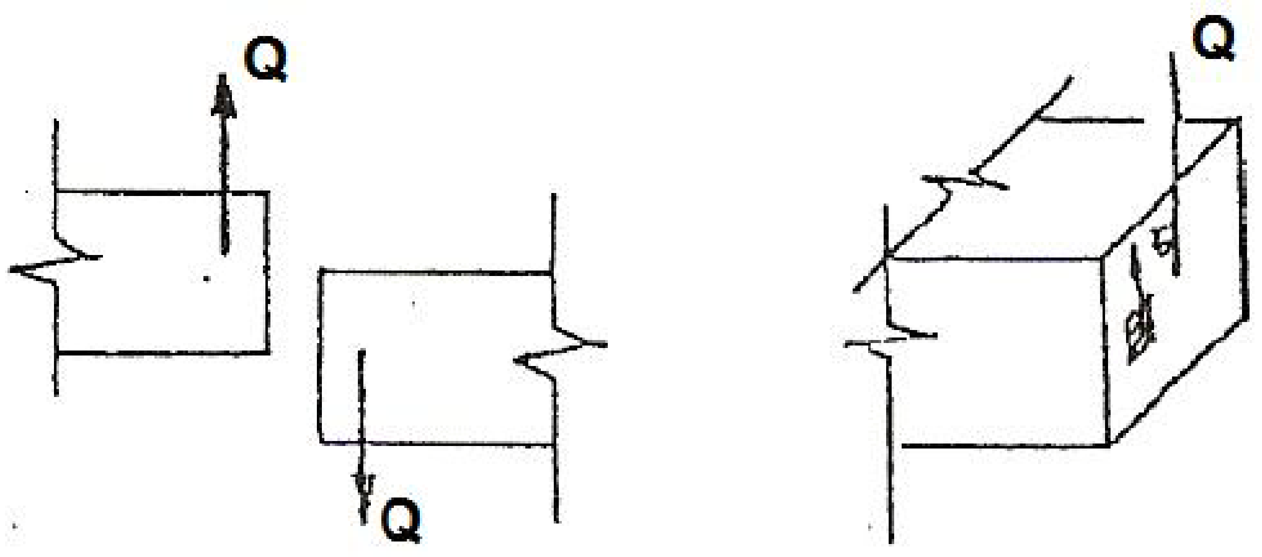
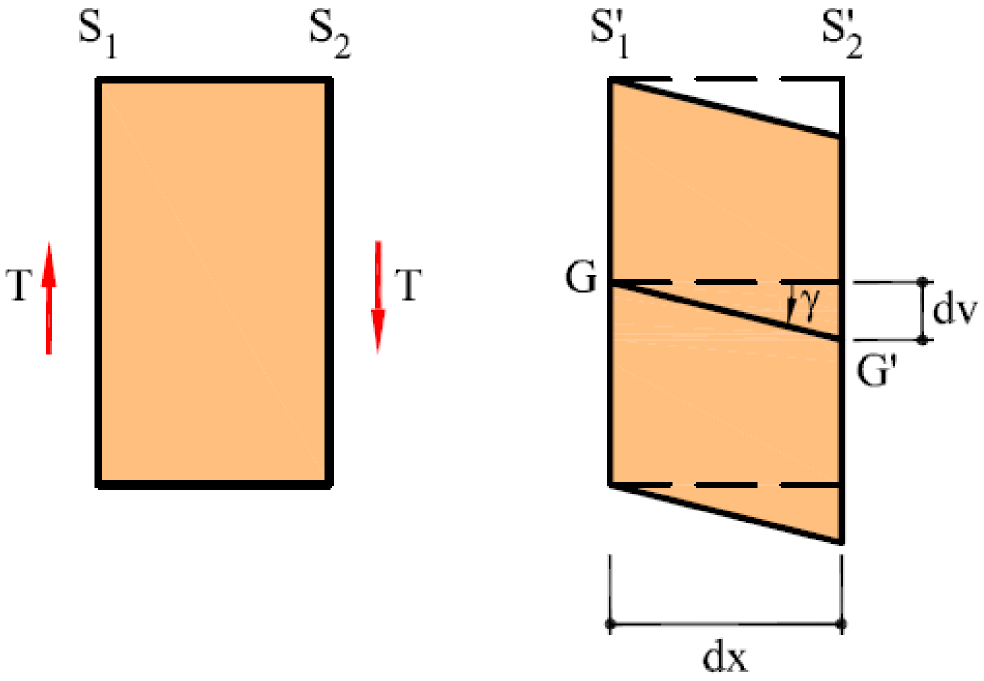
CORTE EN LA FLEXIÓN

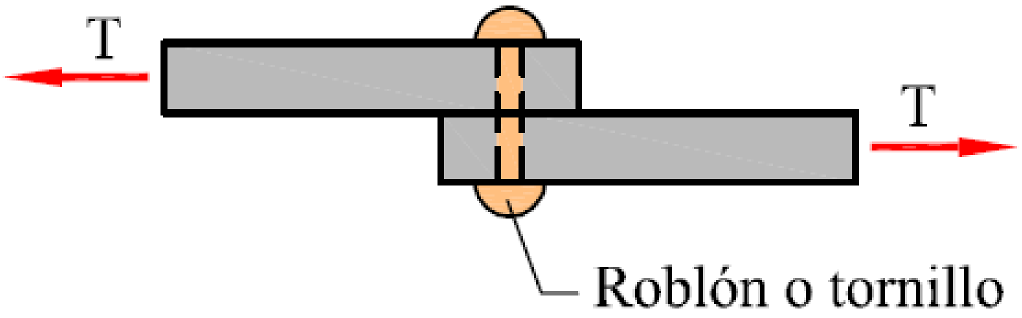


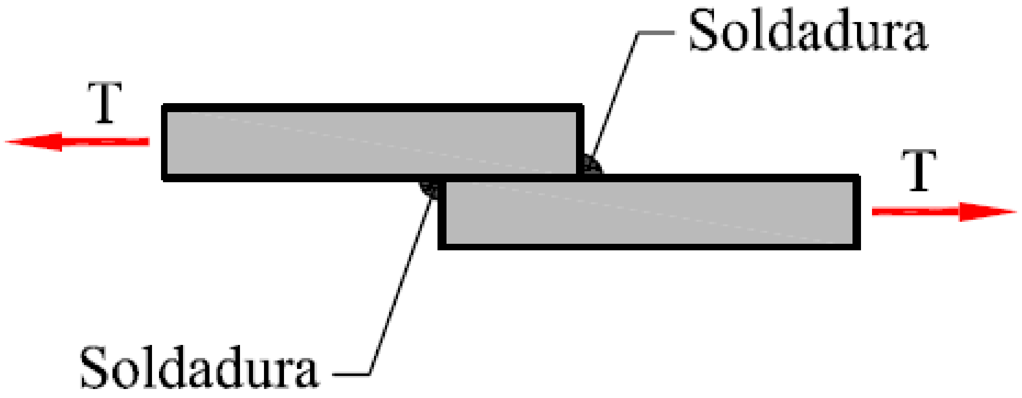


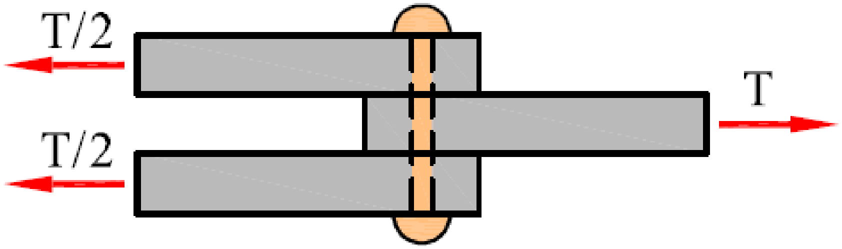
$$\gamma = \frac{dv}{dx}$$

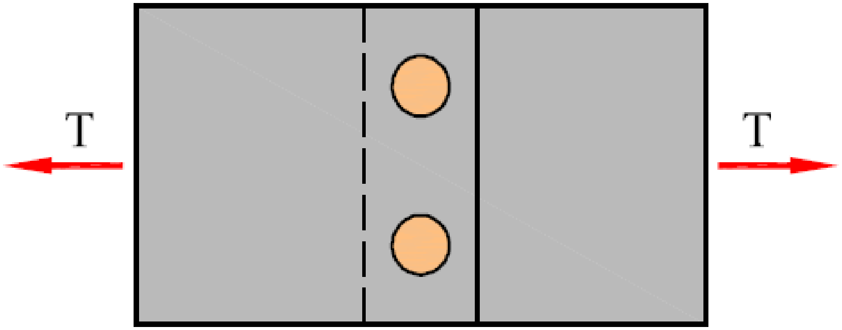
$$\tau = G\,\gamma$$

$$\tau = \frac{T}{A} \qquad \gamma = \frac{T}{GA}$$

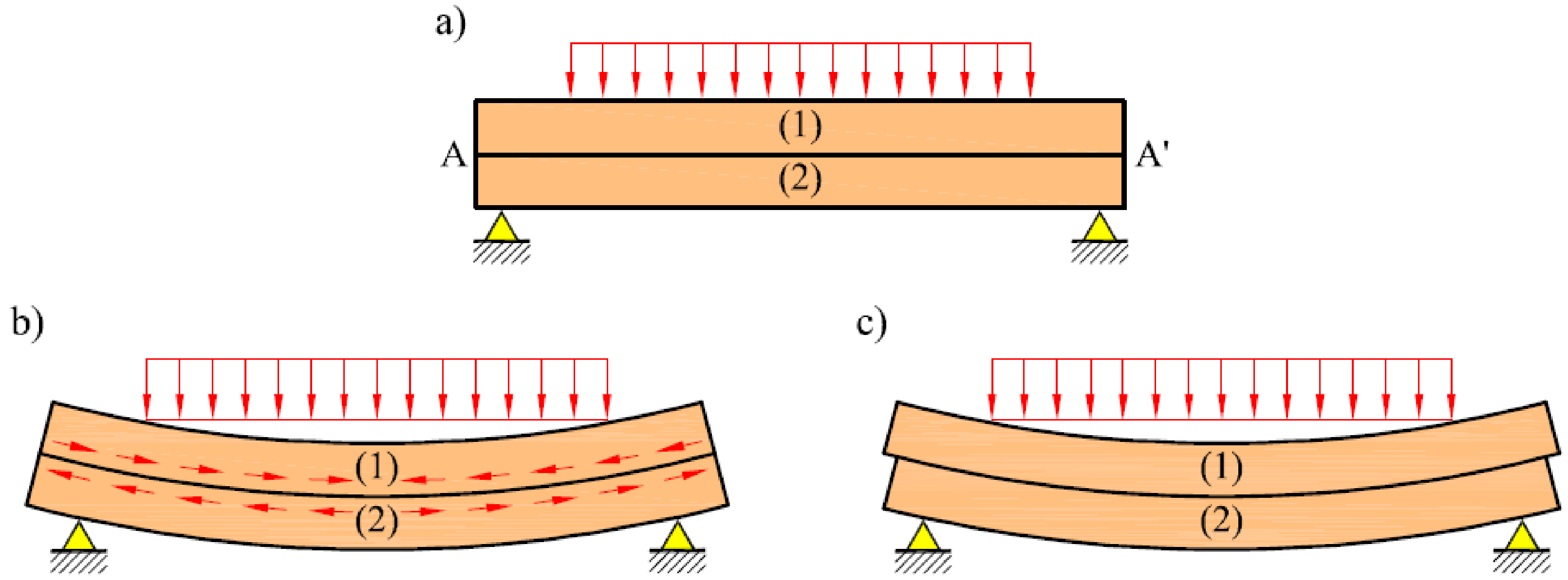

T
T
Roblón o tornillo

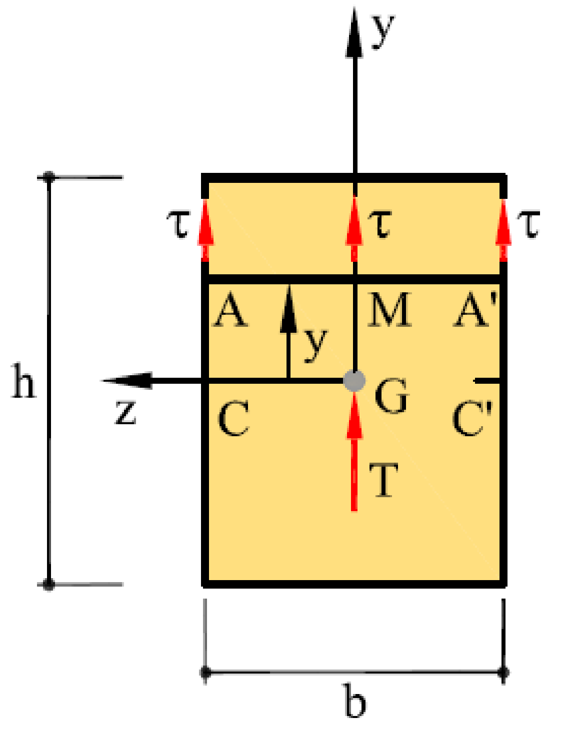

Soldadura
T
T
Soldadura

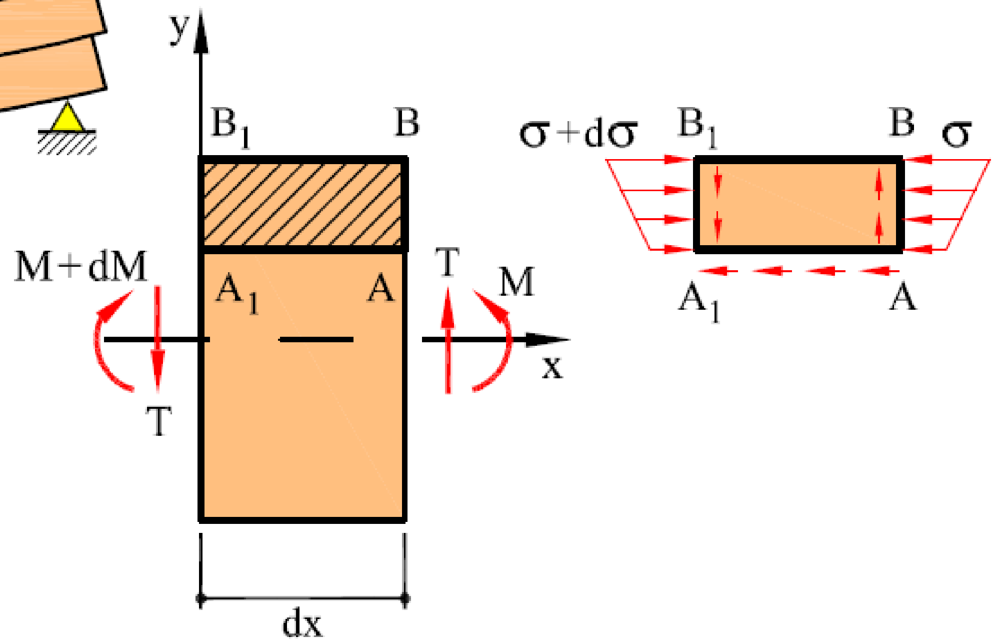

T/2
T/2
T

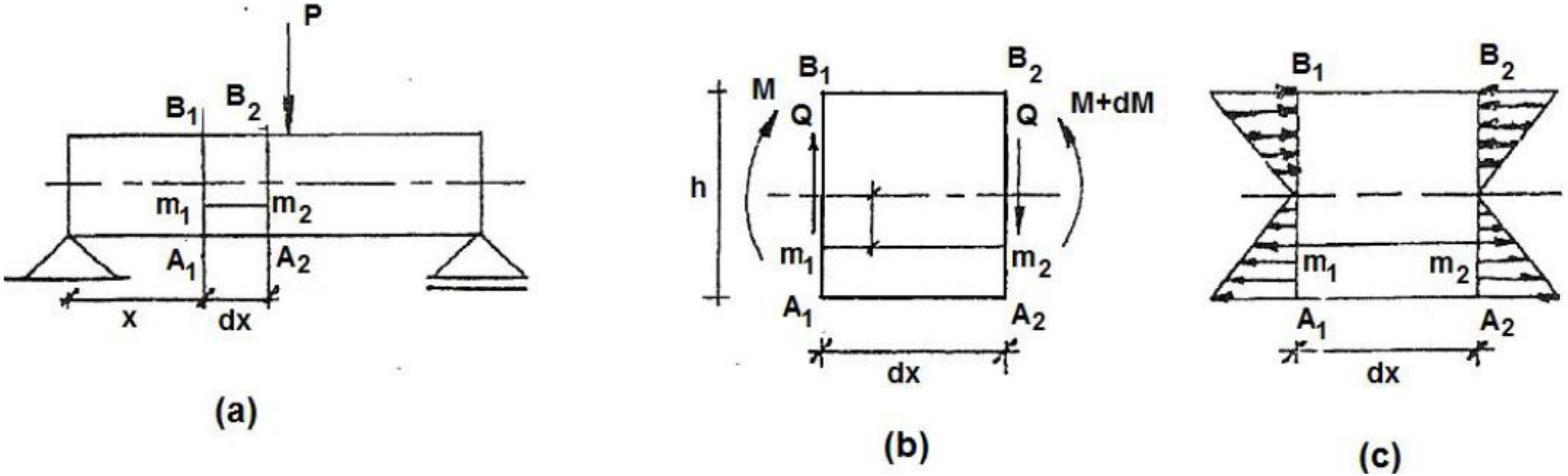

T
T

Expresión de Jourawsky o Collignon



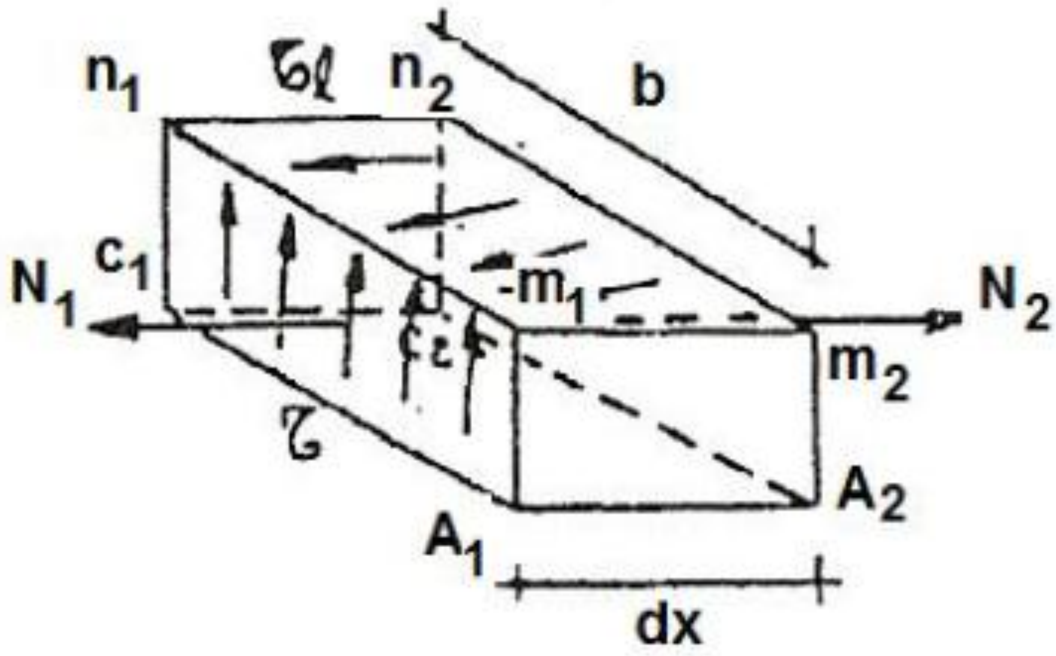






$$\sigma_1 = \frac{M}{I_n} \cdot y$$

$$\sigma_2 = \frac{M + dM}{I_n} \cdot y$$



(d)

$$N_1 = \int_{As} \sigma_1 \cdot dA$$

$$N_2 = \int_{As} \sigma_2 \cdot dA\,.$$

en la cara $m_1n_1n_2m_2$ vale: $\tau \cdot b \cdot dx$

$$\Sigma F_X = 0\,, \qquad -N_1 + N_2 - \tau \cdot b \cdot dx = 0$$

$$-\int_{As} \sigma_1 \cdot dA + \int_{As} \sigma_2 \cdot dA - \tau \cdot b \cdot dx = 0$$

$$\sigma_1 = \frac{M}{I_n}\cdot y$$

$$-\int_{As}\sigma_1\cdot dA + \int_{As}\sigma_2\cdot dA - \tau\cdot b\cdot dx = 0$$

$$\sigma_2 = \frac{M+dM}{I_n}\cdot y$$

$$\cancel{-\frac{M}{I_n}\cdot\int_{As} y\cdot dA} + \cancel{\frac{M}{I_n}\int_{As} y\cdot dA} + \frac{dM}{I_n}\int_{As} y\cdot dA - \tau\cdot b\cdot dx = 0$$

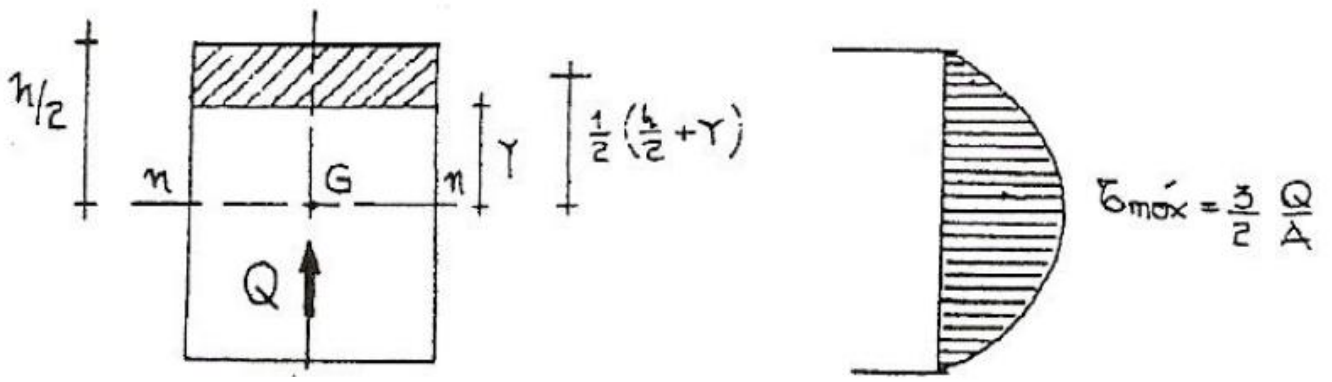
$$S_n = \int_{y}^{h/2} y\cdot dA \qquad \frac{dM}{I_n}\cdot S_n = \tau\cdot b\cdot dx \qquad Q = \frac{dM}{d_x}$$

$$\boxed{\tau = \frac{Q\cdot S_n}{I_n\cdot b}}$$

Expresión de Jourawsky ó Collignon.

LEY DE VARIACIÓN

SECCIÓN RECTANGULAR

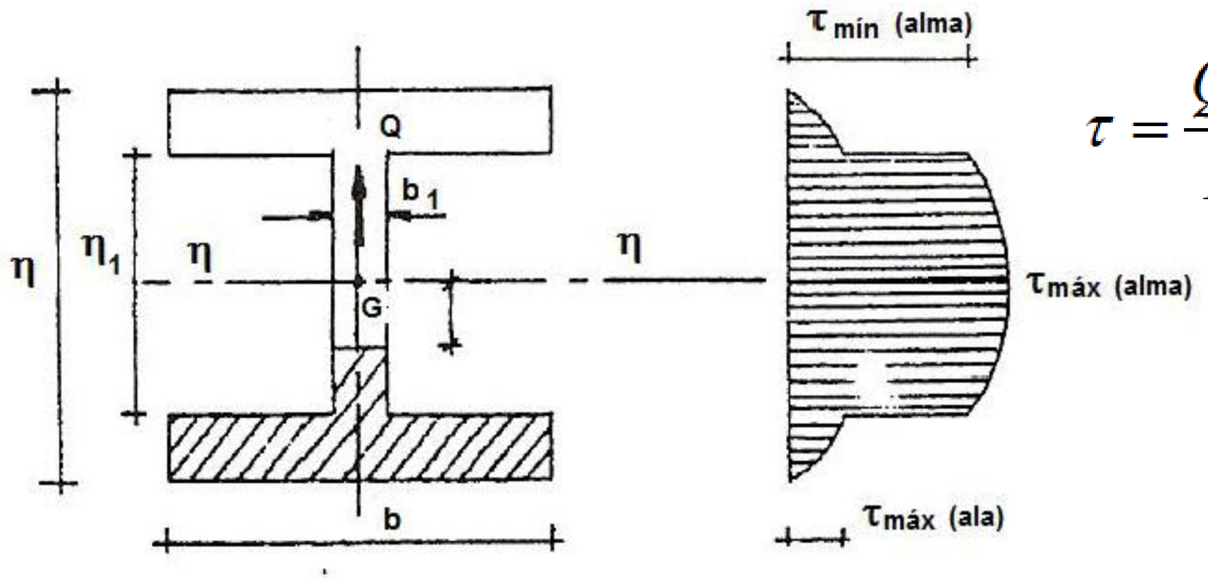


$$S_n = b \cdot \left(\frac{h}{2} - y\right) \cdot \frac{1}{2} \cdot \left(\frac{h}{2} + y\right) = \frac{b}{2}\left(\frac{h^2}{4} - y^2\right)$$

$$\tau = \frac{Q \cdot b \cdot \left(\frac{h^2}{4} - y^2\right)}{2 \cdot I_n \cdot b}$$ como $I_n = \frac{b \cdot h^3}{12}$

$$\tau = \frac{6 \cdot Q}{b \cdot h^3} \cdot \left(\frac{h^2}{4} - y^2\right)$$

SECCIÓN DOBLE T



$$\tau = \frac{Q \cdot S_n}{I_n \cdot b}$$

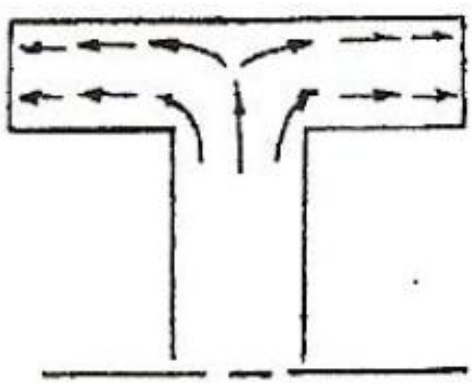
$$S_n = b \cdot \left(\frac{h-h_1}{2}\right) \cdot \left(\frac{h_1}{2} + \frac{h-h_1}{4}\right) + b_1 \cdot \left(\frac{h_1}{2} - y\right) \cdot \frac{1}{2} \cdot \left(\frac{h_1}{2} - y\right)$$

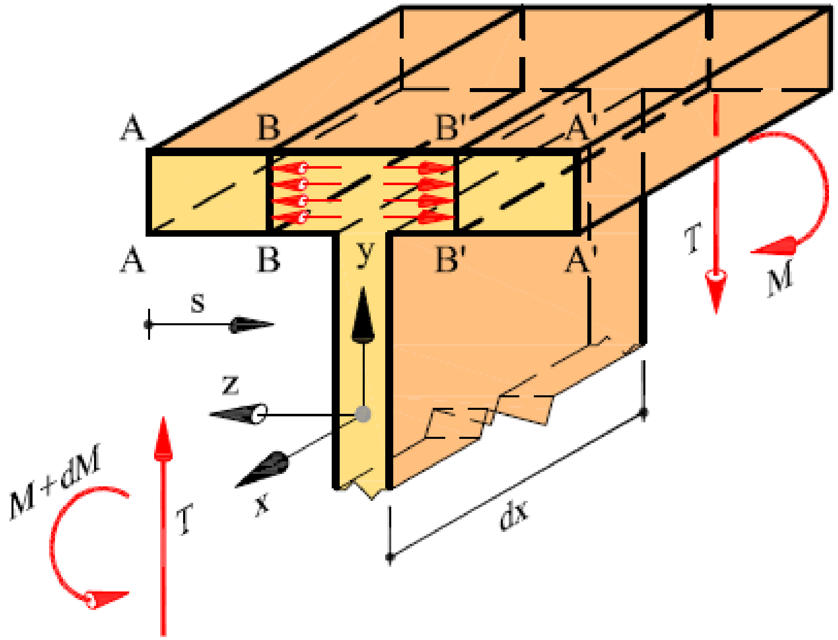
$$S_n = b \cdot \left(\frac{h-h_1}{2}\right) \cdot \left(\frac{h+h_1}{4}\right) + b_1 \cdot \left(\frac{h_1}{2} - y\right) \cdot \left(\frac{h_1}{4} + \frac{y}{2}\right)$$

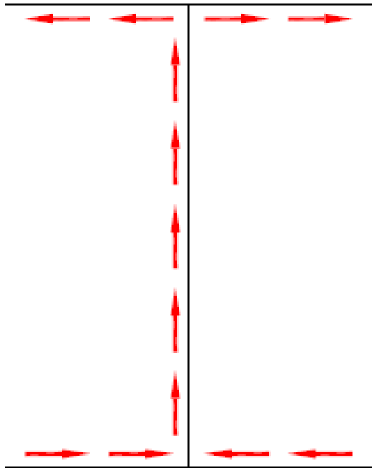
$$\tau = \frac{Q}{I_n \cdot b} \cdot \left[\frac{b}{2} \cdot \left(\frac{h^2}{4} - \frac{h_1^2}{4}\right) + \frac{b_1}{2} \cdot \left(\frac{h_1^2}{4} - y^2\right)\right]$$

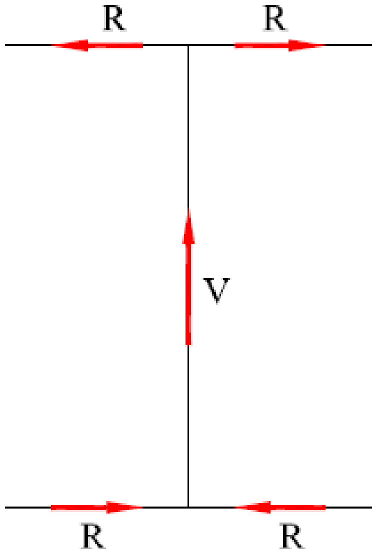
$$S_n = \frac{b}{2} \cdot \left(\frac{h^2}{4} - \frac{h_1^2}{4}\right) + \frac{b_1}{2} \cdot \left(\frac{h_1^2}{4} - y^2\right)$$

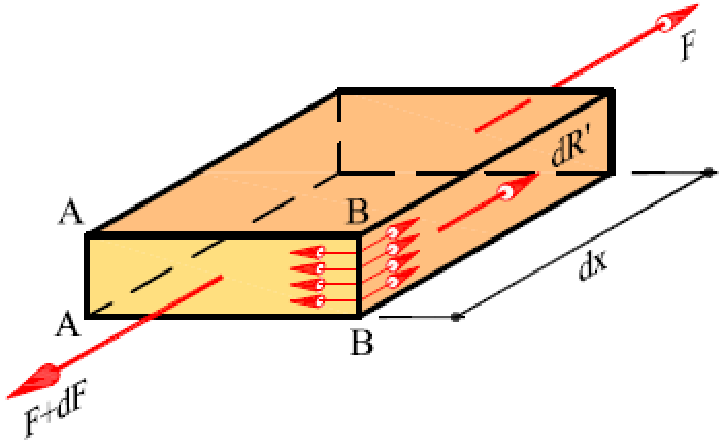
$$\tau_{MÁX} = \frac{Q}{h_1 \cdot b_1}$$

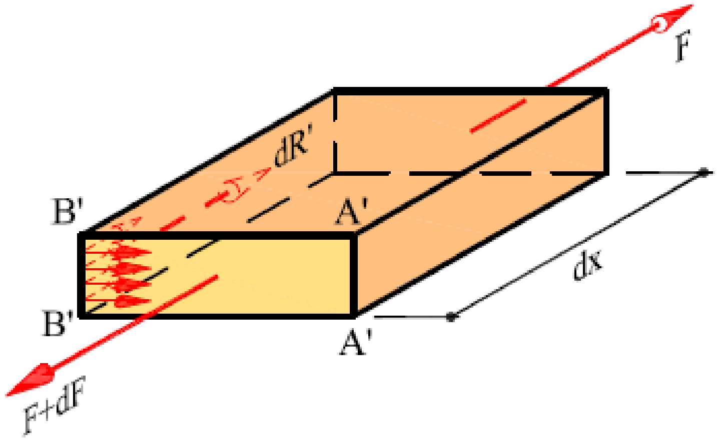


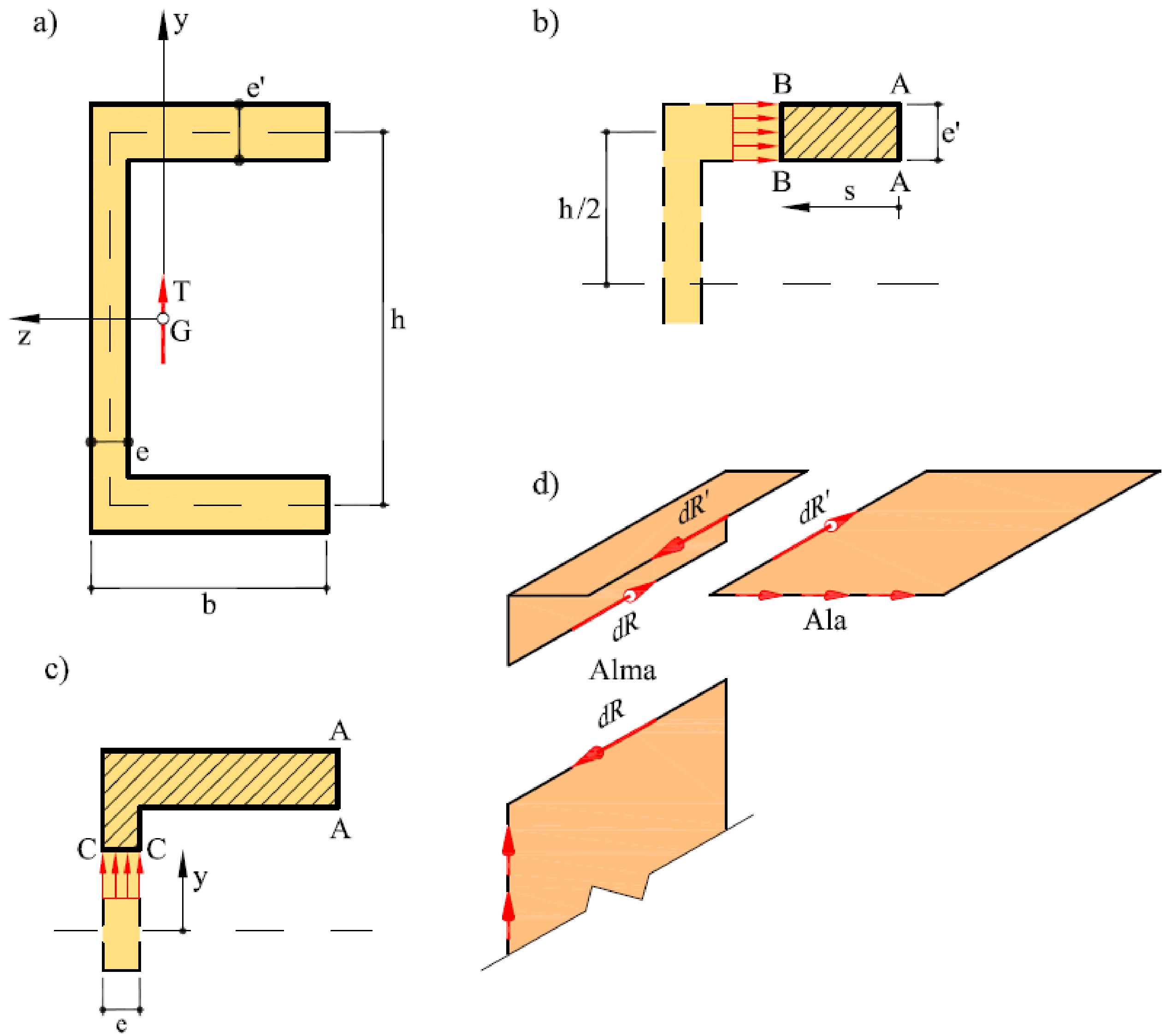

A
B
B'
A'
A
B
B'
A'
y
s
z
x
T
M
M+dM
T
dx

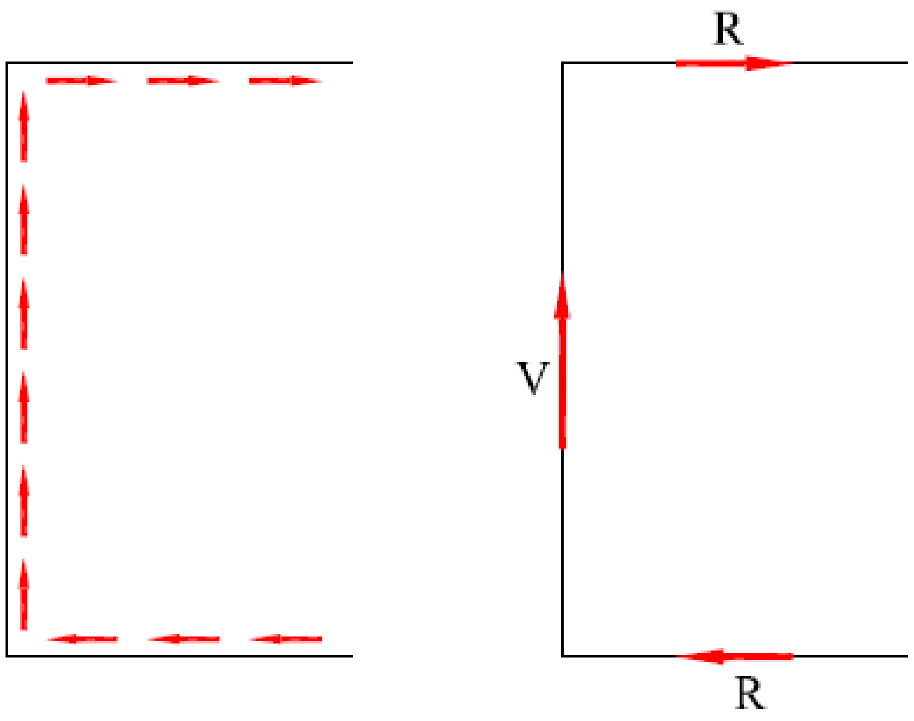


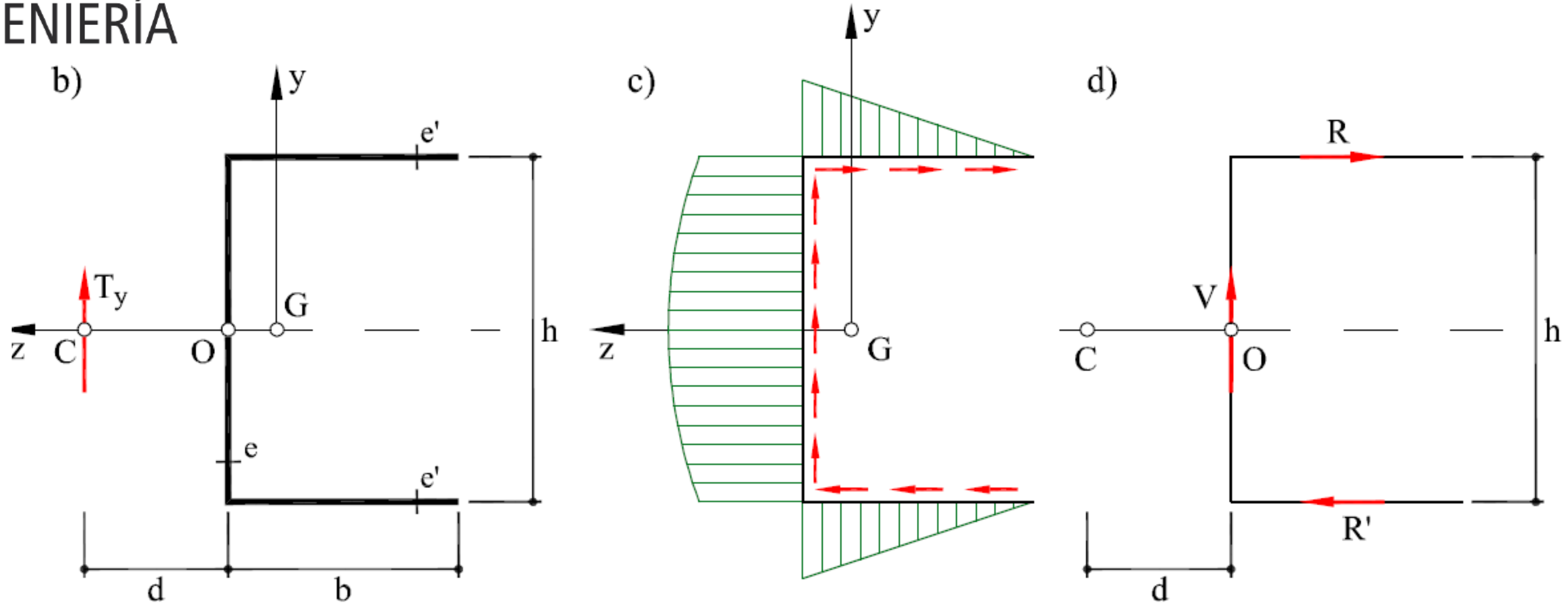

R
R
V
R
R

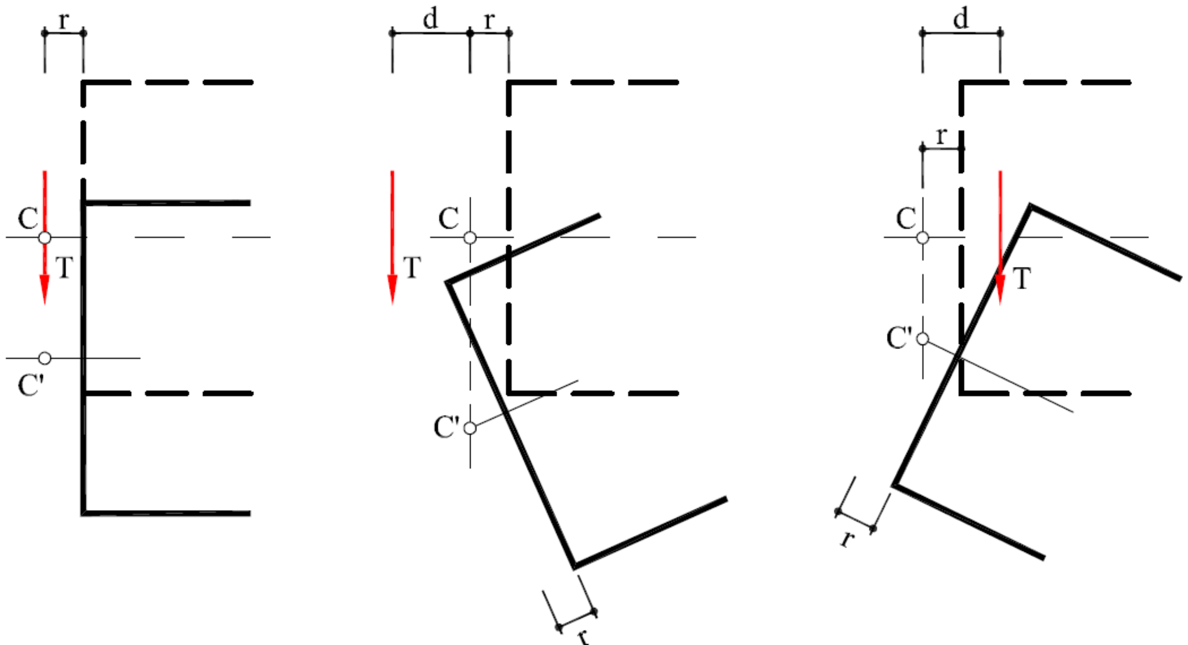

F
dR'
A
B
A
B
dx
F+dF


F
dR'
B'
A'
B'
A'
dx
F+dF

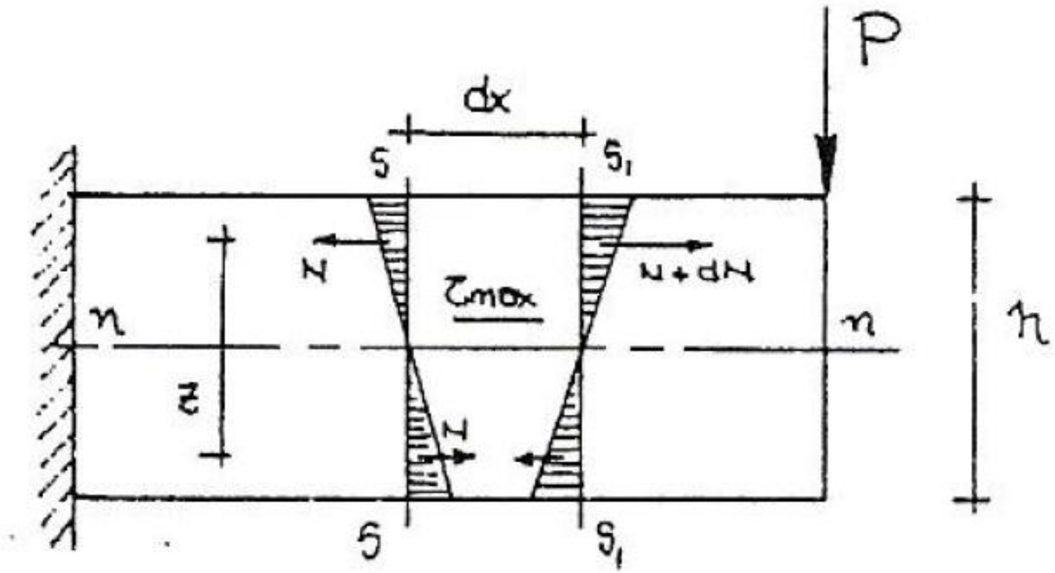

a)
y
e'
T
z
G
h
e
b
b)
B
A
e'
h/2
B
A
s
c)
A
A
C
C
y
e
d)
dR'
dR'
dR
Alma
Ala
dR


R
V
R


b)
y
e'
Ty
G
z
C
O
h
e
e'
d
b
c)
y
z
G
d)
R
V
C
O
h
R'
d


r
C
T
C'
d
r
C
T
C'
r
d
r
C
T
C'
r

EXPRESIÓN SIMPLIFICADA DE $\tau_{MÁX}$



$$\tau_{MÁX} \cdot b \cdot dx + N - (N + dN) = 0 \quad ; \quad \tau_{MÁX} \cdot b = \frac{dN}{dx} \qquad N = \frac{M}{z}$$

$$\frac{dN}{dx} = \frac{1}{z} \cdot \frac{dM}{dx} = \frac{Q}{z}$$

$$\boxed{\tau_{MÁX} = \frac{Q}{b \cdot z}}$$