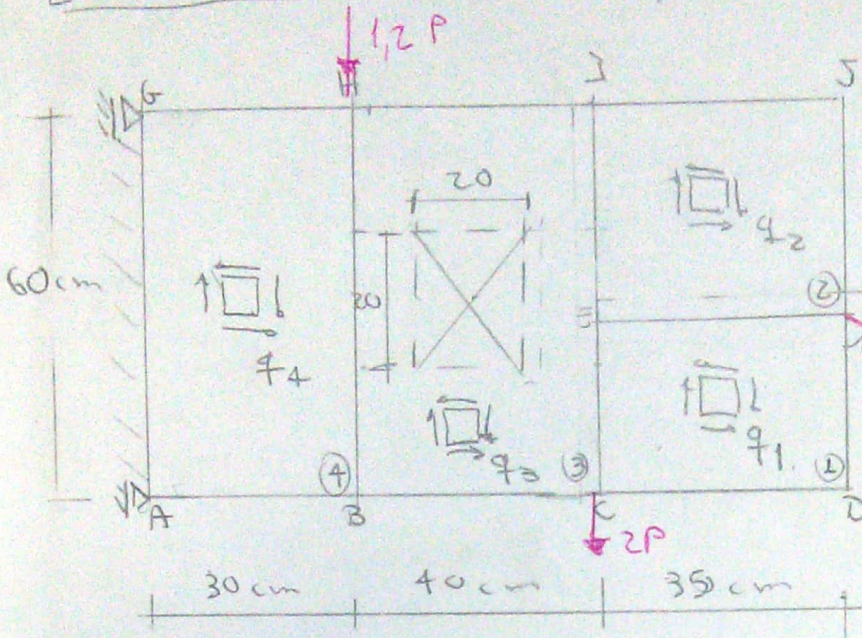


EXERCÍCIO - CHAPA C/ VAZIO



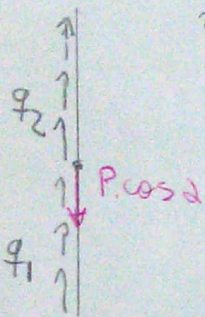
Determinar os fluxos na célula ③ por efeito do vazio e traçar o diagrama de força normal da barra (I-E-C) antes e depois de inserido o vazio.

$$\sin \alpha = 0,8$$

$$\cos \alpha = 0,6$$

Barra (J-F-D)

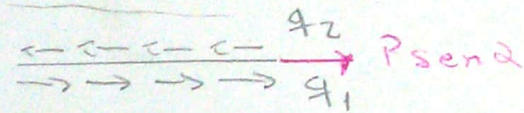
Barra (E-F)



$$25q_1 + 35q_2 = 0,6P$$

$$\begin{cases} 25q_1 + 35q_2 = 0,6P \\ 35q_1 - 35q_2 = -0,8P \end{cases}$$

$$60q_1 = -0,2P$$

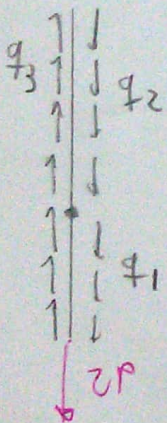


$$35q_2 - 35q_1 = 0,8P$$

$$q_1 = -3,33 \cdot 10^{-3} P$$

$$q_2 = 19,5 \cdot 10^{-3} P$$

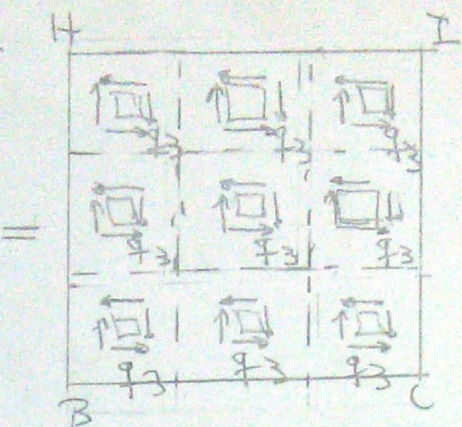
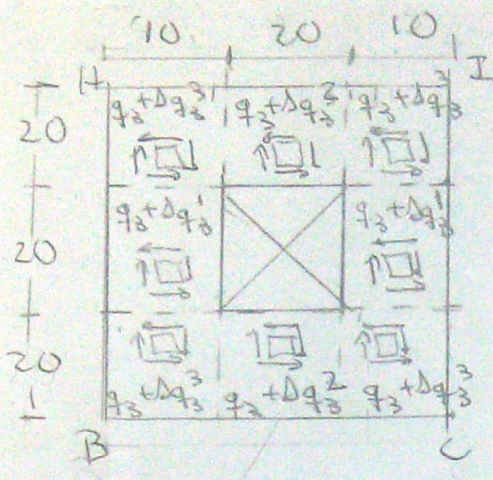
Barra (I-E-C)



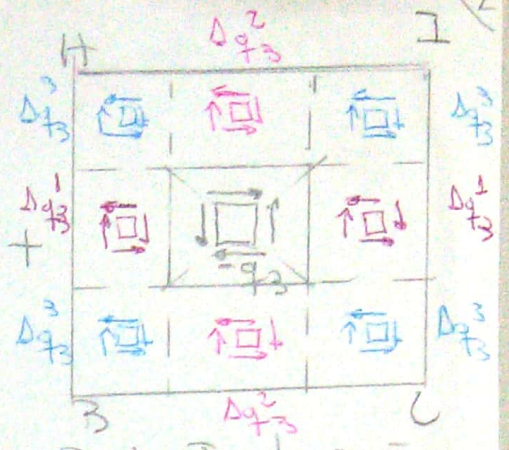
$$60q_3 = 2P + 35q_2 + 25q_1$$

$$60q_3 = 2,6P$$

$$q_3 = \frac{2,6}{60} P = 43,33 \cdot 10^{-3} P$$

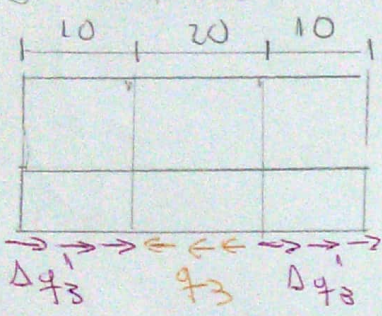


Configuração inicial



Redistribuição de q_3 no vazio

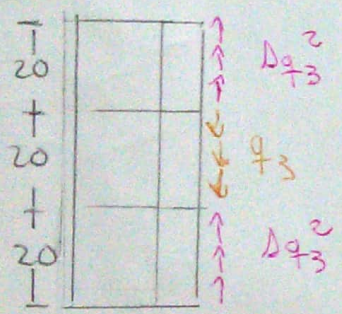
Corte A-A'



$$\Delta q_3^1 \times 10 + \Delta q_3^1 \times 10 - q_3 \times 20 = 0$$

$$\Delta q_3^1 = q_3$$

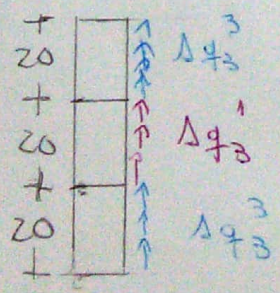
Corte B-B'



$$20 \times \Delta q_3^2 + 20 \times \Delta q_3^2 - 20 \times q_3 = 0$$

$$\Delta q_3^2 = \frac{q_3}{2}$$

Corte C-C'

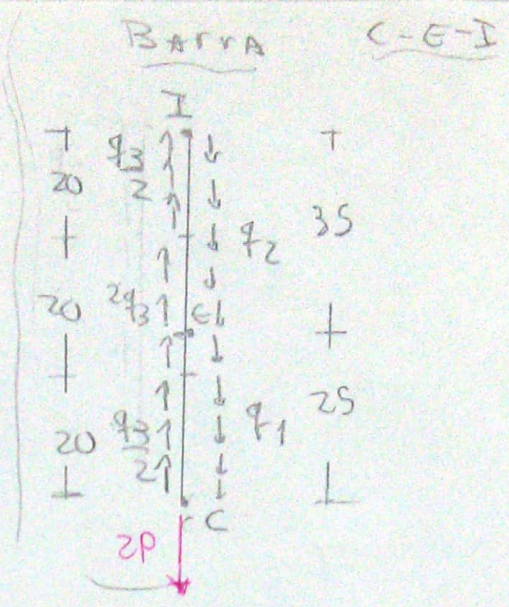
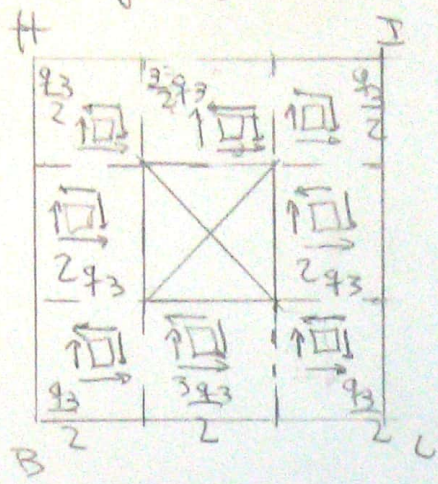


$$20 \times \Delta q_3^3 + 20 \times \Delta q_3^3 + 20 \times \Delta q_3^1 = 0$$

$$\Delta q_3^3 = -\frac{\Delta q_3^1}{2}$$

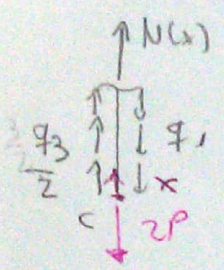
$$\Delta q_3^3 = -\frac{q_3}{2}$$

Configuração final:



Determinação de $N(x)$:

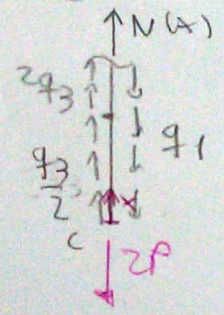
$0 \leq x \leq 20$



$$N(x) + \frac{1}{2}q_3 x - q_1 x - 2P = 0$$

$$N(x) = 2P + \left(q_1 - \frac{q_3}{2} \right) x$$

$20 \leq x \leq 25$

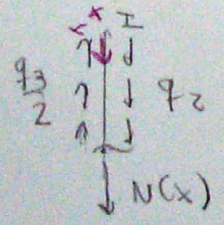


$$N(x) + \frac{q_3}{2} \cdot 20 + 2q_3(x-20) - q_1 x - 2P = 0$$

$$N(x) + 10q_3 + 2q_3 x - 40q_3 - q_1 x - 2P = 0$$

$$N(x) = 2P + 30q_3 + (q_1 - 2q_3)x$$

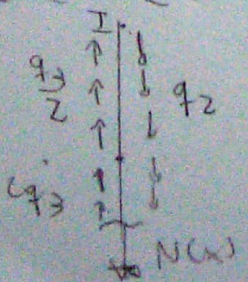
$0 \leq x^* \leq 20$



$$N(x) + q_2 x^* - \frac{q_3}{2} x^* = 0$$

$$N(x) = \left(\frac{q_3}{2} - q_2 \right) x^*$$

$20 \leq x^* \leq 35$



$$N(x) + q_2 x^* - \frac{q_3}{2} \cdot 20 - 2q_3(x^* - 20) = 0$$

$$N(x) + x^* q_2 - 10q_3 - 2q_3 x^* + 40q_3 = 0$$

$$N(x) = -30q_3 + x^*(2q_3 - q_2)$$

