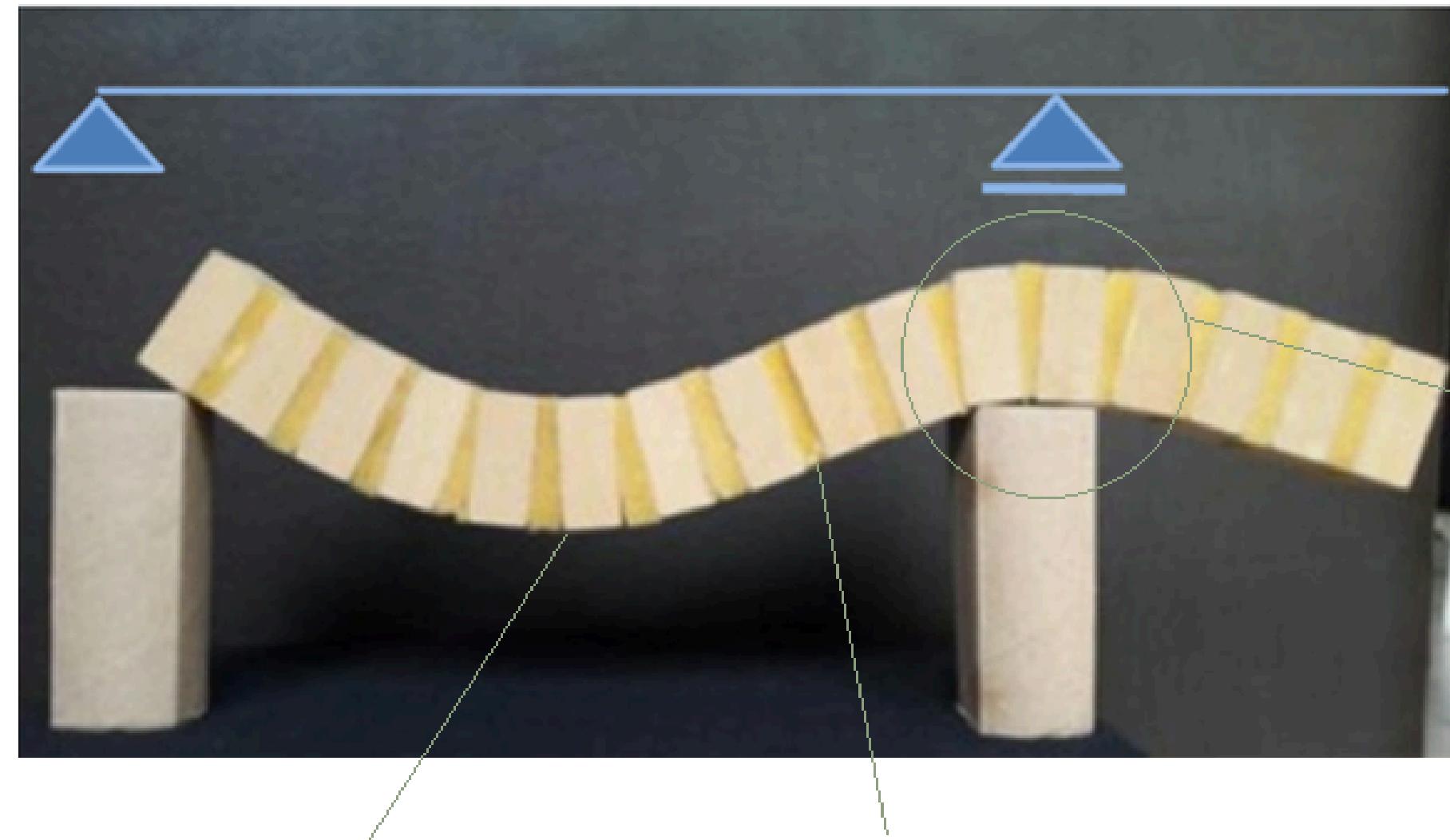
# EJEMPLO



# Flexión y corte en viga simplemente apoyada



# DEFORMADA POR CARGAS VERTICALES



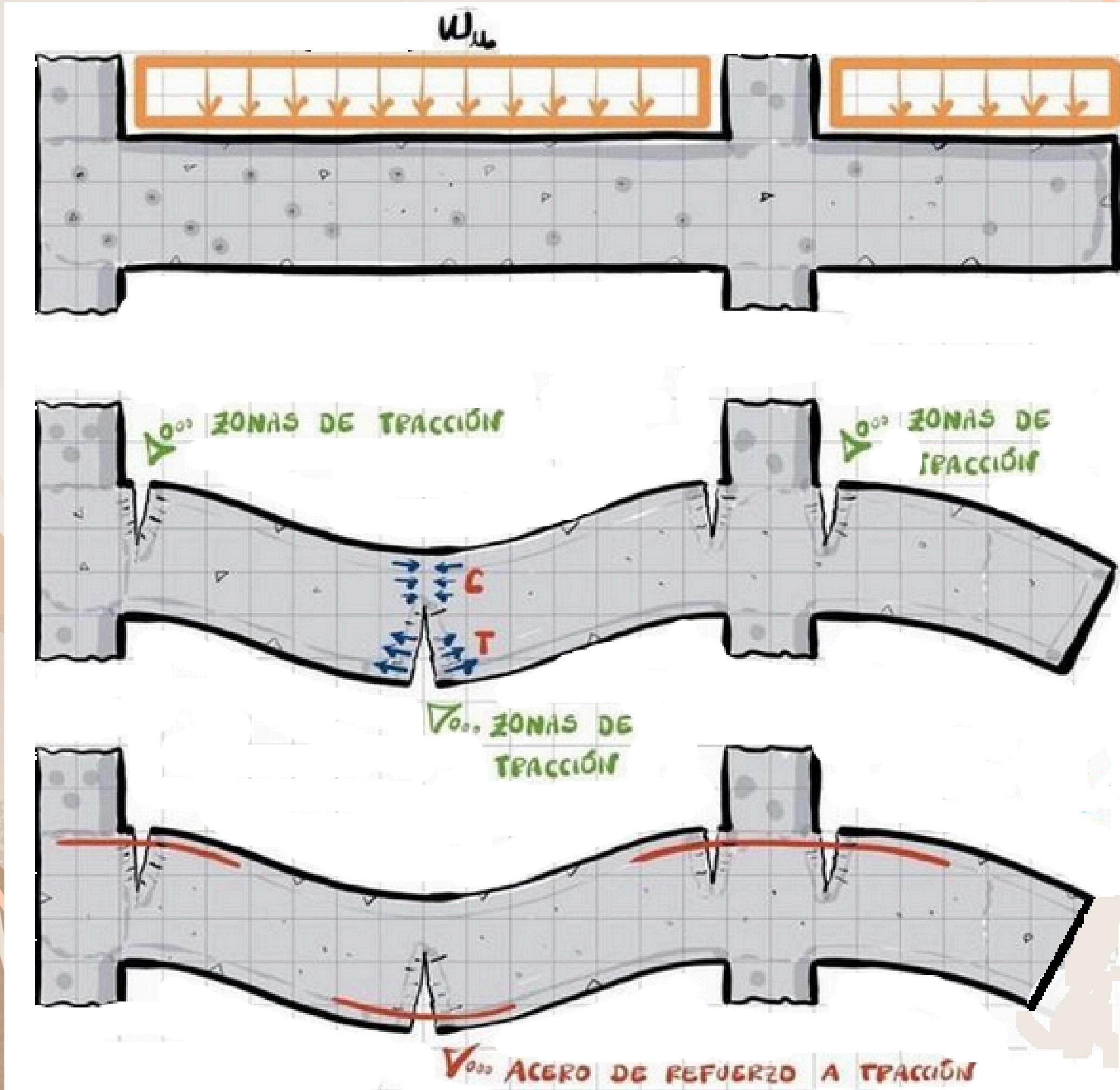
Tracción inferior

Momento (+) dibujado del lado de la tracción

Cambio en la concavidad  
Cambio en el signo del momento

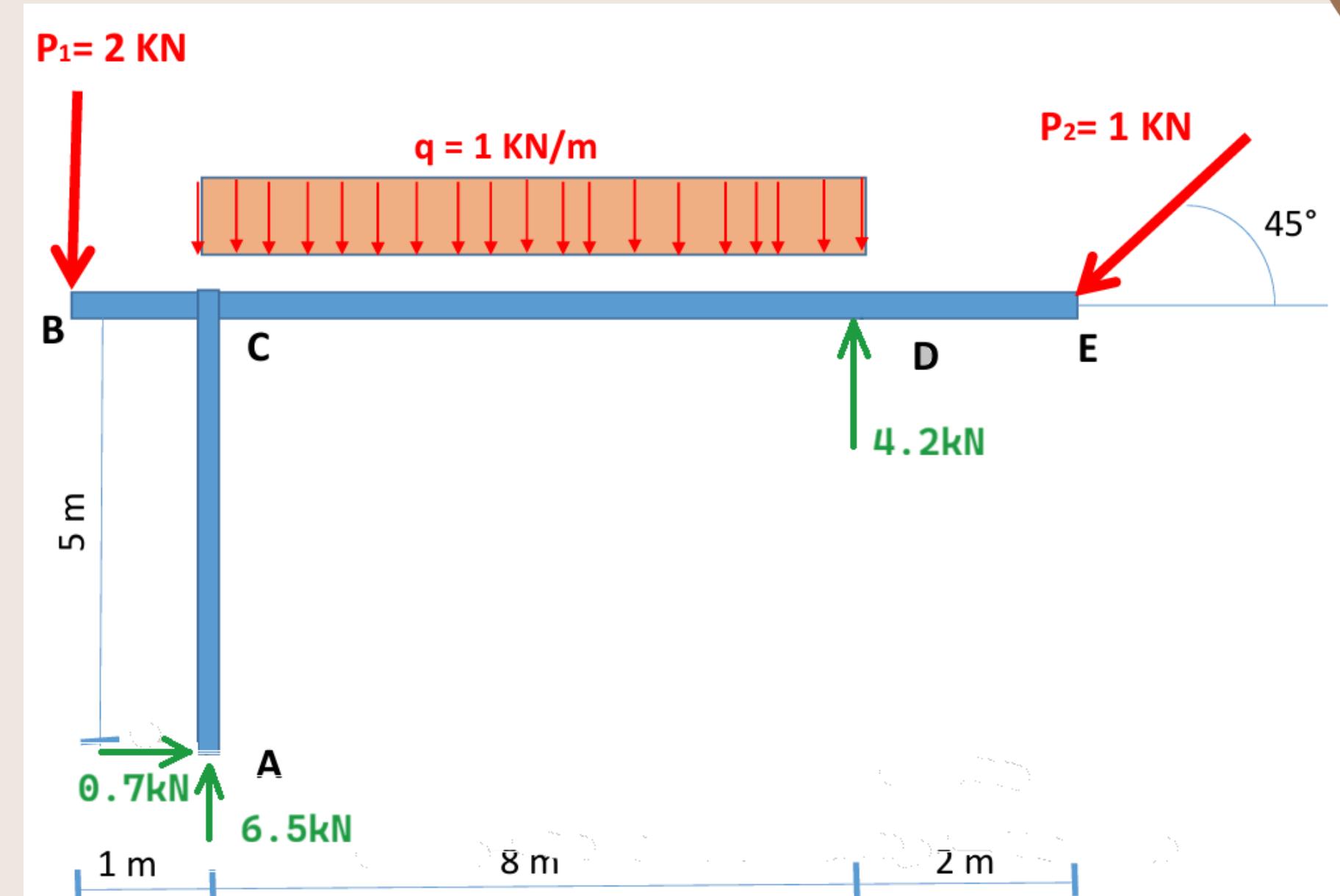
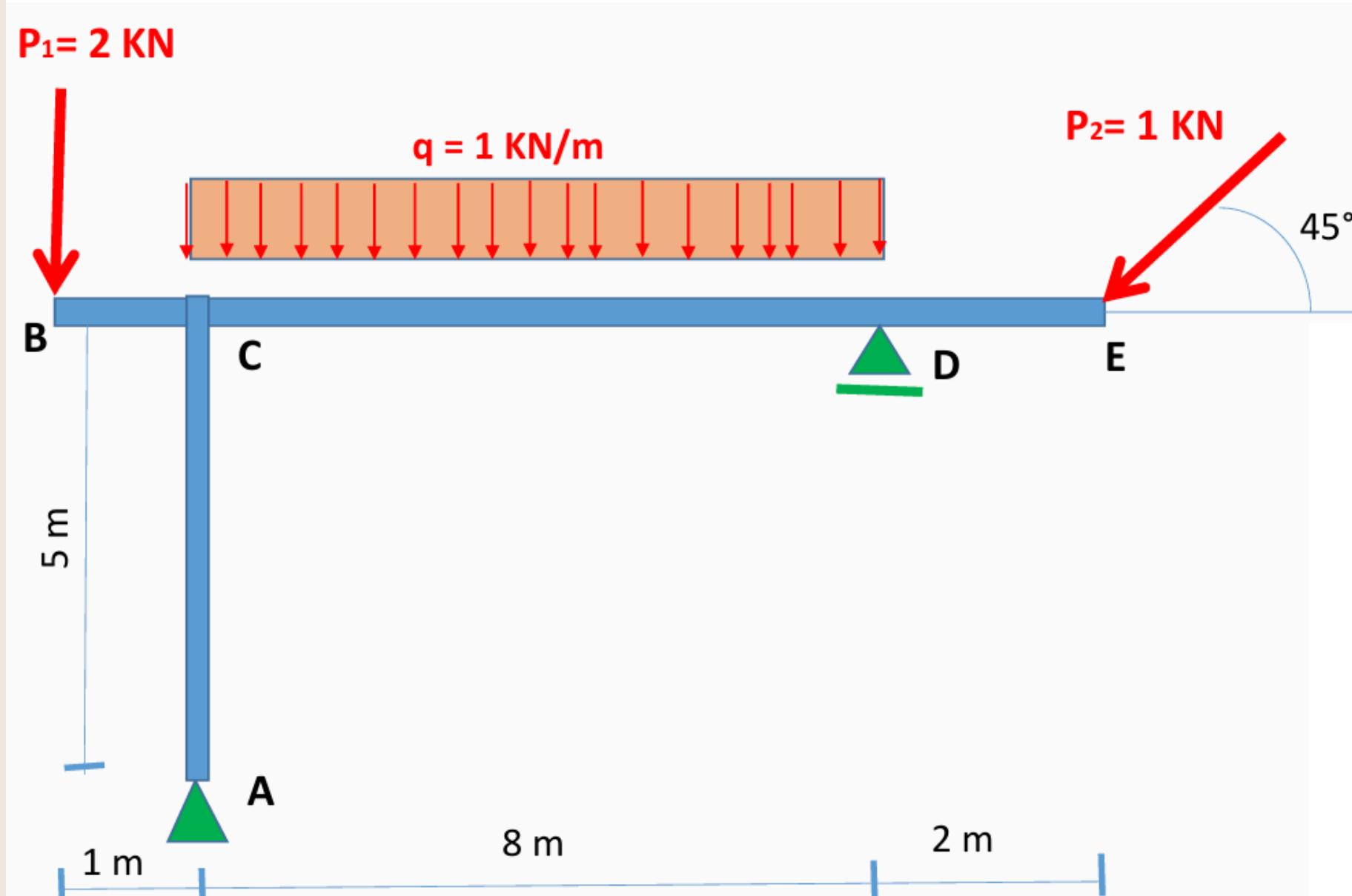
Tracción superior

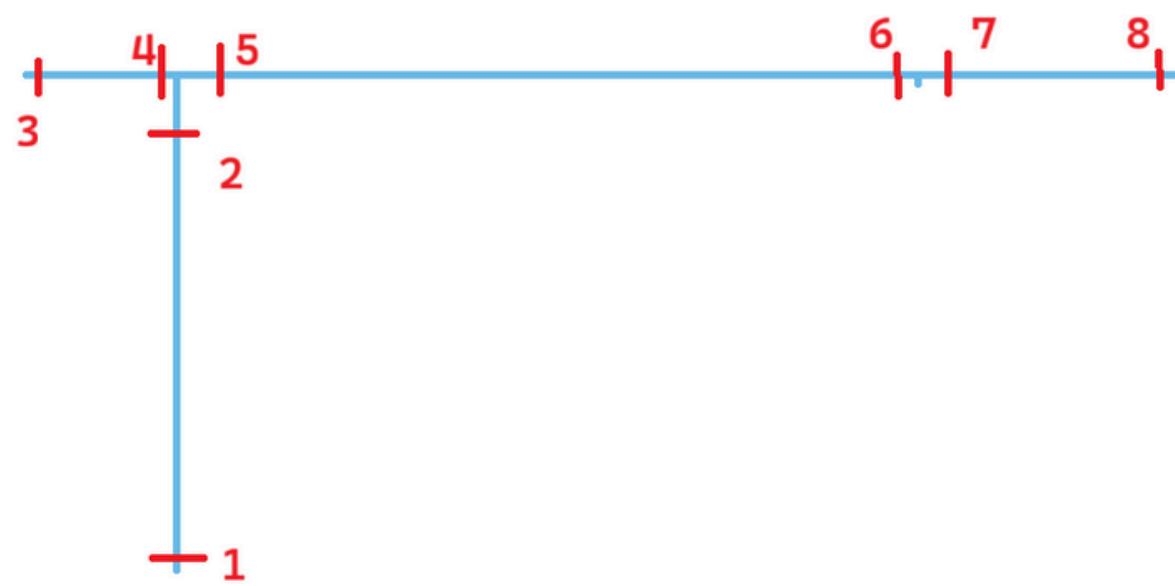
Momento (-)



Viga de Hormigón Armado

# Ejemplo





## Secciones para el análisis

$Q(3-4) = -2 \text{ kN}$   
 $N(3-4) = 0$   
 $M(3-4) = 0$   
 $M(4-3) = -2 \text{ kNm}$

$-2$   
 $2$   
 $-0.7$   
 $5.5$   
 $5.5$   
 $5$   
 $-3.5$   
 $-3.5$   
 $-6.5$   
 $-0.7$

$1$   
 $4.5$   
 $5.5$   
 $5$   
 $-1.5$   
 $-0.7$   
 $-3.5$

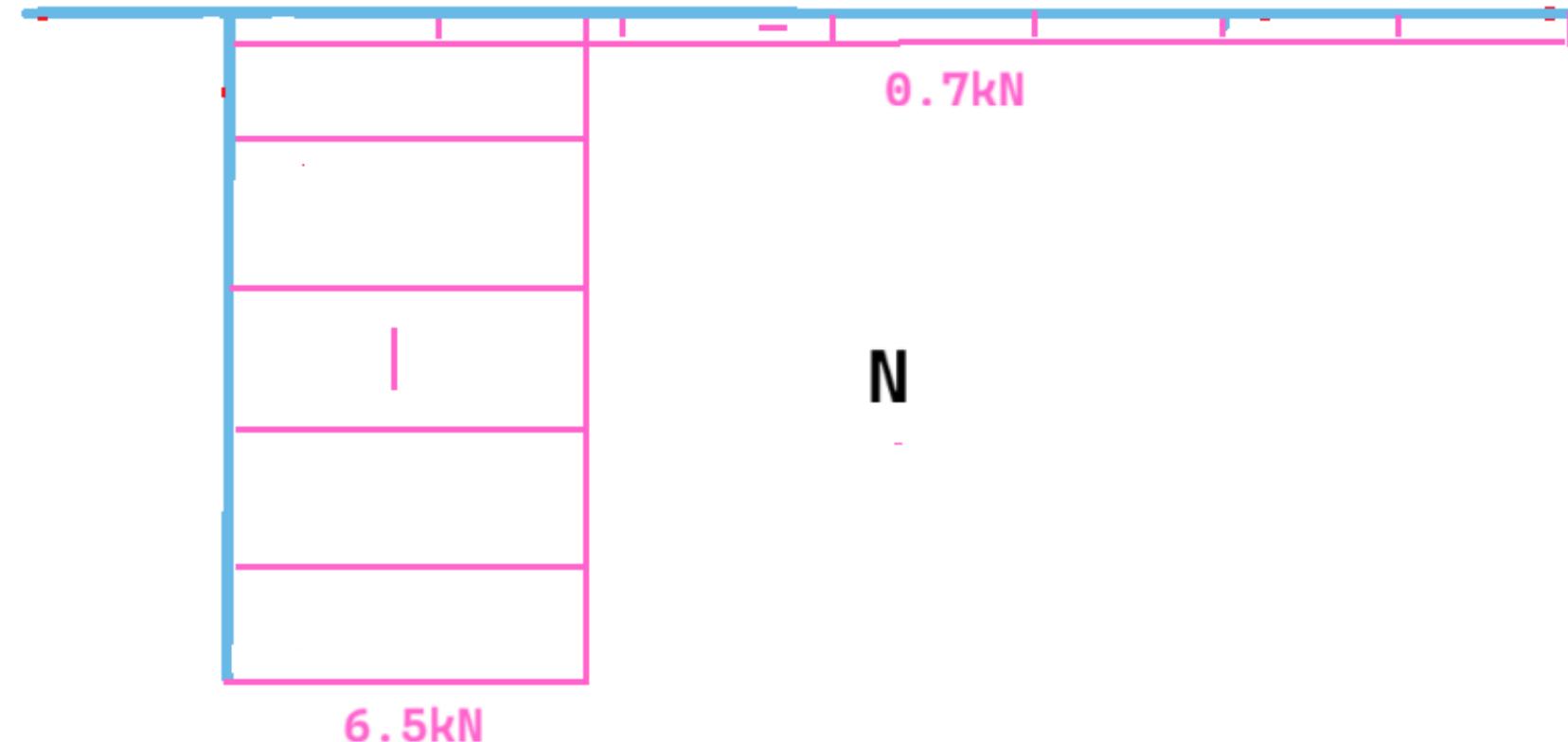
$N(5-6) = -0.7 \text{ kN}$   
 $Q(x) = 4.5 - 1 \cdot x$   
 $M(x) = -5.5 + 4.5x - \frac{1}{2}x^2$

$1$   
 $0.7$   
 $-0.7$   
 $-1.5$   
 $-0.7$   
 $0.7$

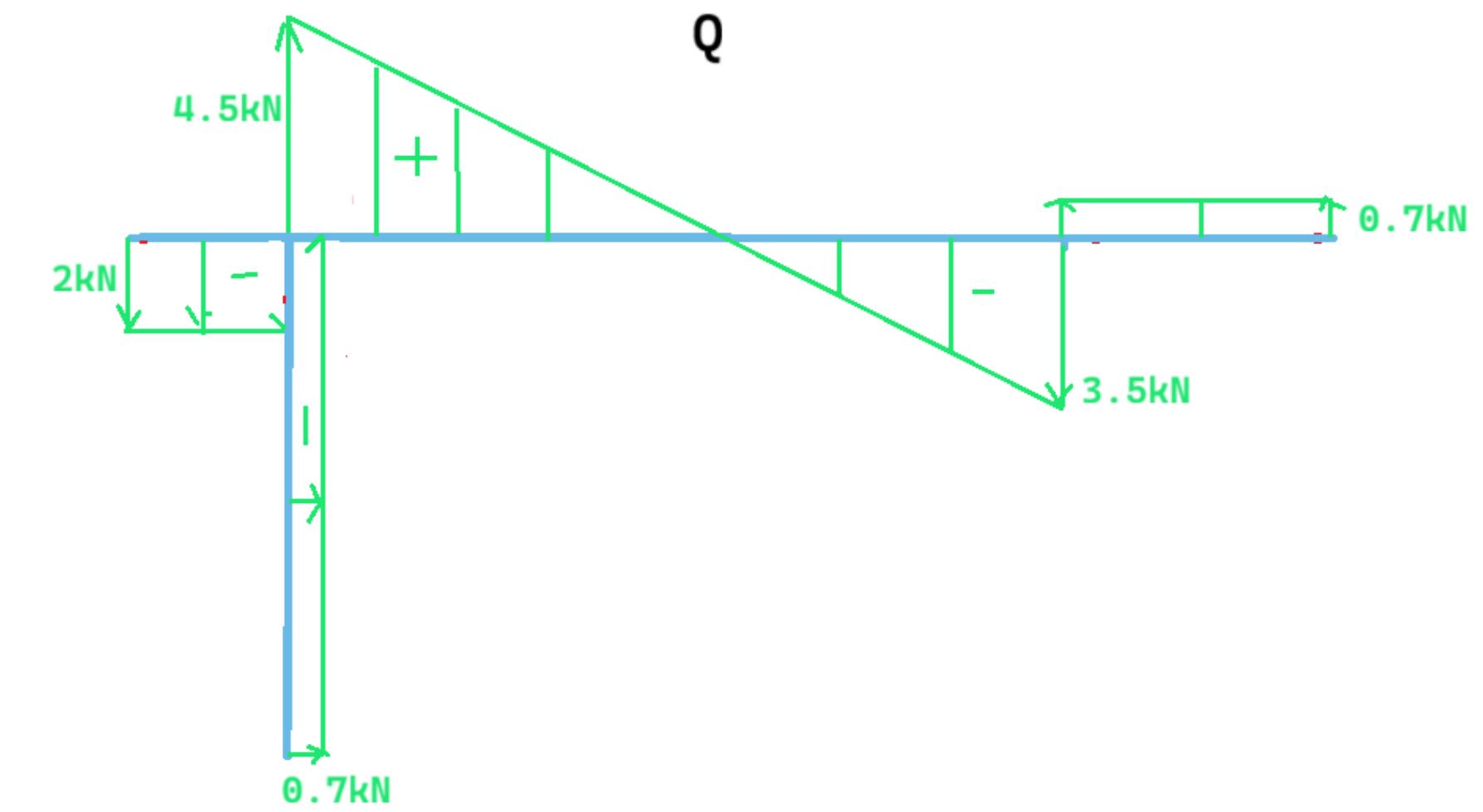
$N(7-8) = -0.7$   
 $Q(7-8) = 0.7$   
 $M(7) = -1.5$   
 $M(8) = 0$

$2$   
 $1$   
 $0.7$   
 $6.5$

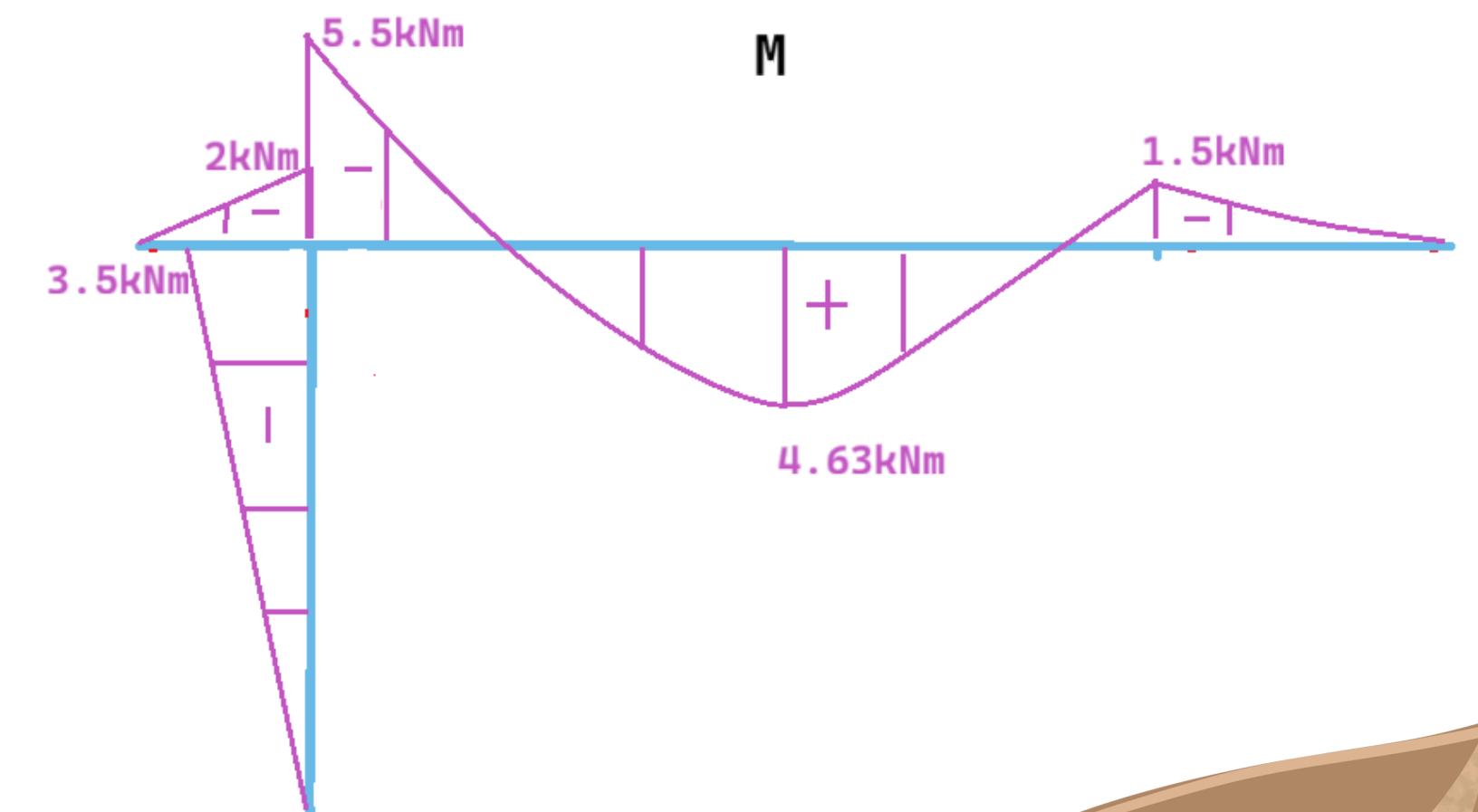
$Q(1-2) = -0.7 \text{ kN}$   
 $N(1-2) = -6.5 \text{ kN}$   
 $M(1) = 0$   
 $M(2-1) = -3.5 \text{ kNm}$



**N**



**Q**



**M**