

# Esfuerzos Internos

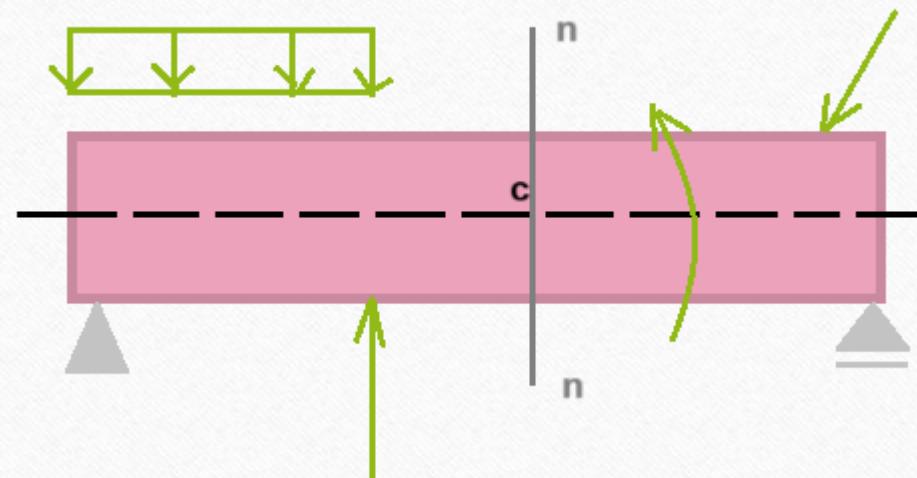
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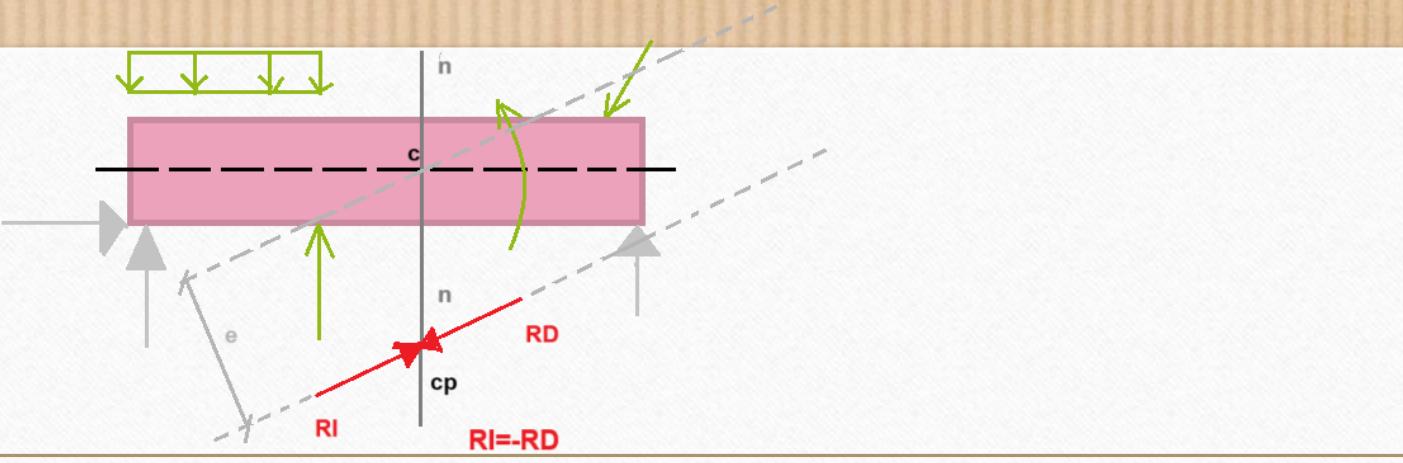
**Estructuras planas de Alma Llena**

# Introducción

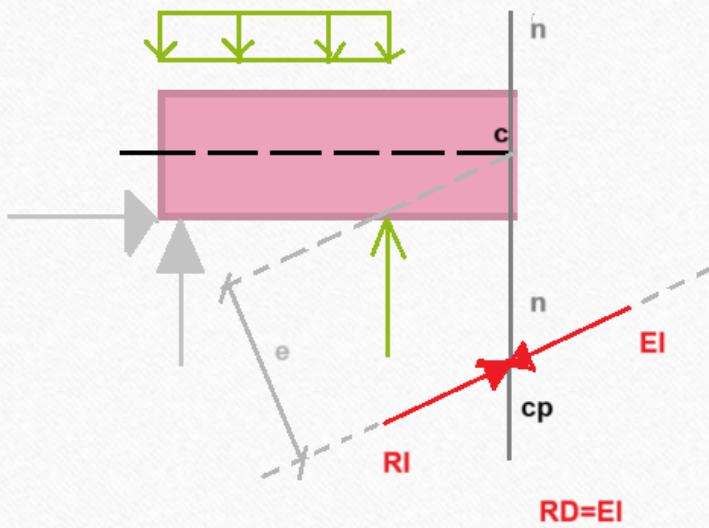
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- Supongamos un cuerpo que se encuentra en equilibrio cuando sobre él actúa un sistema de fuerzas externas

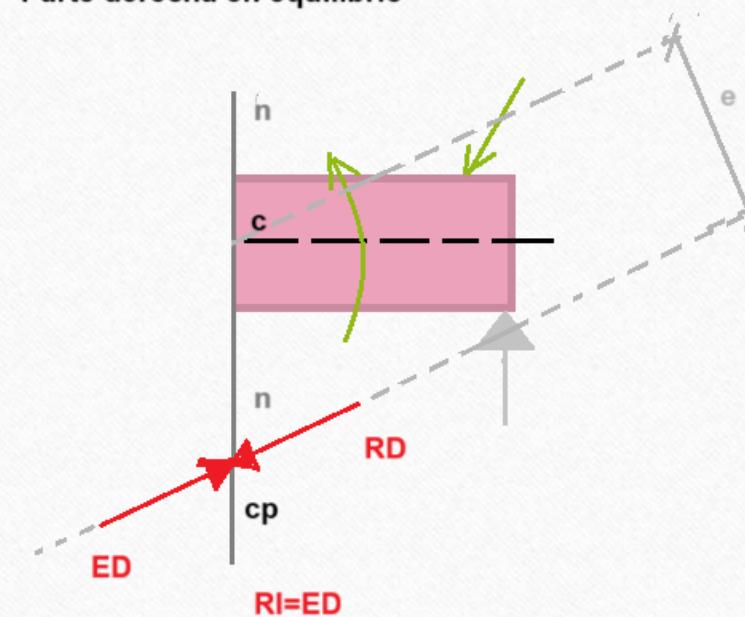




**Parte izquierda en equilibrio**

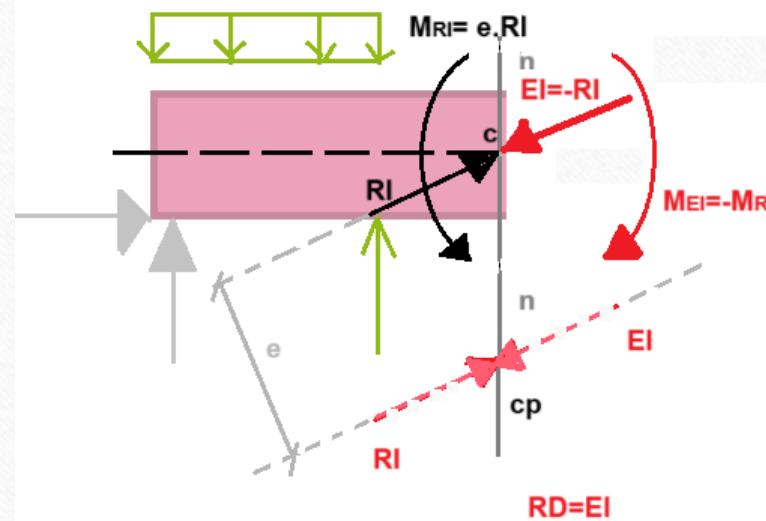


**Parte derecha en equilibrio**

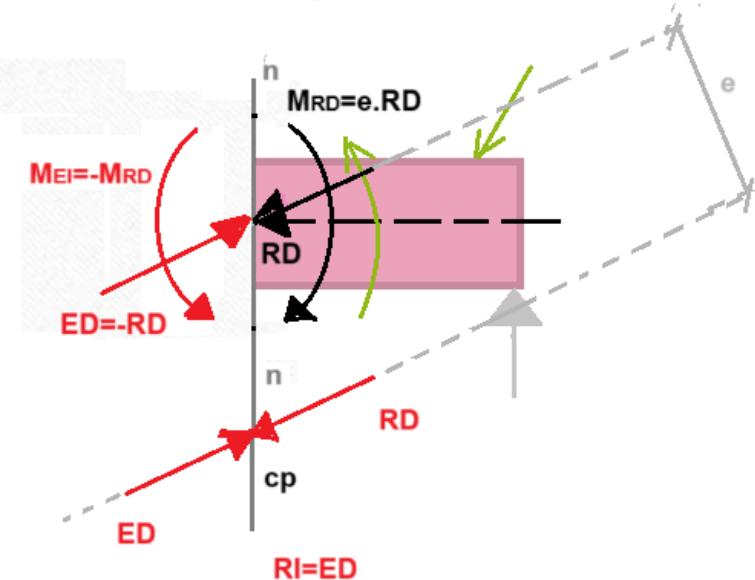


Equilibrio de parte izquierda coincide con equilibrio de parte derecha

Parte izquierda en equilibrio



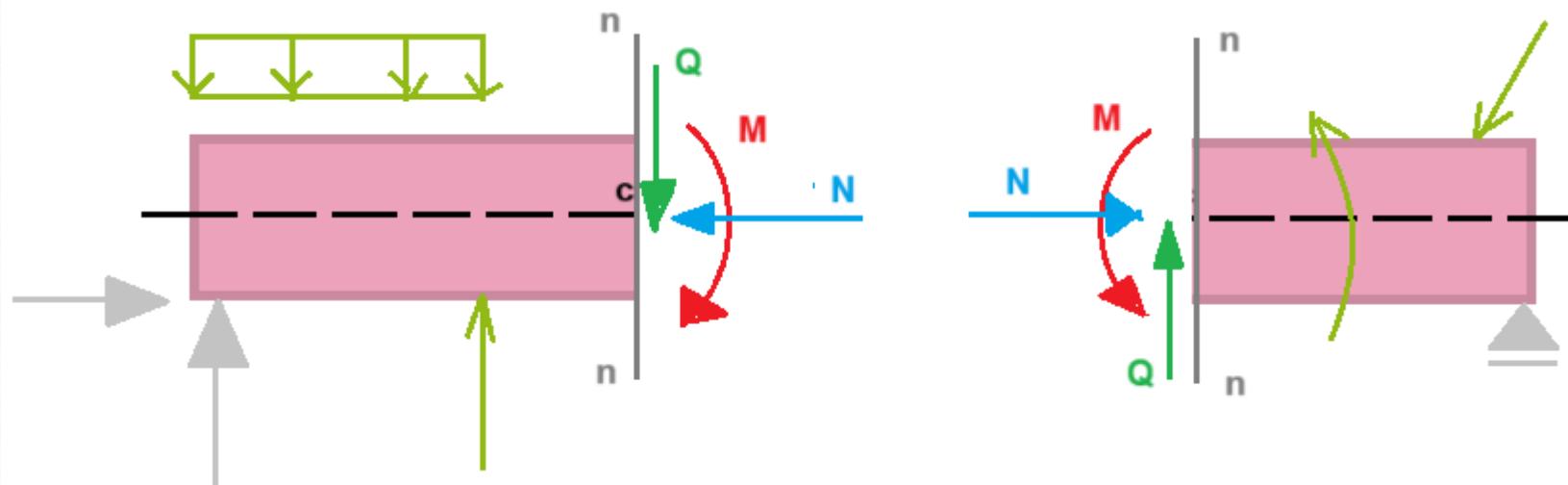
Parte derecha en equilibrio

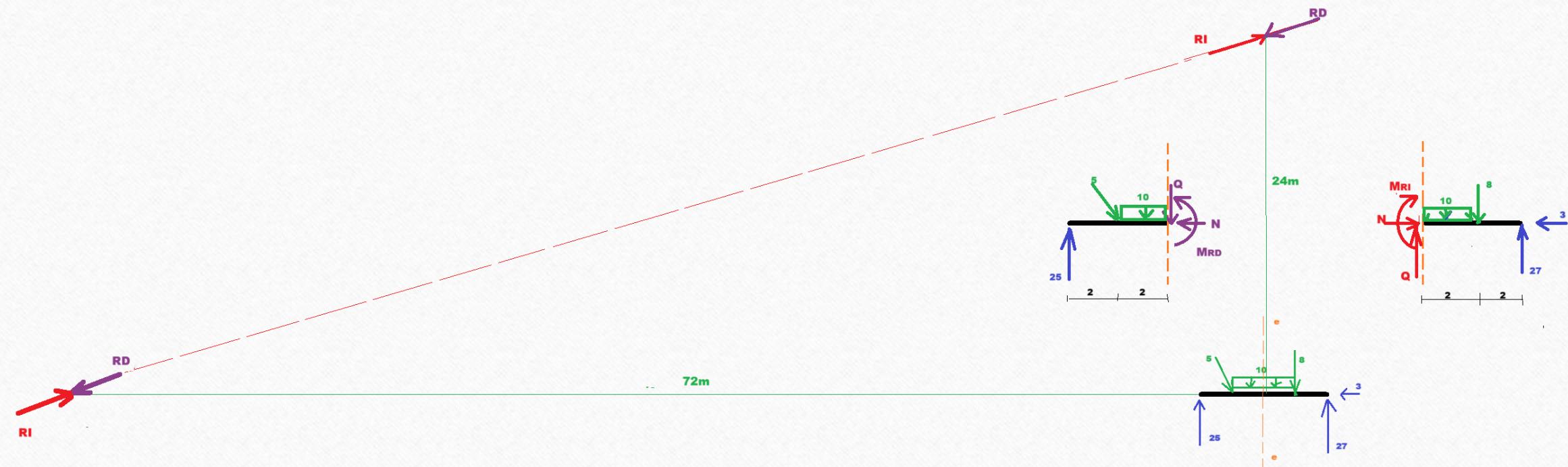
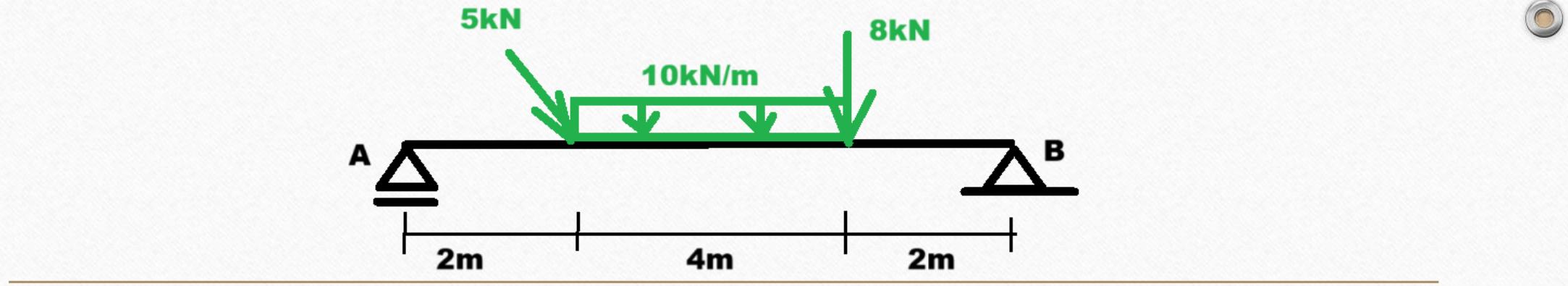


**N Normal:** Proyección paralela al eje de la barra de la equilibrante reducida al baricentro.

**Q Corte:** Proyección perpendicular al eje de la barra de la equilibrante reducida al baricentro.

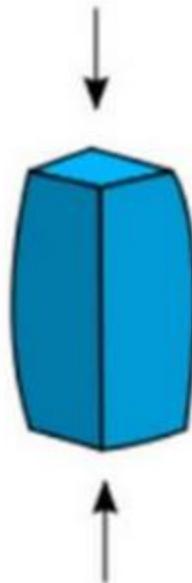
**M Momento flector:** Momento equilibrante de reducción al baricentro.





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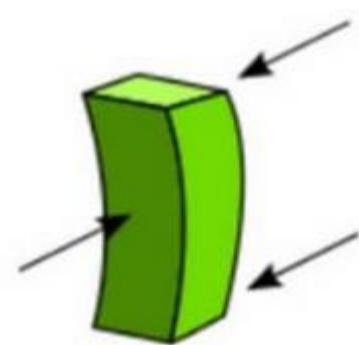
compresión



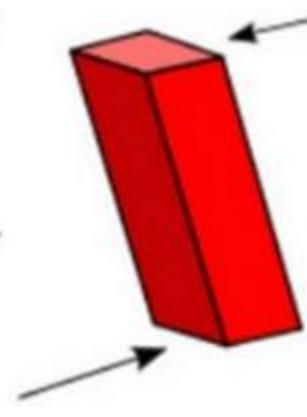
tracción



flexión



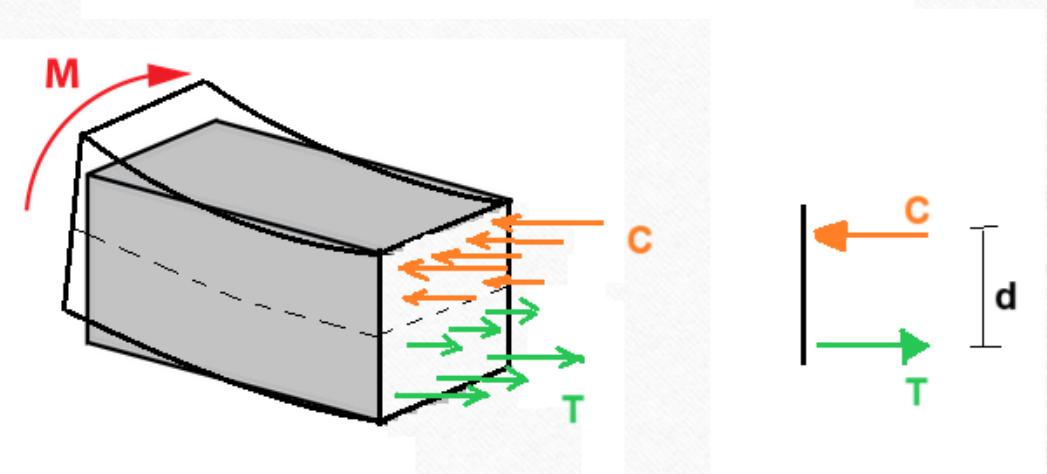
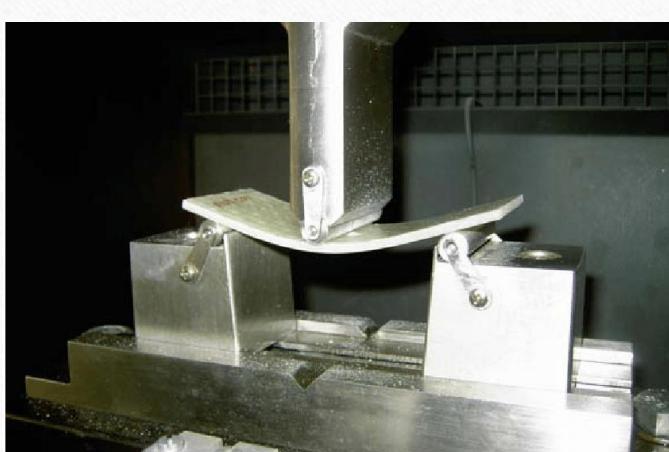
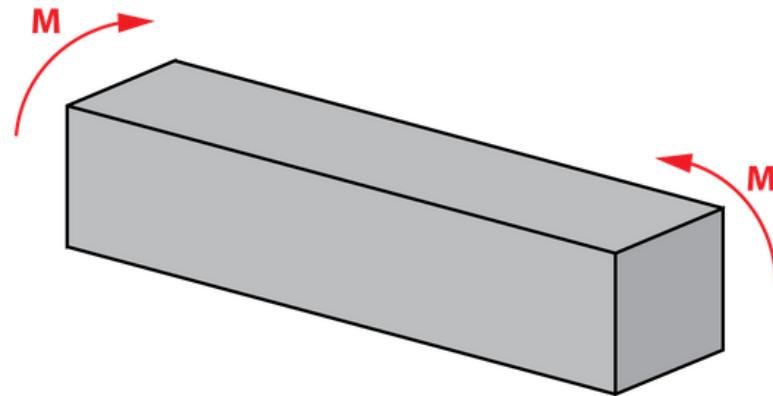
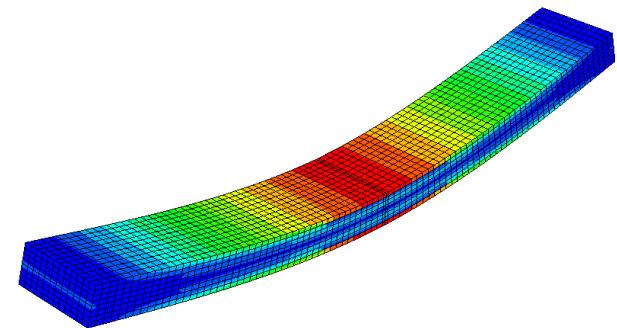
corte



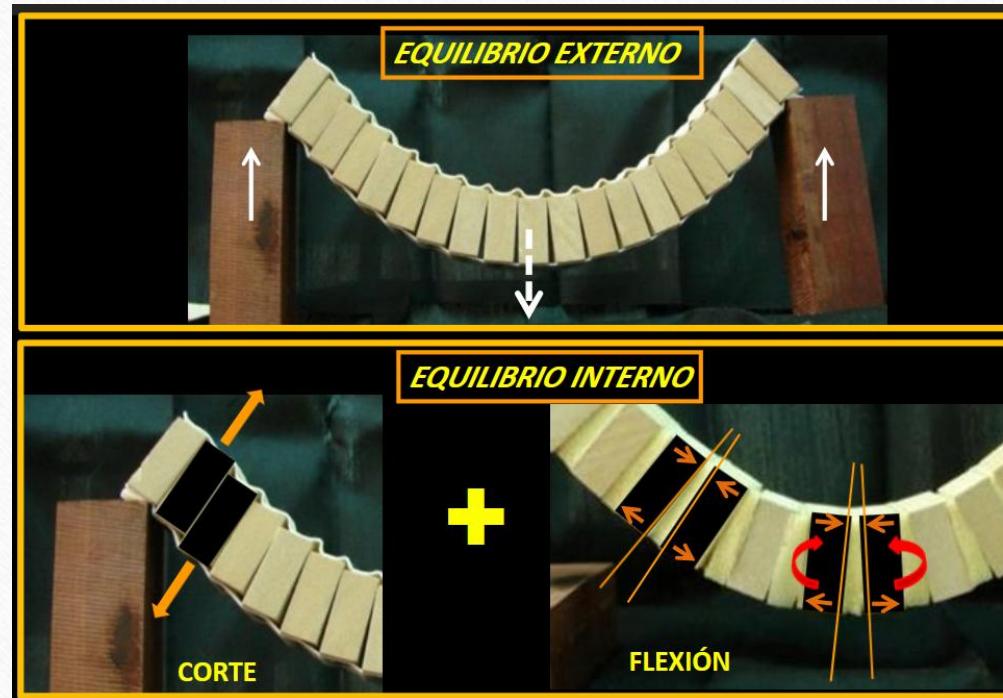
torsión



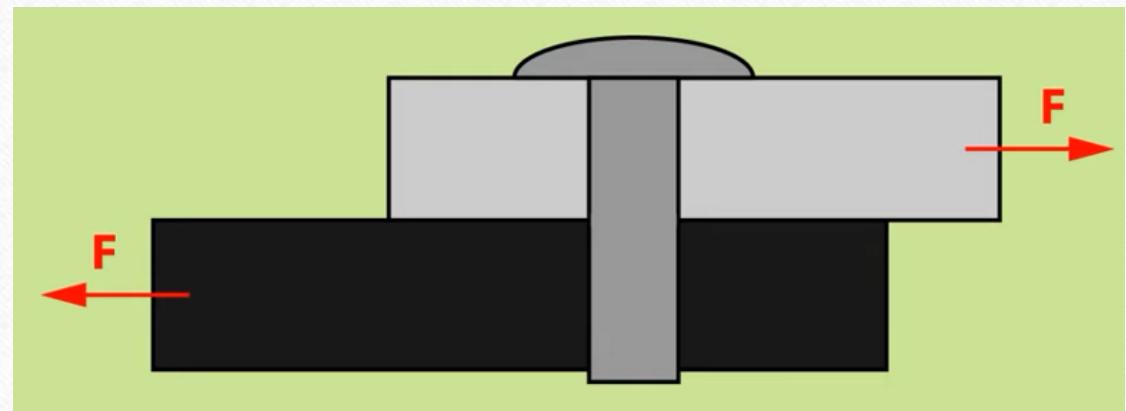
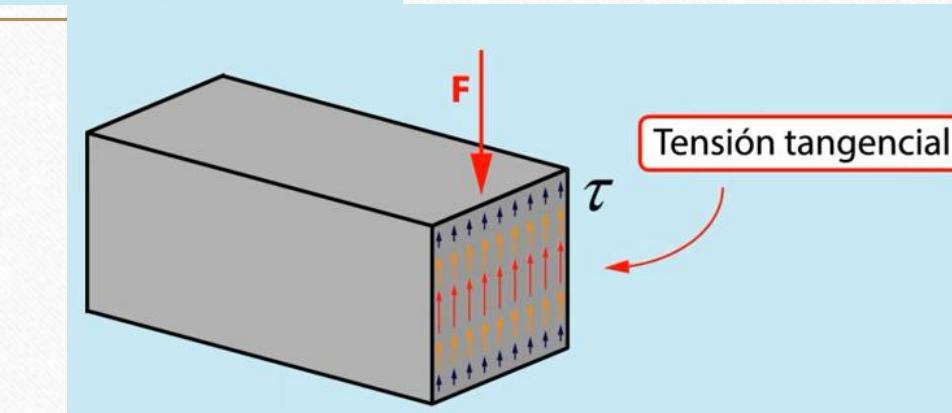
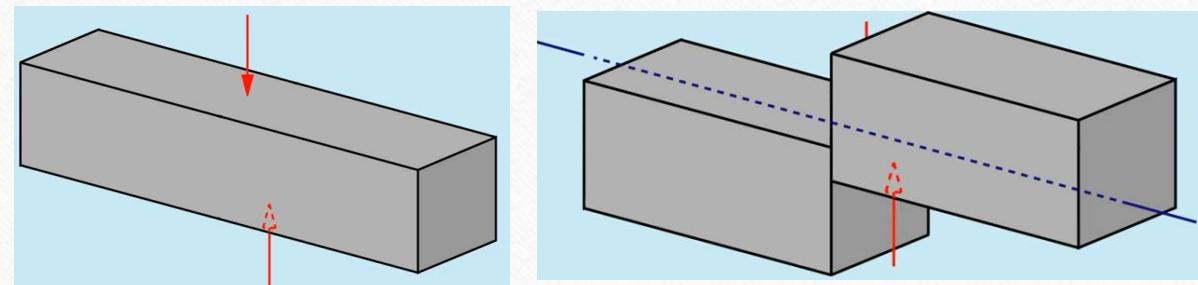
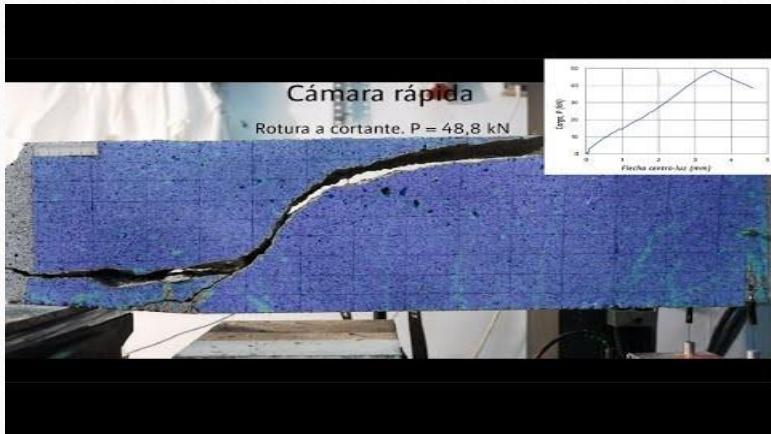
# Esfuerzos de Flexión



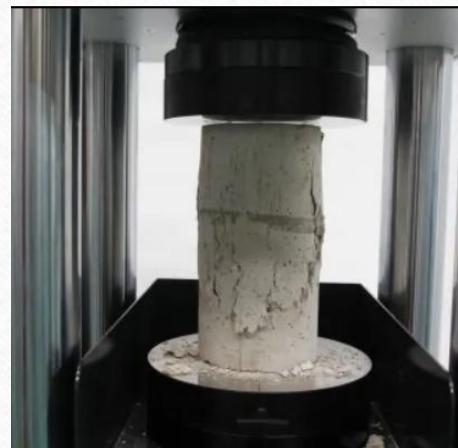
# Esfuerzo de flexión y corte en viga simplemente apoyada bajo carga vertical



# Esfuerzo de corte

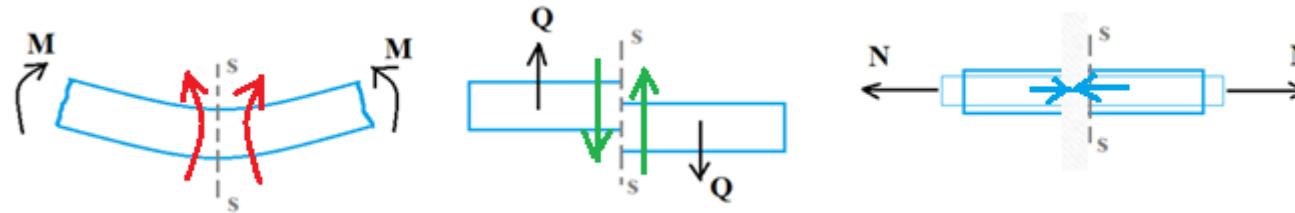
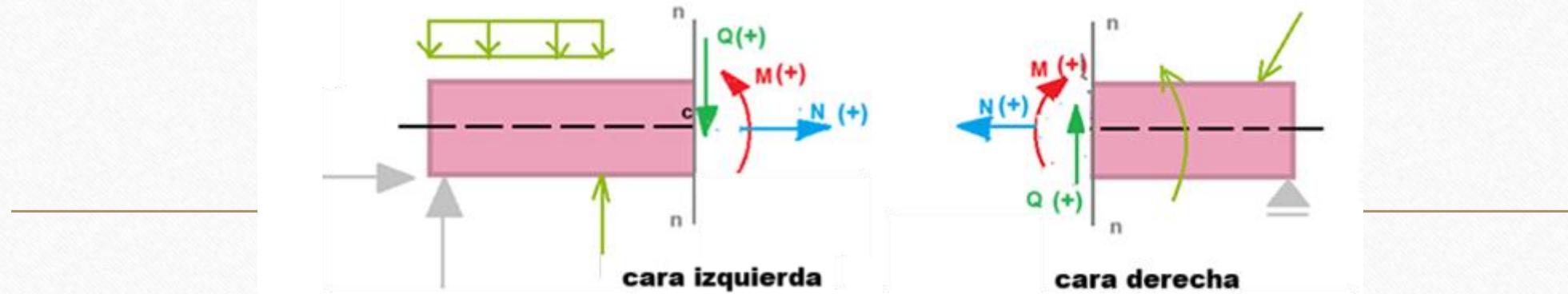


# Esfuerzos de tracción y compresión



# Convención de signos

Plano XY



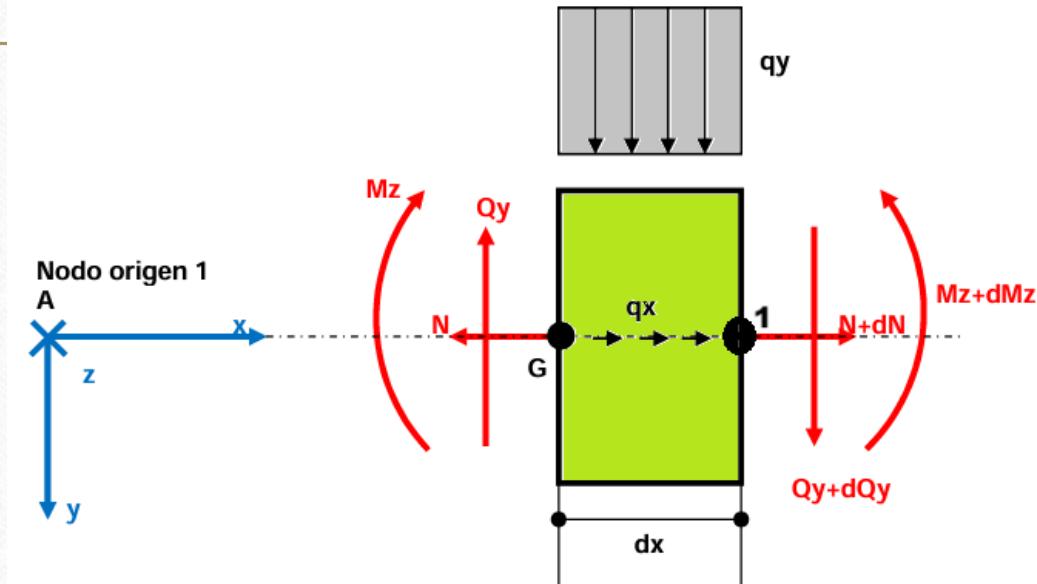
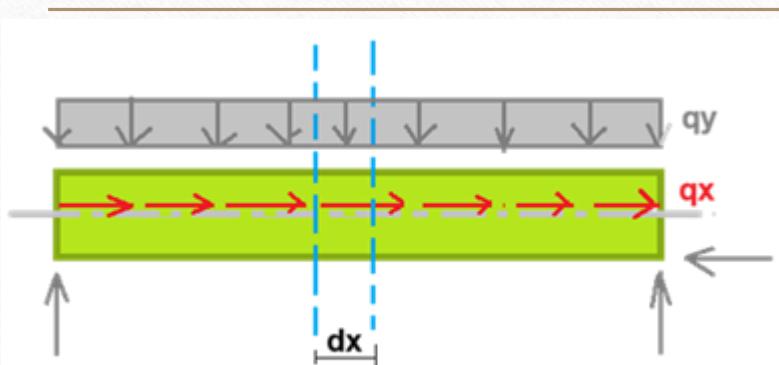
**RESUMEN DE LA CONVENCION PLANO LOCAL x-y:**

*Esfuerzo axil  $N>0$ : Tracción en la sección*

*Momento Flector  $M_z >0$ : Traciona fibras inferiores (coordenada y positiva)*

*Corte  $Q_y >0$ : En el sentido de avance de x provoca  $M_z$  positivo*

# Relaciones diferenciales entre carga-corte-momento

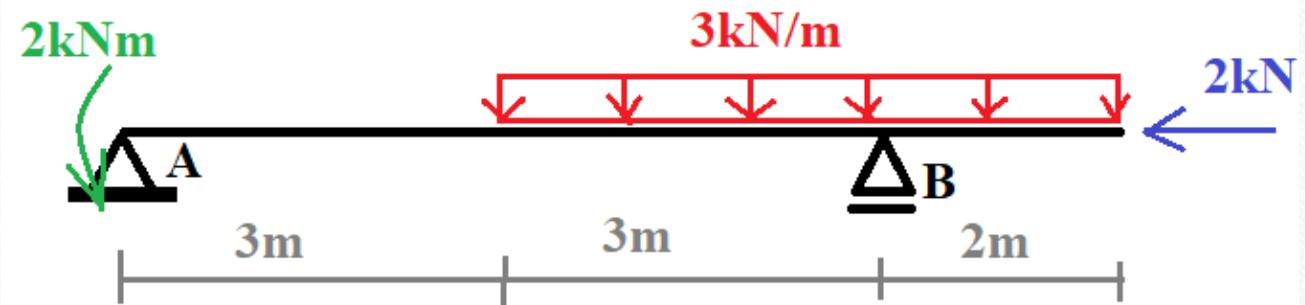
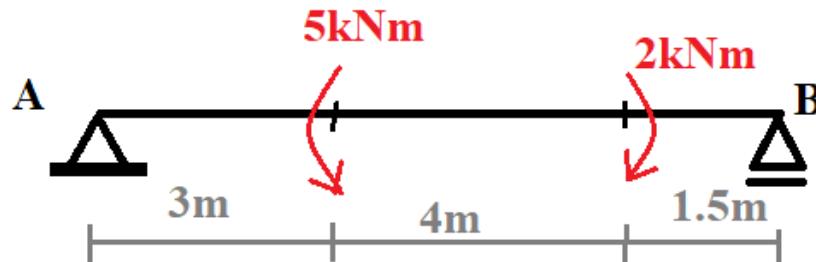
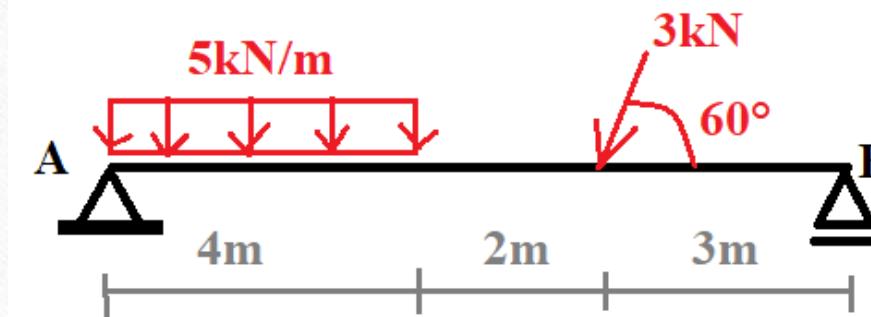
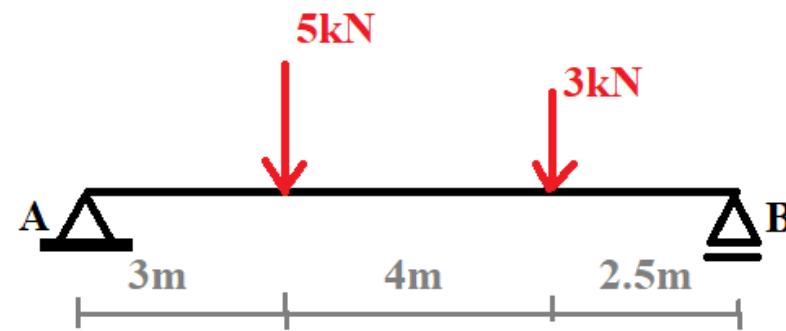


$$-q_y = \frac{dQ}{dx}$$

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

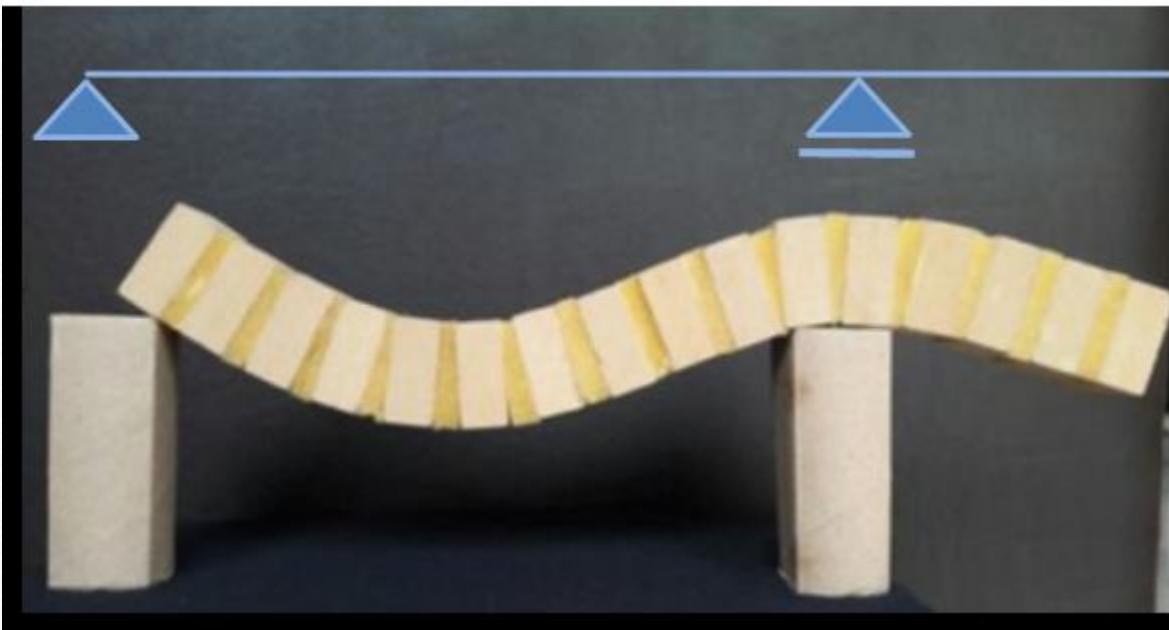
$$Q_y = \frac{dM_z}{dx}$$

# Ejemplos simples



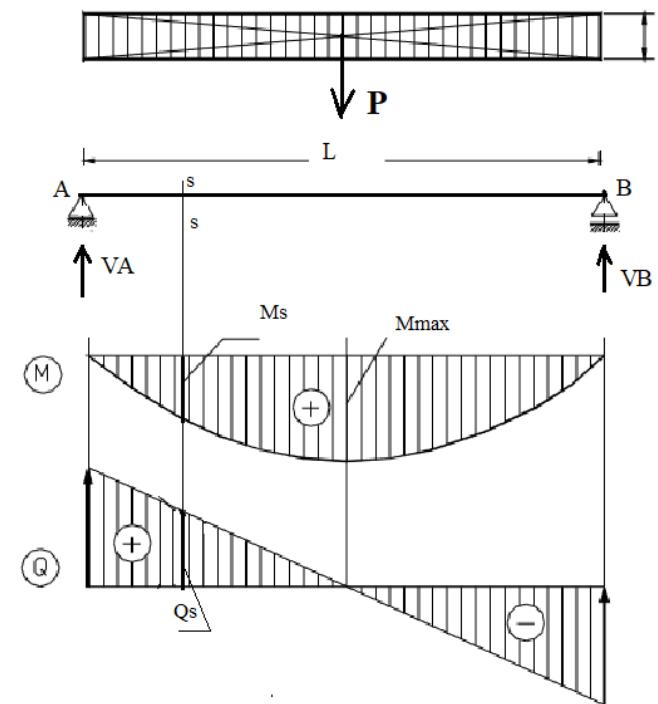
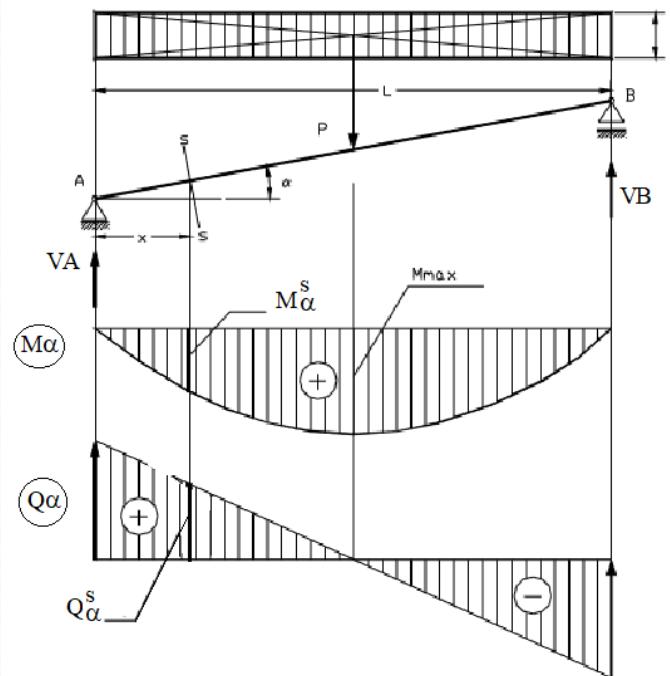
# Viga simplemente apoyada con voladizo

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**RELACIÓN ESQUEMA  
CARGA-DEFORMADA-  
DIAGR. V Y Mf**

# Vigas de eje inclinado



# Vigas de eje inclinado

