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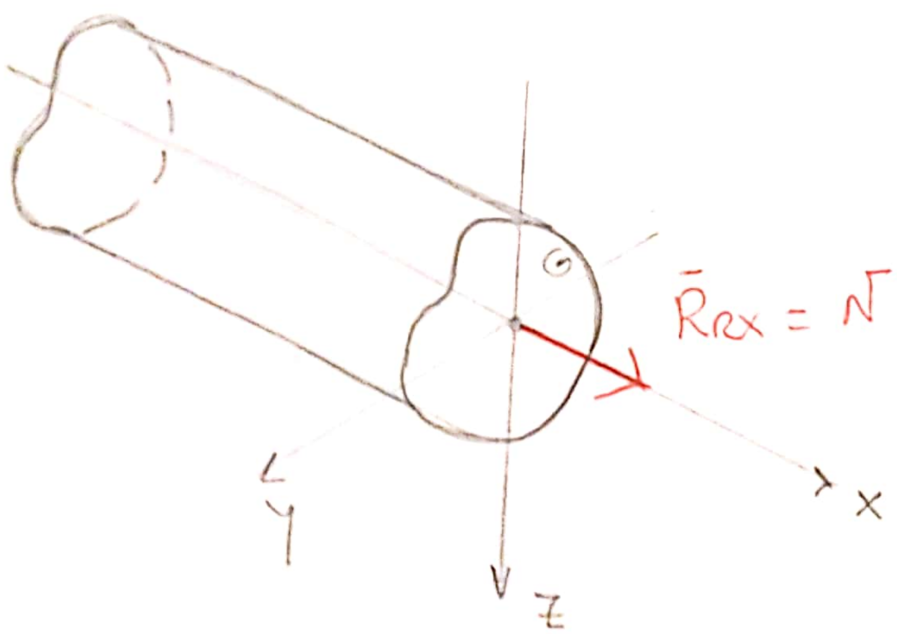
SOLICITACIÓN AXIL:

1)- OBJETO:

2)- DEFINICIÓN



3)- EC. DE EQUIVALENCIA:

1) $N = \int_A \sigma_x \cdot dA$

2) $Q_y = 0 = \int_A \tau_{xy} \cdot dA.$

3) $Q_z = 0 = \int_A \tau_{xz} \, dA$

---

4) $M_x = 0 = \int_A (-\tau_{xy} \cdot z + \tau_{xz} \cdot y) dA$

5) $M_y = 0 = \int_A \sigma_x \cdot z \cdot dA.$

6) $M_z = 0 = \int_A (-\sigma_x) \cdot y \cdot dA$

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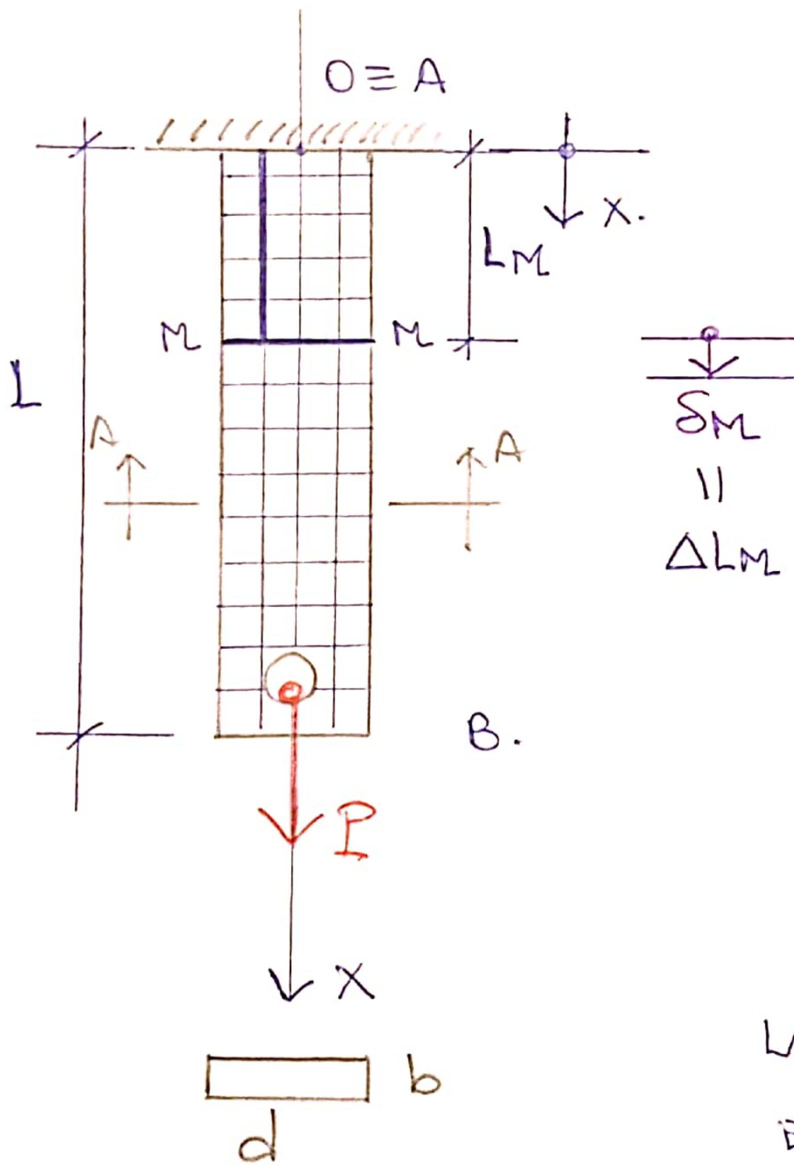
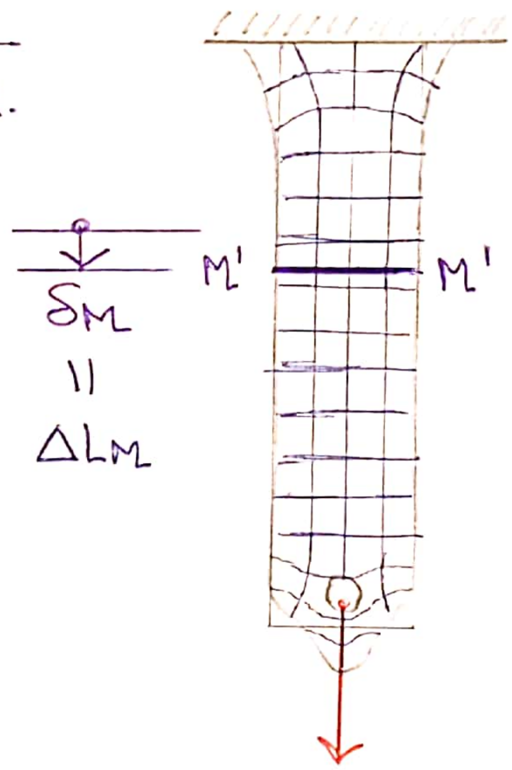
4)- EXPLICACIÓN DEL FENÓMENO:

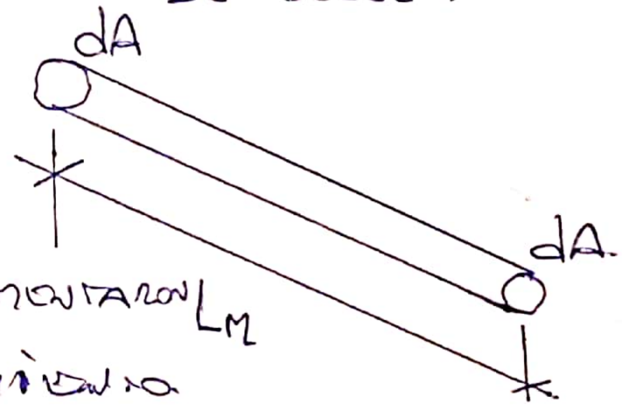


CORTE A-A



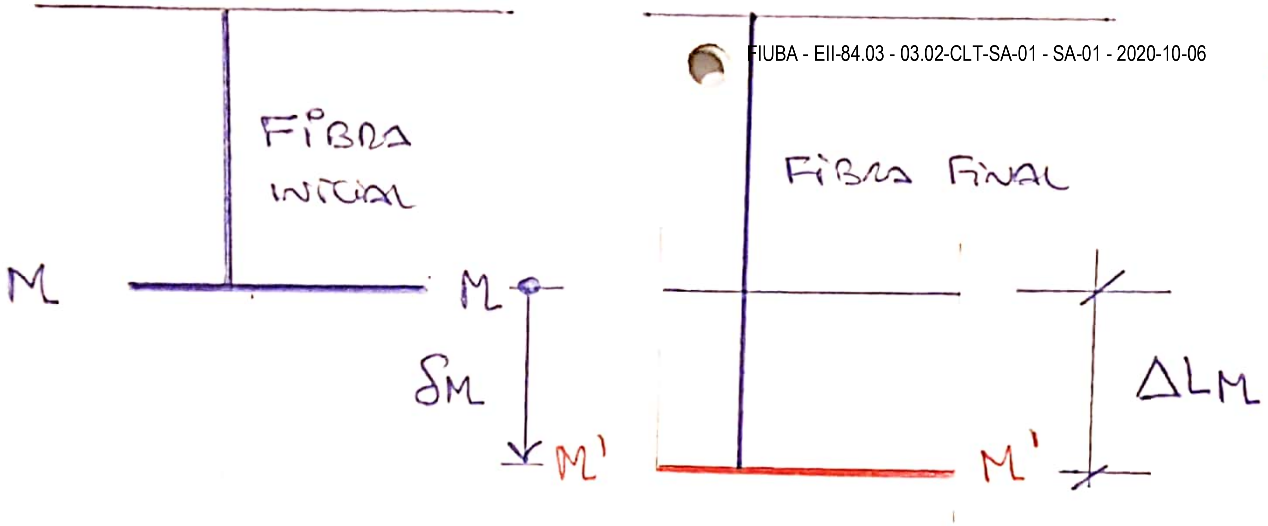
- LAS SECCIONES SE MANTIENEN PLANAS Y PARALELAS A SÍ MISMAS.

- <u>FIBRA</u>: ES UN PRISMA DE SECCIÓN INFINITÉSIMA, PARALELA AL EJE DE LA BARRA. Y DE LA LONGITUD QUE SE DESEE.



LAS FIBRAS EXPERIMENTARON EL MISMO ALARGAMIENTO

ΔL_M



FIBRA: $L_0 = L_M \rightarrow \Delta L_M \longrightarrow \Delta L = CTE$ P/ TODAS LAS FIBRAS Y PTOS DE LA SECCIÓN.

$\frac{\Delta L}{L_0} = \underbrace{\varepsilon_x}_{} = CTE$; SI AHORA CONSIDERO LA LEY DE HOOKE

DEFORMACIÓN ESPECÍFICA LONGITUDINAL.

$\sigma_x = E \cdot \underbrace{\varepsilon_x}_{CTE} = \boxed{CTES}$

($E \rightarrow$ CTE.)

EN $\boxed{SA}$ P/ SECCIONES ALEJADAS DE LA ZONA DE APLICACIÓN DE CARGAS Y DE APOYOS; PARA TODOS LOS PUNTOS DE LA MISMA.

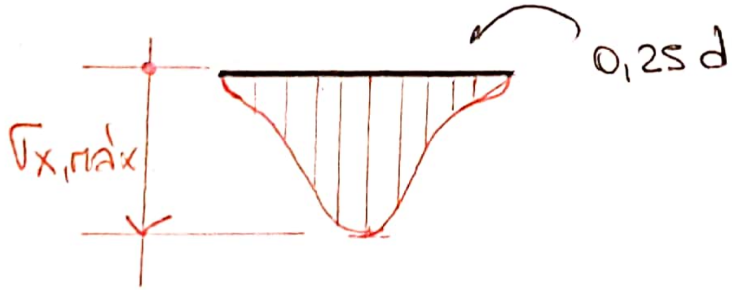
SE COMPRUEBA QUE: $\varepsilon_x = CTE$ Y P/ LAS FIBRAS QUE $\Delta L = CTE$.

$\sigma_x = CTE$

DE LA EC. DE EQUIVALENCIA (1):

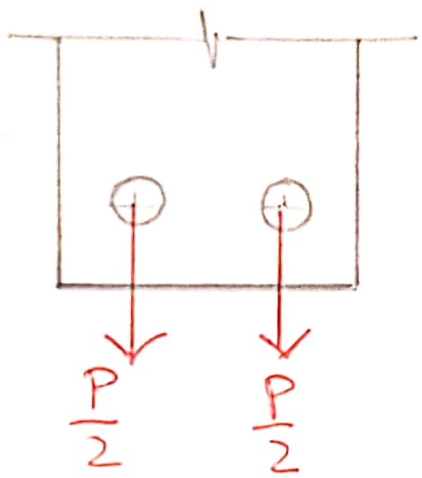
$$N = \int_A \underbrace{\sigma_x}_{cte} \, dA = \sigma_x \underbrace{\int_A dA}_{A} = \sigma_x \cdot A \;\rightarrow\; \boxed{\sigma_x(x) = \frac{N(x)}{A(x)}}$$

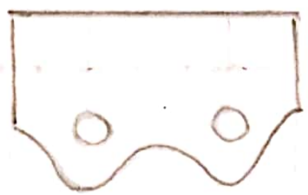
→ HIPÓTESIS DE TRABAJO → NAVIER → "HIP. DE NAVIER"



$\sigma_{x,máx} \cong 1{,}03 \; \sigma_{x,media}$

$\sigma_{x,máx} = 2{,}60 \; \sigma_{x,media}$

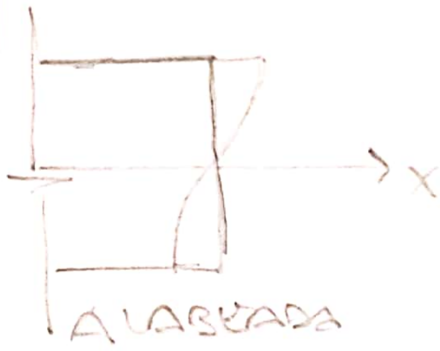




- Si las secciones se mantienen planas:

I → Las secciones NO se alabean

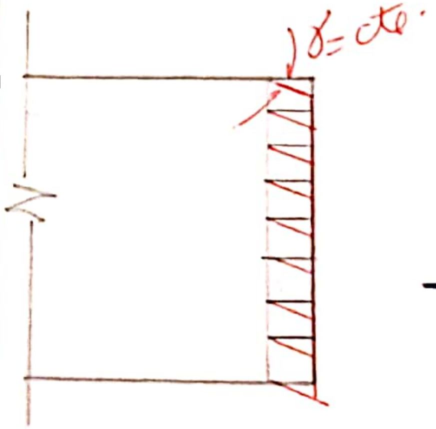
$\gamma = 0 \longrightarrow \tau = G \cdot \underset{=0}{\gamma} = 0.$

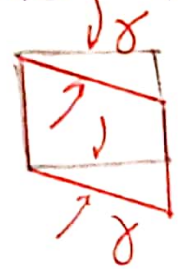


(2) $0 = \int_A \tau_{xy} \, dA$ ✓

(3) $0 = \int_A \tau_{xz} \, dA$ ✓

II → Las secciones ~~se alabe~~ NO se alabean, pero → $\gamma = cte.$





$\rightarrow \tau = G \cdot \gamma = cte.$

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(2) $0 = \int_A \tau_{xy}\, dA = \tau_{xy} \int_A dA. \rightarrow 0 = \int_A dA$

(3) $0 = \int_A \tau_{xz}\, dA = \tau_{xz} \int_A dA. \rightarrow 0 = \int_A dA.$ $\rightarrow$

$\rightarrow$ 1°) INCONGRUENCIA MATEMÁTICA $\rightarrow$ y LUEGO FÍSICA. $\rightarrow$

$\rightarrow$ $\boxed{\tau_{xy} = \tau_{xz} = 0}$

- LA SECCIÓN NO SE ALABEA y NO SE DISTORSIONA.

(4) $\rightarrow M_x = 0 = \int_A (-\underbrace{\tau_{xy}}_{=0} \cdot z + \underbrace{\tau_{xz}}_{=0} \cdot y)\, dA$ ✓

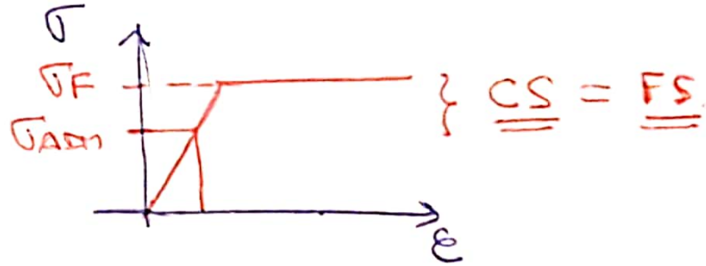
(5) $M_y = 0 = \int_A \sigma_x \cdot z\, dA = \sigma_x \int_A z\, dA. = \int_A z\, dA$ ✓

$M_z = 0 = \int_A (-\sigma_x) \cdot y\, dA = (-\sigma_x) \int_A y\, dA = \int_A y\, dA$ ✓

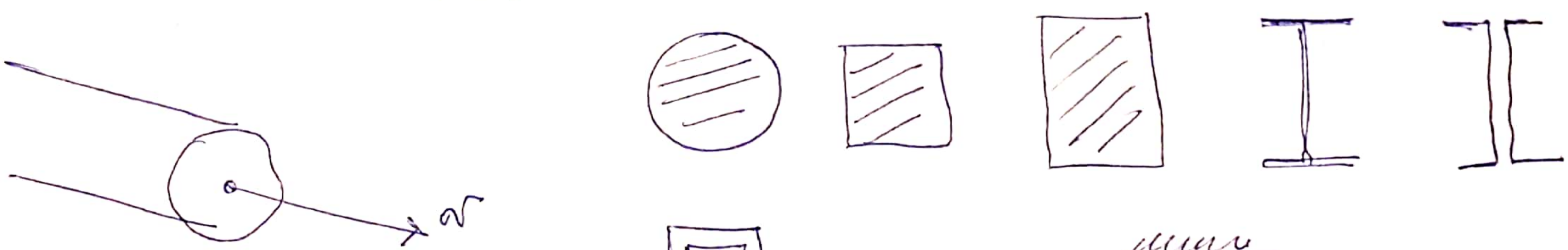
MOMENTOS ESTÁTICOS RESPECTO EJES BARICÉN.

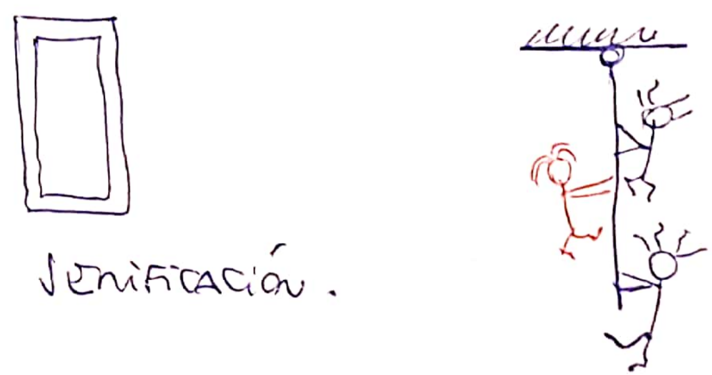
$\sigma_x(x) = \dfrac{N(x)}{A(x)}$ → VERIFICAR LOS ELEMENTOS ESTRUCTURALES.

$\sigma_x \leq \sigma_{x,ADM} = \dfrac{\sigma_F}{CS}$



→ $A(x) \geq \dfrac{N(x)}{\sigma_{ADM}}$ → DIMENSIONADO O DIMENSIONAMIENTO.



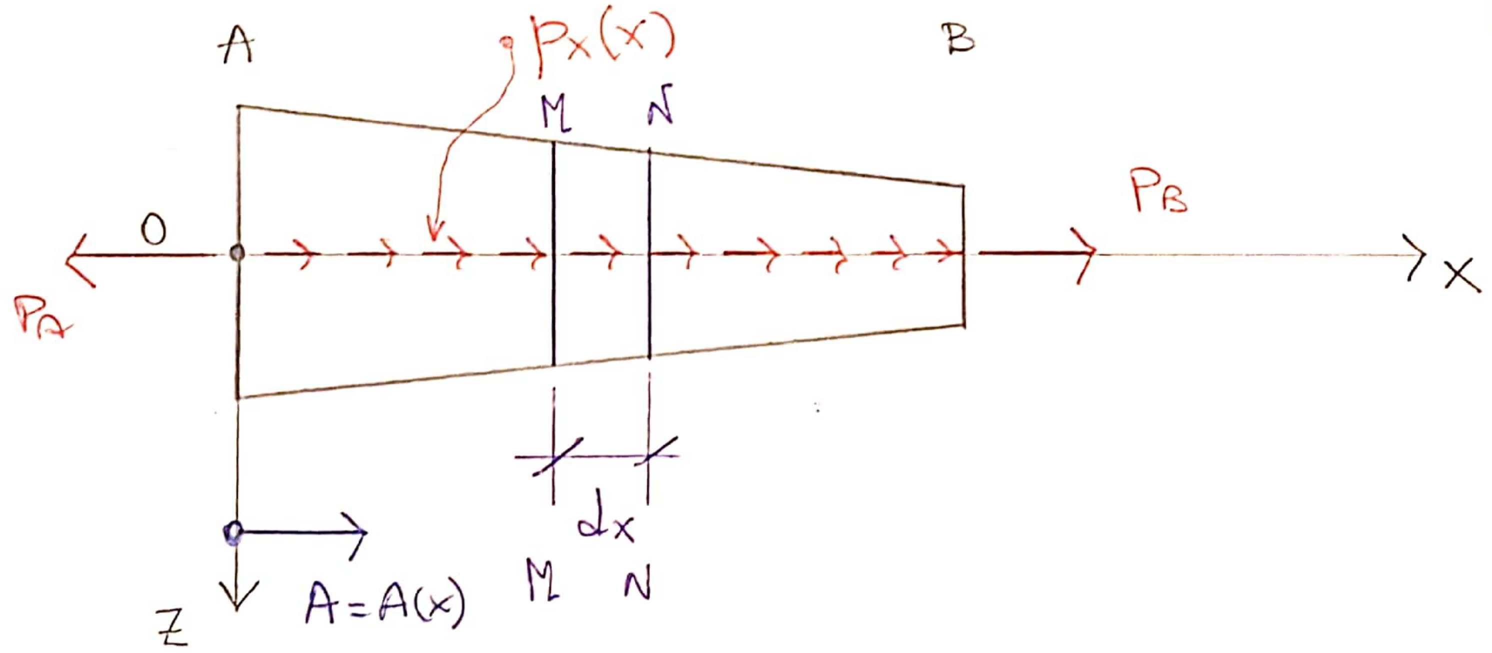


→ $N(x) = \sigma_x \cdot A(x)$. → VERIFICACIÓN.

$$N_{ADM} = \sigma_{ADM} \cdot A(x)$$

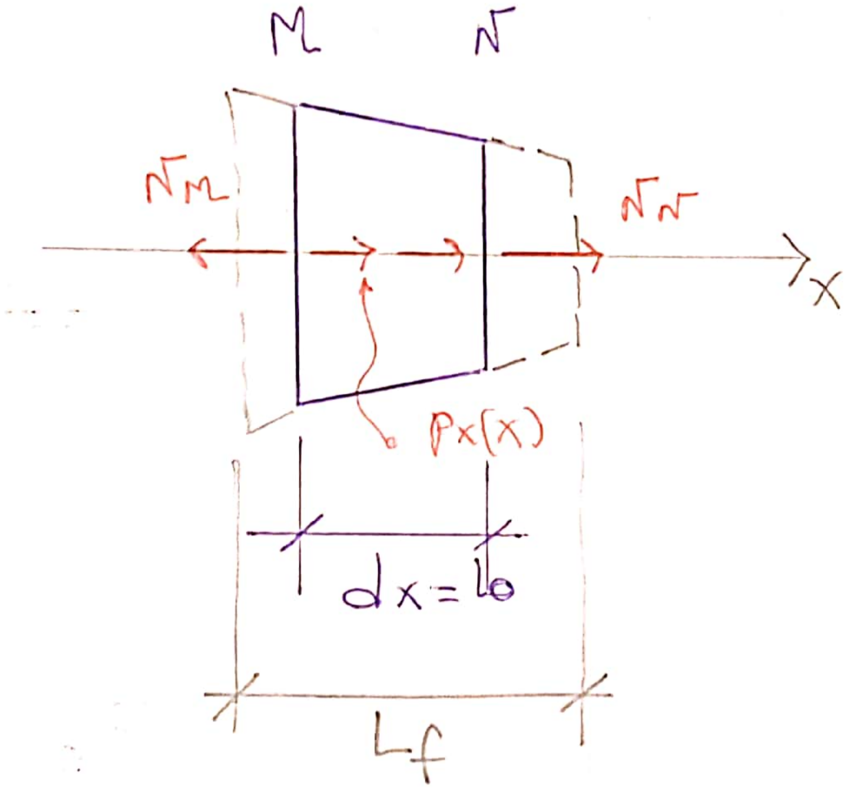
- SA → T
  - → C → PANDEO ← SÍ DEPENDE LA FORMA DE LA SECCIÓN.
    - → NO PANDEO.

OS) → DESPLAZAMIENTOS Y DEFORMACIONES:



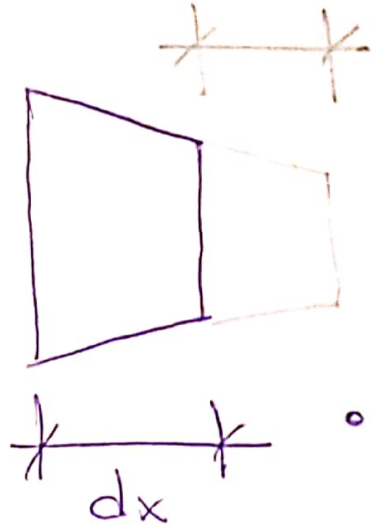
REBANADA ELEMENTAL.

L → dx



$\Delta L = L_f - l_0 = \Delta dx$

$\Delta L = \Delta dx$



$$\frac{\Delta dx}{dx} = \varepsilon_x(x)$$

$$\Delta dx = \varepsilon_x(x) \cdot dx.$$

- Ley de Hooke

$$\sigma_x(x) = E \cdot \varepsilon(x).$$

$$\Delta dx = \frac{\sigma_x(x)}{E} \cdot dx.$$

- si $\sigma_x(x) = \dfrac{N(x)}{A(x)}$

$$\Delta dx = \frac{N(x)}{E A(x)} \cdot dx.$$

$$\boxed{\Delta L(x) = \delta(x) = \int \Delta dx = \int \frac{N(x)}{E A(x)} \, dx.}$$

$$\boxed{\frac{d\delta(x)}{dx} = \frac{d\Delta L(x)}{dx} = \varepsilon_x(x)}$$

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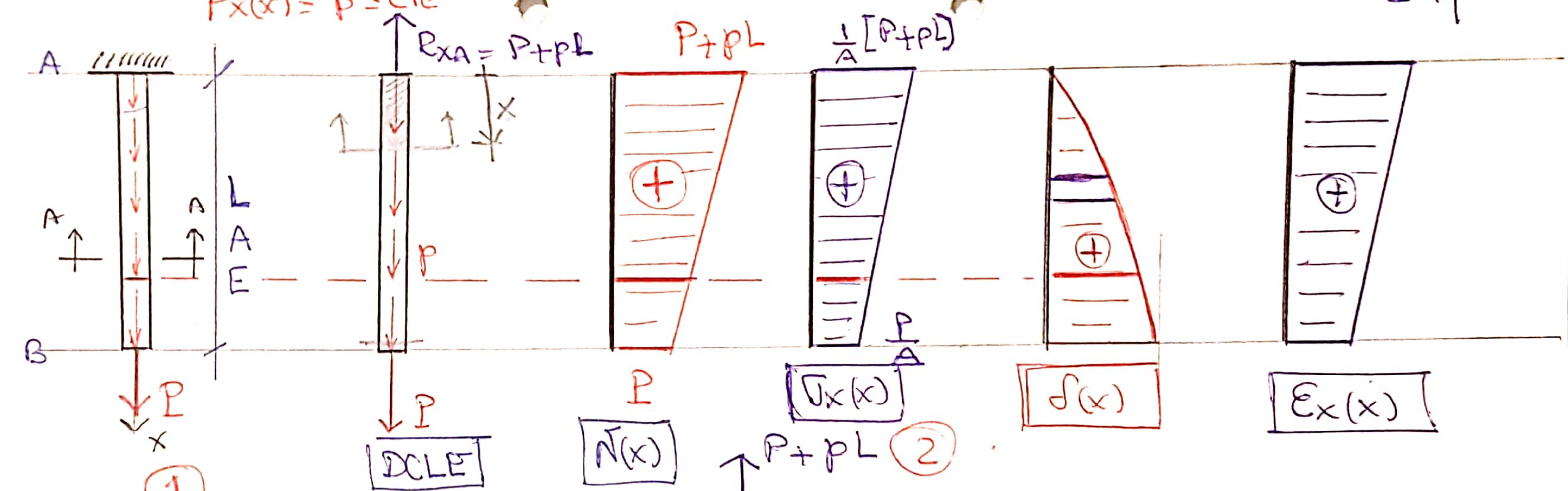
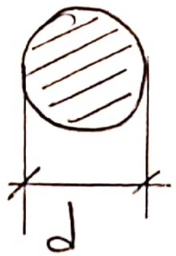
$P_x(x) = p = cte$



①

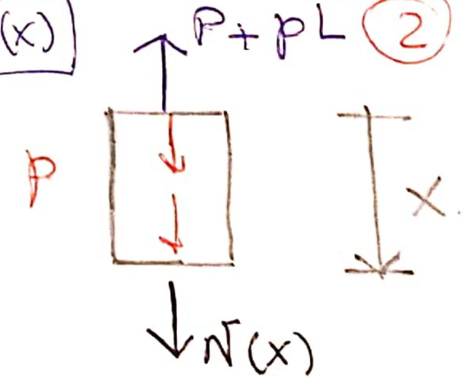


$$\Sigma F_x = 0.$$

$$P + p \cdot L + R_{XA} = 0.$$

$$\boxed{R_{XA} = -P - pL}$$

②



$$N(x) + p \cdot x - (P + pL) = 0$$

$$N(x) = P + pL - px$$

$$\boxed{N(x) = P + p(L - x)}$$

$x = 0 \quad N(x=0) = P + pL$

$x = L \quad N(x=L) = P.$

③

$$\boxed{\sigma_x(x) = \frac{N(x)}{A(x)} = \frac{N(x)}{A} = \frac{1}{A}\left[P + p(L-x)\right]}$$

$A(x) = A$

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$$\delta(x) = \int \frac{N(x)}{EA(x)}\,dx = \frac{1}{EA}\int N(x)\,dx.$$

$$\frac{d\delta(x)}{dx} = \frac{1}{EA}\left[P + pL - px\right]$$

$X \to L \to$ LA PENDIENTE DISMINUYE.

$$\delta(x) = \frac{1}{EA}\int \left[P + p(L-x)\right]dx =$$

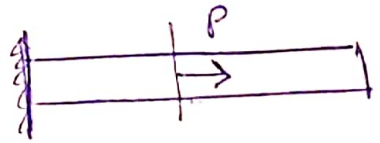
$$= \frac{1}{EA}\left[Px + pLx - \frac{1}{2}px^2\right]$$

$$\delta(x) = \frac{1}{EA}\left[Px + p\left(Lx - \frac{x^2}{2}\right)\right]$$

$$\varepsilon_x(x) = \frac{1}{EA}\left[P + pL - px\right]$$

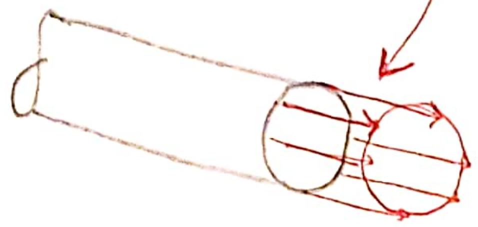
$$\varepsilon_x(x=0) = \frac{1}{EA}\left[P + pL\right].$$

$$\varepsilon_x(x=0) = \frac{P}{EA}$$



$$\delta(x=0) = \frac{1}{EA}\left[P\cdot 0 + p\left(L\cdot 0 - \frac{0^2}{2}\right)\right] = 0$$ ✓

VOLUMEN DE TENSIONES:

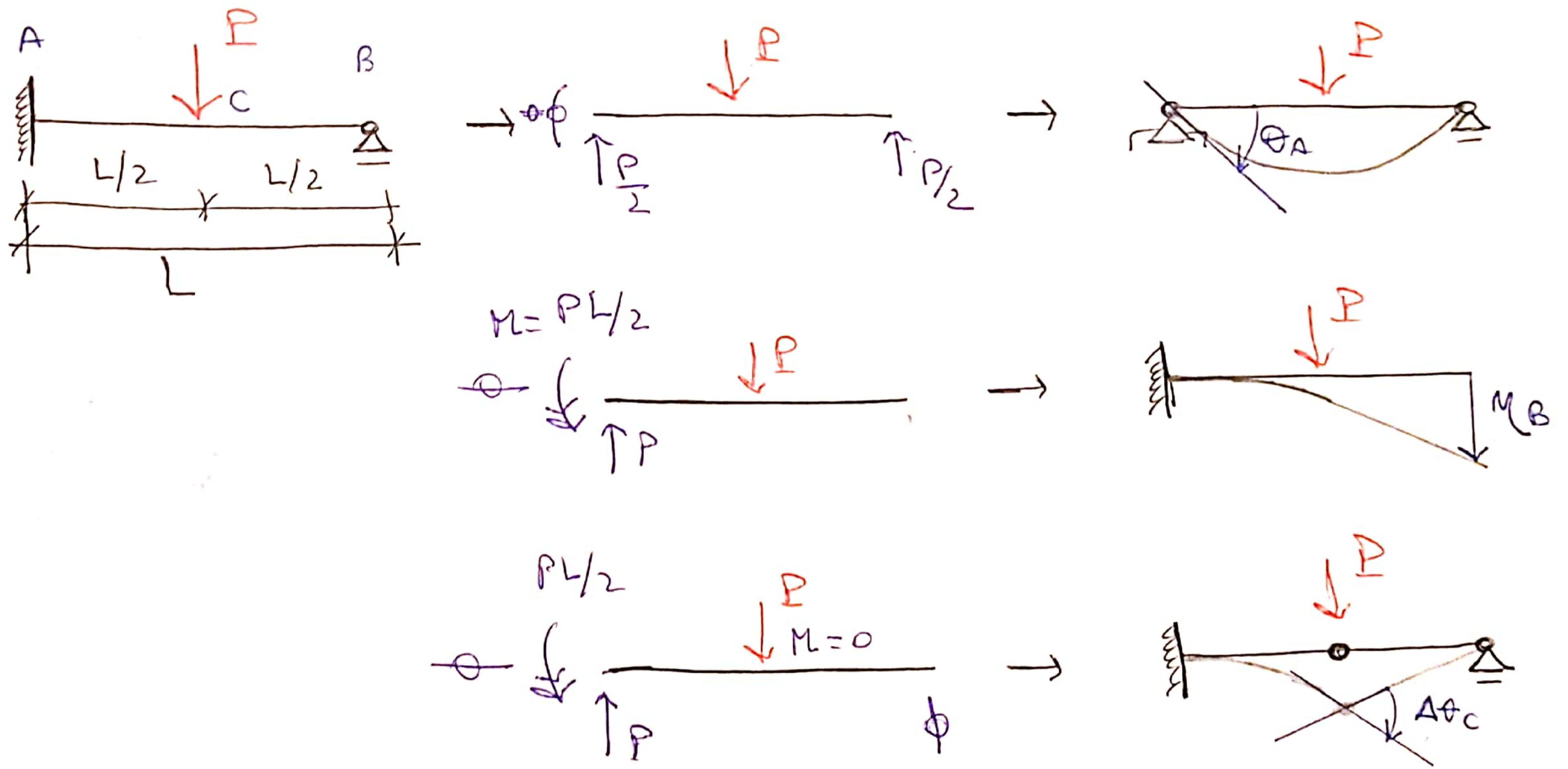


$\sigma_x = \text{CTE}.$

$$\delta(x=L) = \frac{1}{EA}\left[PL + pL^2 - p\frac{L^2}{2}\right]$$

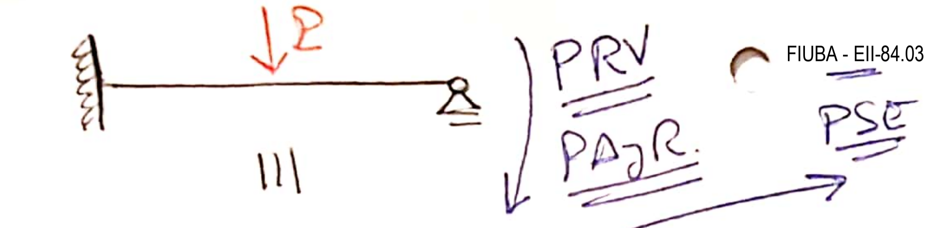
$$\delta(x=L) = \frac{1}{EA}\left[PL + \frac{1}{2}pL^2\right]$$ ✓

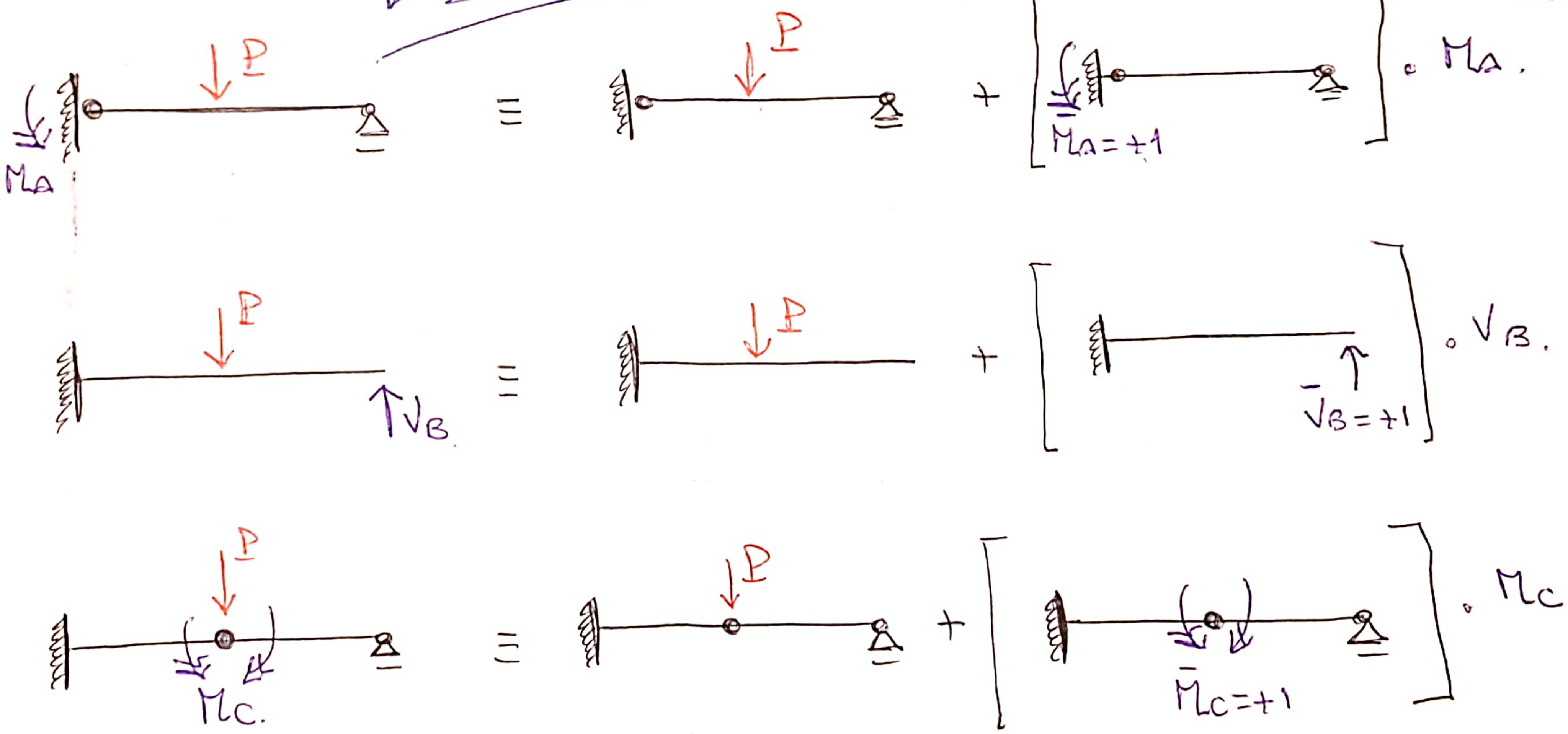
Método de incógnitas estáticas p/ resolución de sistemas hiperestáticos:

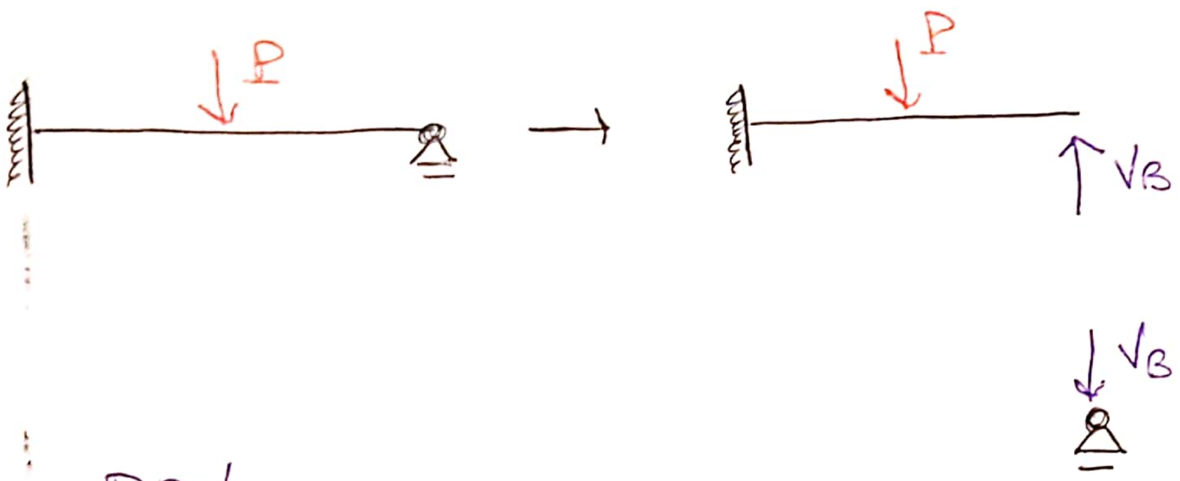


$e_{c_i} = k\, c_i \quad c_i = +1 \quad 22|25$

SF : SISTEMA FUNDAMENTAL O SIST CERO.





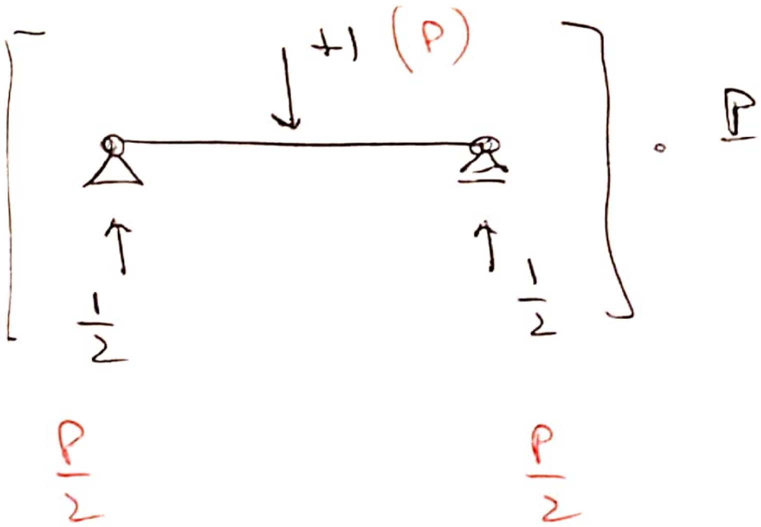


V_B ← REACCIÓN DE VÍNCULO

V_B ← ACCIÓN DE LA ESTRUCTURA SOBRE EL VÍNCULO.

PRV

PAyR



PRV: PRINCIPIO DE LAS REACCIONES VINCULARES

PAyR PRINCIPIO DE ACCIÓN Y REACCIÓN.

PSE: PRINCIPIO DE SUPERPOSICIÓN DE EFECTOS

$$\theta^{H}_{A,CF} = 0 = \theta^{0}_{A,CF} + \theta^{0}_{A,\bar{M}_A=+1} \cdot M_A$$

$$M^{H}_{B,CF} = 0 = M^{0}_{B,CF} + M^{0}_{B,\bar{V}_B} \cdot V_B$$

$$\Delta\theta^{H}_{C,CF} = 0 = \Delta\theta^{0}_{C,CF} + \Delta\theta^{0}_{C,\bar{M}_C} \cdot M_C$$

ECS. DE COMPATIBILIDAD DE LOS DESPLAZAMIENTOS.

→ INCÓGNITAS → → ESTÁTICAS

LOS DESPLAZ → TTV → PRINCIPIO DE EQUIVALENCIA.

→ TDV → TDVU

→ TFV → TFVU

$\downarrow M$.

H: HIPERESTÁTICO

O: SIST. FUNDAMENTAL

CF: CAUSA FUERZA

ΔT: VARIACIÓN DE TEMPERATURA

CV: CEDIMIENTO DE VÍNCULO

$\rightarrow \xi$.

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FIN

$$e^{H}_{i,CD} = e^{0}_{i,CD} + e^{0}_{i,\bar{X}} \cdot X \, .$$

TERMINOS DE CAUSA — FLEXIBILIDADES — INCÓGNITAS

GH = 1.

FLEXIBILIDADES