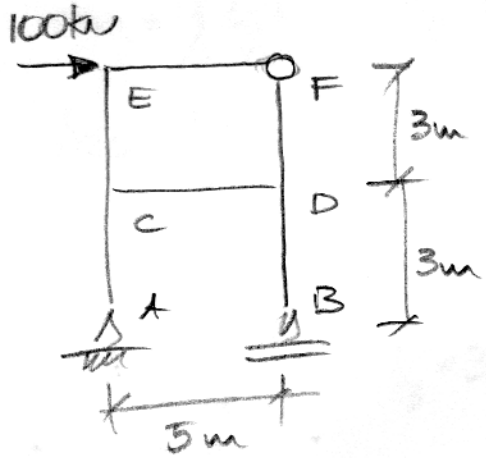
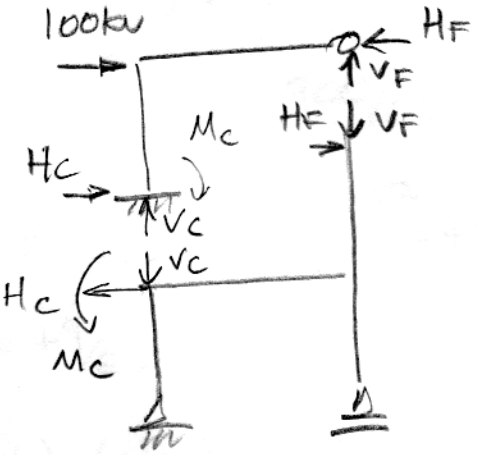
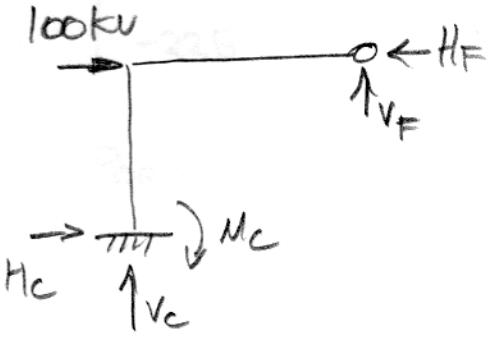
TE2-5.3b



1ª TENTATIVA:

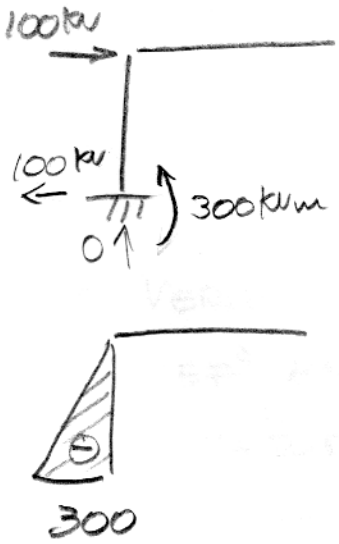


→ RESOLVER A ESTRUTURA "CEF" HIPERESTÁTICA E TRANSPORTAR SUAS REAÇÕES COMO CARGAS P/ A ESTRUTURA "ABCDF".

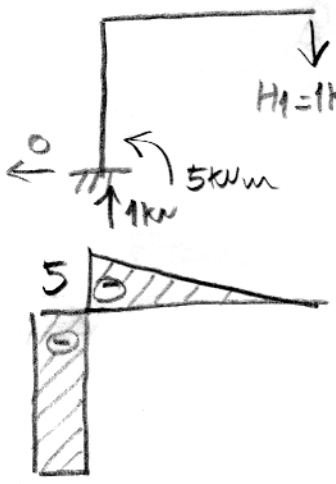


// EI IGUAL P/ TODAS AS BARRAS //

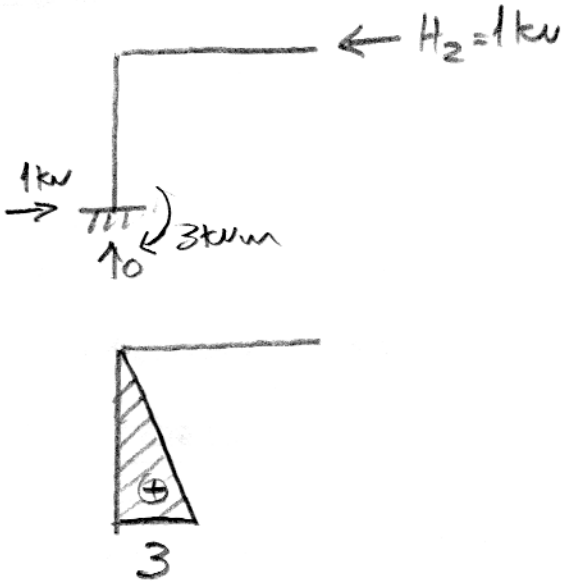
CASO 0



CASO 1



CASO 2



$$\delta_{10} = \frac{1}{2} \underset{V}{L_{jk}} = \frac{1}{2} \times 3m \times (-300kNm) \times (-5kNm) = +2250/EI$$

$$\delta_{20} = \frac{1}{3} L_{vjk} = \frac{1}{3} \times 3m \times (-300kNm) \times (-3kNm) = -900/EI$$

$$\delta_{11} = L_{vjk} + \frac{1}{3} L_{Hjk} = 3m \times (-5kNm)^2 + \frac{1}{3} \times 5m \times (-5kNm)^2 = +116{,}67/EI$$

$$\delta_{22} = \frac{1}{3} L_{vjk} = \frac{1}{3} \times 3m \times (3kNm)^2 = +9/EI$$

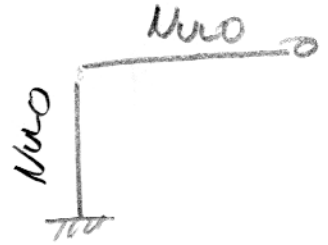
$$\delta_{12} = \delta_{21} = \frac{1}{2} L_{vjk} = \frac{1}{2} \times 3m \times (-5kNm) \times (3kNm) = -22{,}5/EI$$

SISTEMA DE EQUAÇÕES:

$$\begin{bmatrix} 116{,}67 & -22{,}5 \\ -22{,}5 & 9 \end{bmatrix} \begin{Bmatrix} V_A \\ H_A \end{Bmatrix} = \begin{Bmatrix} -2250 \\ +900 \end{Bmatrix} \quad \begin{cases} V_A = 0 \\ H_A = 100 \leftarrow \end{cases}$$

POR EQUILÍBRIO:
$$\begin{cases} H_C = -H_A = 100kN \rightarrow \\ V_C = 0 \\ M_C = 0 \end{cases}$$

DIAGRAMA M DE "CEF":

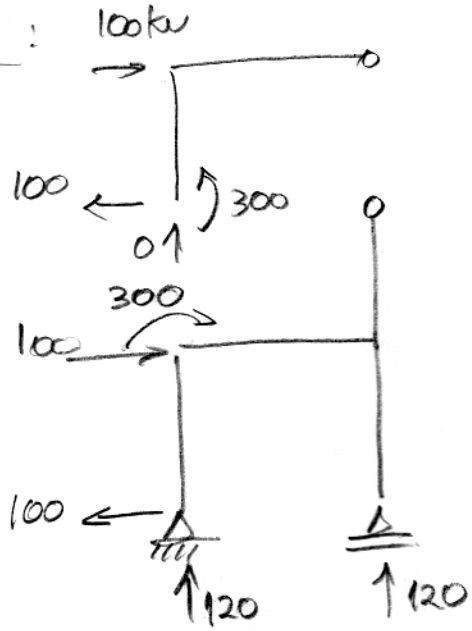


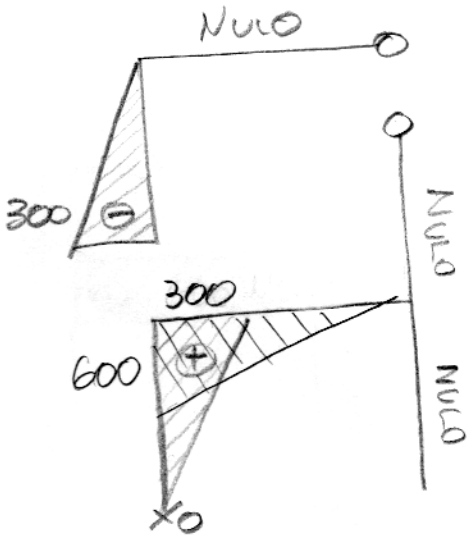
↳ VERIFICANDO NO FTOOL O DIAGRAMA DO TRECHO "CEF" NÃO CONDIZ COM O DIAGRAMA DA ESTRUTURA COMO UM TODO. PORQUE?

A DIVISÃO EM DUAS ESTRUTURAS, SENDO UMA HIPERESTÁTICA, IMPLICA QUE ESTAS NÃO FUNCIONAM ISOLADAMENTE E PELO CONTRÁRIO INTERFEREM-SE MUTUAMENTE.

2ª TENTATIVA

CASO 0 :

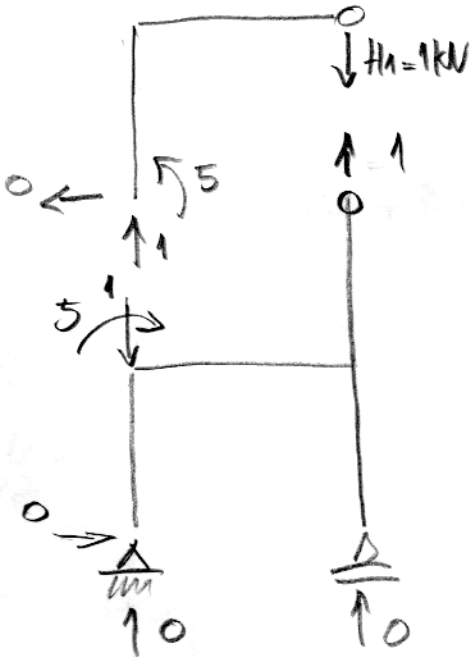


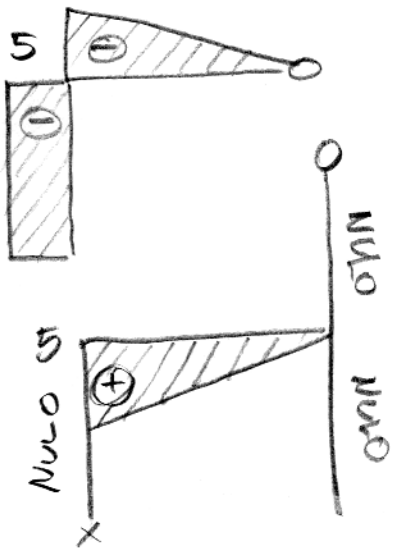


$\oplus \circlearrowright \Sigma M_A = 0 \quad 300 - 100 \times 3 + V_B \times 5 = 0$

$V_B = 0 \quad V_A = 0$

CASO 1 :

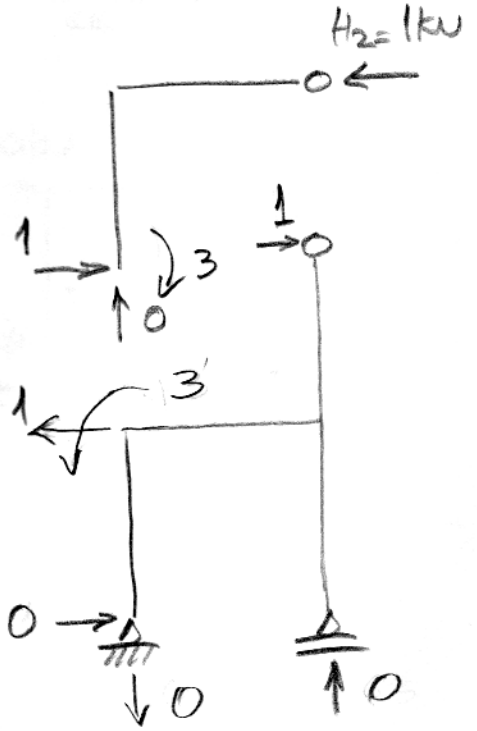


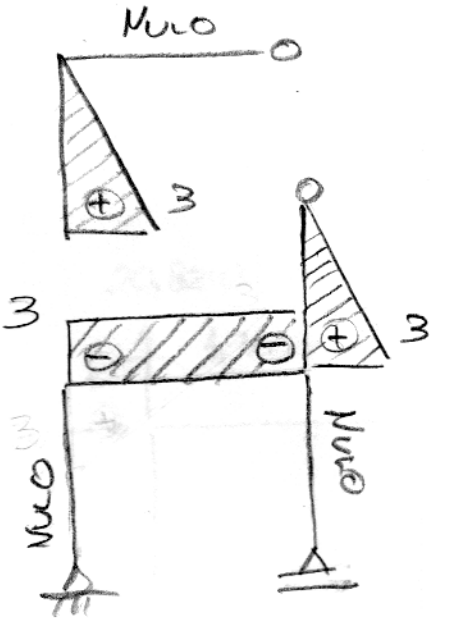


$\oplus \circlearrowright \Sigma M_A = 0 \quad 5 - 1 \times 5 + V_B \times 5 = 0$

$V_B = V_A = 0$

CASO 2





$$\overset{\oplus}{\uparrow} \Sigma M_A = 0 \quad 3 - 1\times 3 + 1\times 6 - V_B \times 5 = 0$$

$$V_B = \tfrac{1}{5}(3 - 3 + 6) = \tfrac{6}{5}$$

$$\delta_{10} = \tfrac{1}{2}\times 3m\times(-300kN)\times(-5kN) + \tfrac{1}{3}\times 5m\times(600kN)(5kN) = 7250/EI$$

$$\delta_{20} = \tfrac{1}{3}\times 3m\times(-300kN)\times(+3kN) + \tfrac{1}{2}\times 5m\,(600kN)(-3kN) = -5400/EI$$

$$\delta_{11} = \tfrac{1}{3}\times 5m\times(5kN)^2\times 2 + 3m\times(5kN)^2 = 158{,}33/EI$$

$$\delta_{22} = \tfrac{1}{3}\times 3m\,(3kN)^2\times 2 + 5m\times(3kN)^2 = 63/EI$$

$$\delta_{12} = \tfrac{1}{2}\times 3m\times(-5)(+3) + \tfrac{1}{2}\times 5m\times(-3)(+5) = -60/EI$$

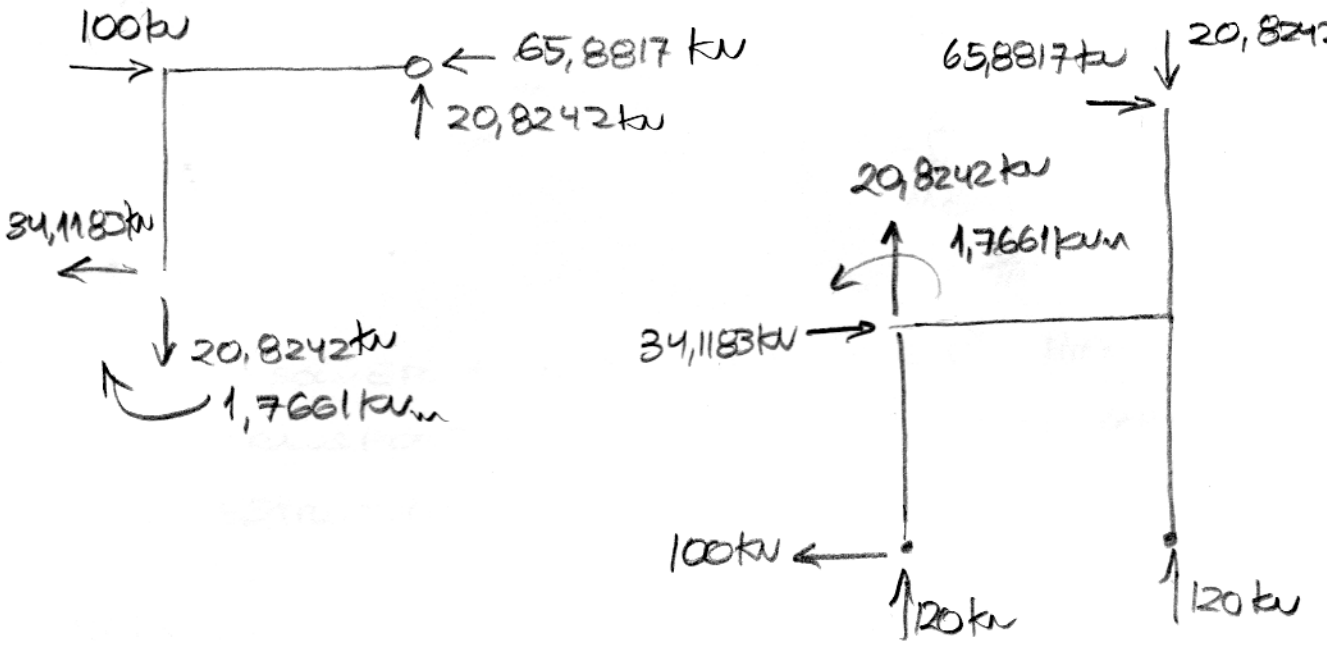
$$\begin{bmatrix} 158{,}33 & -60 \\ -60 & 63 \end{bmatrix} \begin{Bmatrix} V_F \\ H_F \end{Bmatrix} = \begin{Bmatrix} -7250 \\ +5400 \end{Bmatrix}$$

$V_F = -20{,}8242$ kN

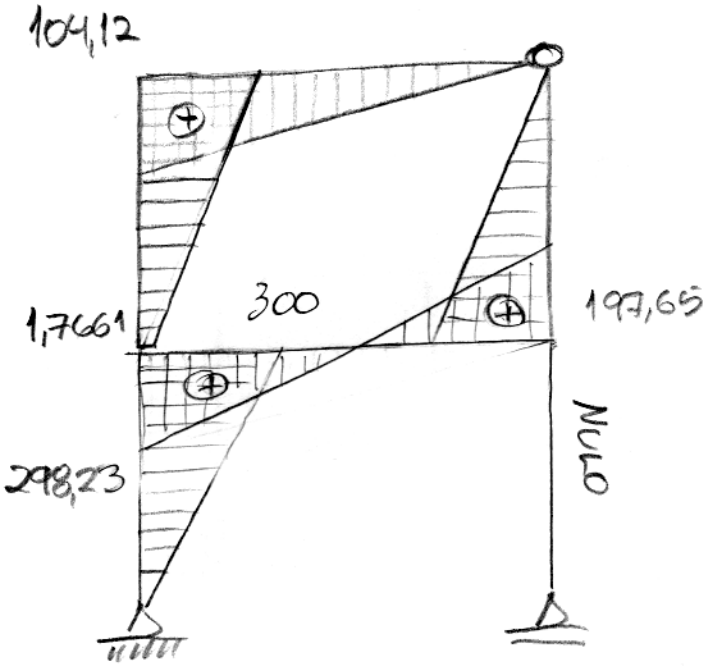
$H_F = 65{,}8817$ kN

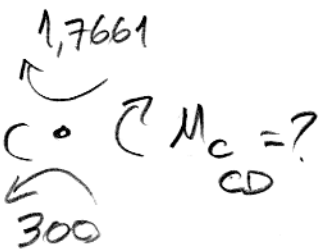
↷ ⊕

$$M_{C_{CE}} = -300 - 5 \times -20,8242 + 3 \times 65,8817 = +1,7661\,kN$$ ↷



* Reações de Apoio Iguais ao caso 0





$$N_{C_{CD}} = 300 - 1,7661$$

$$N_{C_{CD}} = 298,23$$