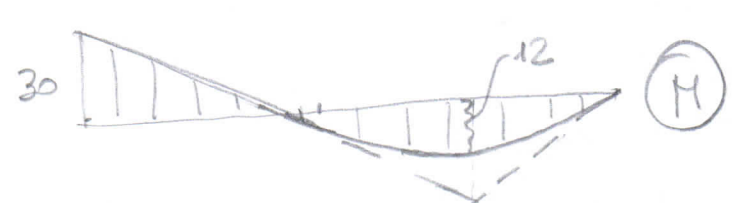
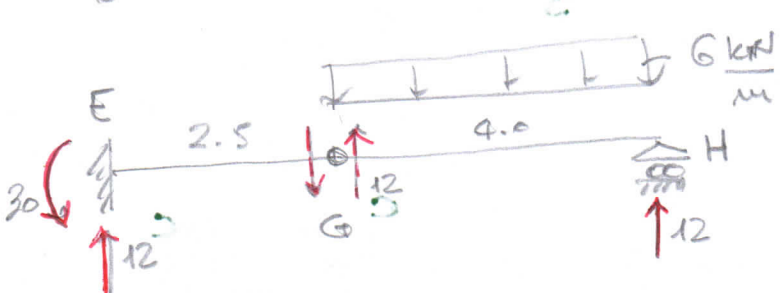
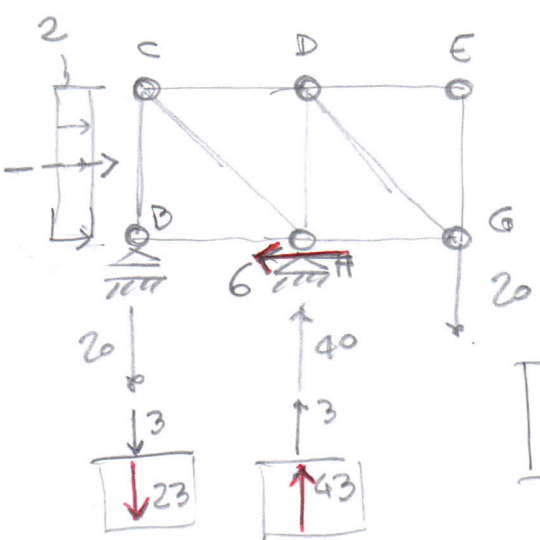
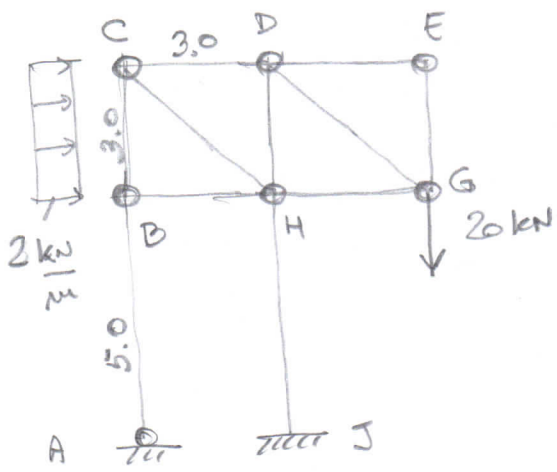
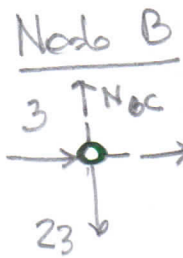
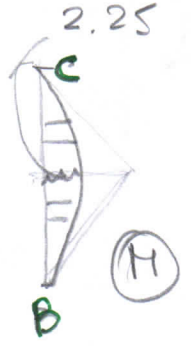
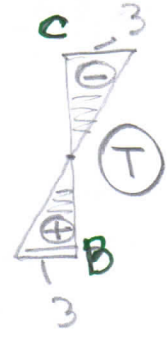
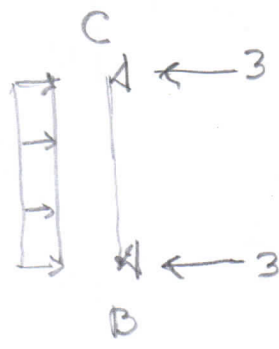
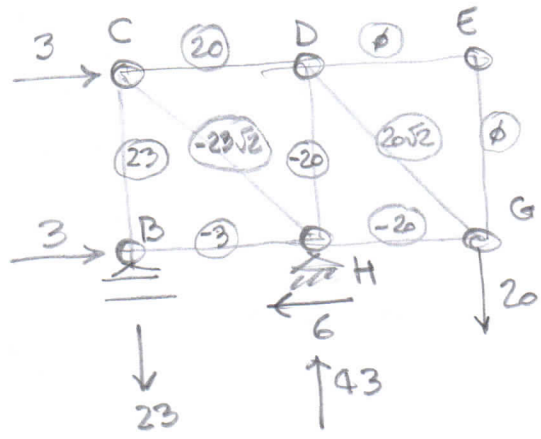
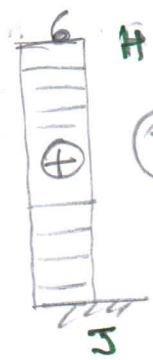
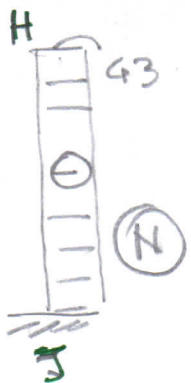
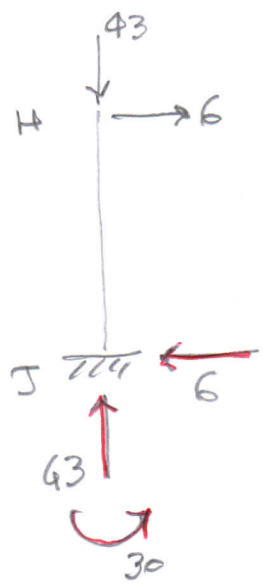
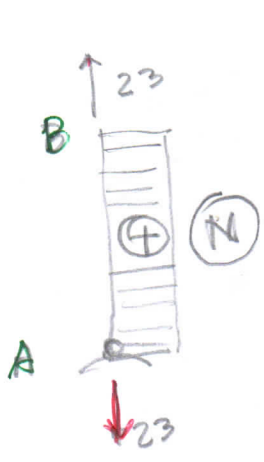


ES.1



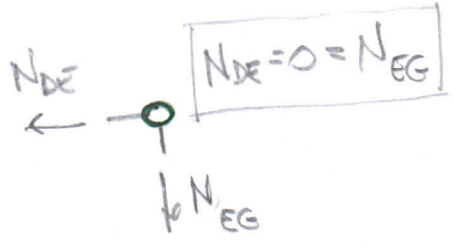


ES.2



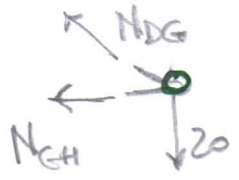
$N_{BC} = 23$
$N_{BH} = -3$

Node E



$N_{DE} = 0 = N_{EG}$
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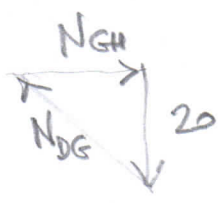
Node G



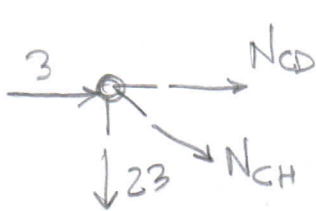
$$N_{GH} + N_{DG} \frac{\sqrt{2}}{2} = 0$$

$$N_{DG} \frac{\sqrt{2}}{2} - 20 = 0$$

$N_{DG} = 20\sqrt{2} = 28.28$	$N_{GH} = -20$
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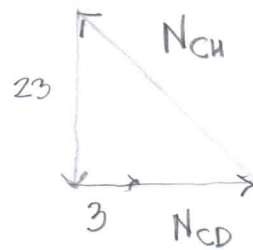


Nodo C

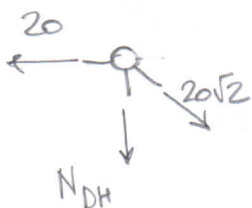


$$\begin{cases} 3 + N_{CD} + N_{CH} \frac{\sqrt{2}}{2} = 0 \\ N_{CH} \frac{\sqrt{2}}{2} + 23 = 0 \end{cases}$$

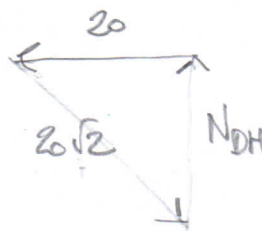
$$\boxed{N_{CD} = 20 \quad N_{CH} = -23\sqrt{2}}$$



Nodo D



$$N_{DH} + 20\sqrt{2} \times \frac{\sqrt{2}}{2} = 0$$



$$\boxed{N_{DH} = -20}$$

ES. 3

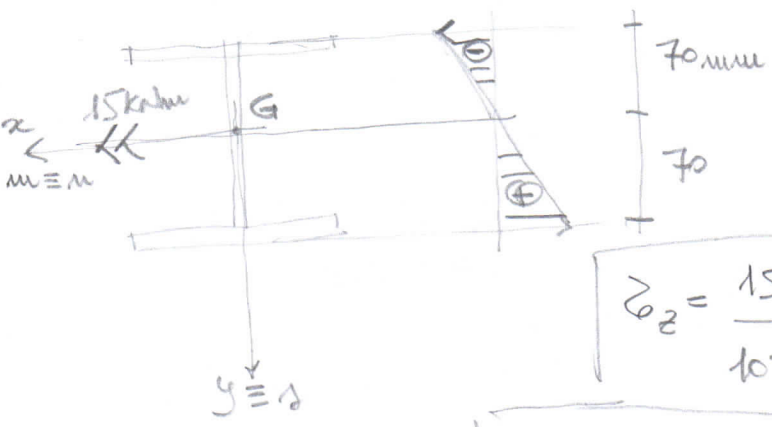
$P_1 = 18 \times 0.5 \times 4 = 36 \text{ kW}$	$Q_1 = 8 \times \frac{6}{2} = 24 \text{ kW}$
$P_2 = 18 \times 0.35 \times 3 = 18.9 \text{ kW}$	$Q_2 = 4 \times \frac{6}{2} = 12 \text{ kW}$

$$M_{st} = 36 \times \frac{0.5}{2} + 24 \times \underbrace{\left[ \frac{0.35 + 0.5 - 0.35}{2} \right]}_{0.425} + 18.9 \times \frac{0.35}{2} + 12 \times \frac{0.35}{2} = 9 + 10.2 + 3.31 + 2.1 = 24.61 \text{ kcal/m}$$

$$M_{ust} = \alpha \left[ 36 \times \frac{4}{2} + 24 \times 4 + 18.9 \times \left( 4 + \frac{3}{2} \right) + 12 \times 7 \right] = \alpha [72 + 96 + 103.95 + 84] = 355.95 \alpha$$

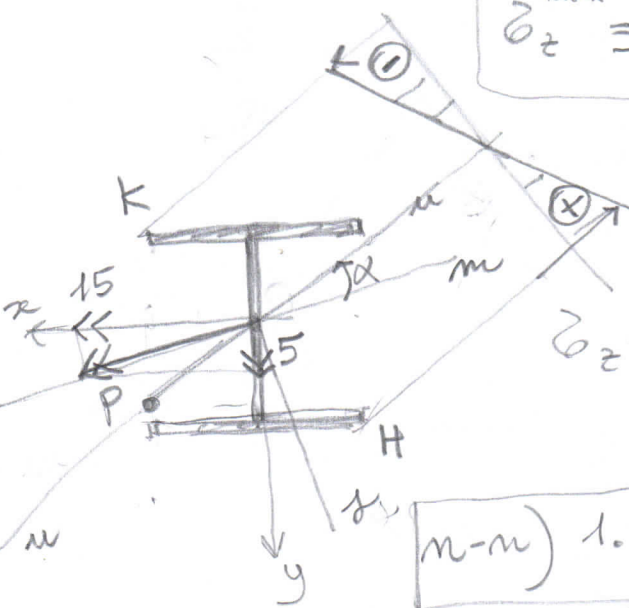
$$\alpha = \frac{24.61}{355.95} = 0.069$$

ES.4



$$\sigma_z = \frac{15 \times 10^6}{1033 \times 10^4} y = 1.452 y$$

$$\sigma_z^{\max} = -\sigma_z^{\min} = 1.452 \times 70 = 102 \frac{N}{mm^2}$$



$$\sigma_z = 1.452 y - \frac{5 \times 10^6}{389 \times 10^4} x = 1.452 y - 1.285 x$$

$$n-n) \quad 1.452 y - 1.285 x = 0 \quad \left| \frac{y}{x} = 0.885 \Rightarrow \alpha = 42^\circ \right.$$

$$P = \left( 70, \frac{1.285 \times 70}{1.452} = 62 \right)$$

$$\sigma_z^{\max} = 1.452 \times 70 - 1.285 (-70) = 192 \frac{N}{mm^2} = \sigma_z^H$$

$$\sigma_z^{\min} = 1.452 \cdot (-70) - 1.285 \cdot (70) = -192 \sigma_z^K$$