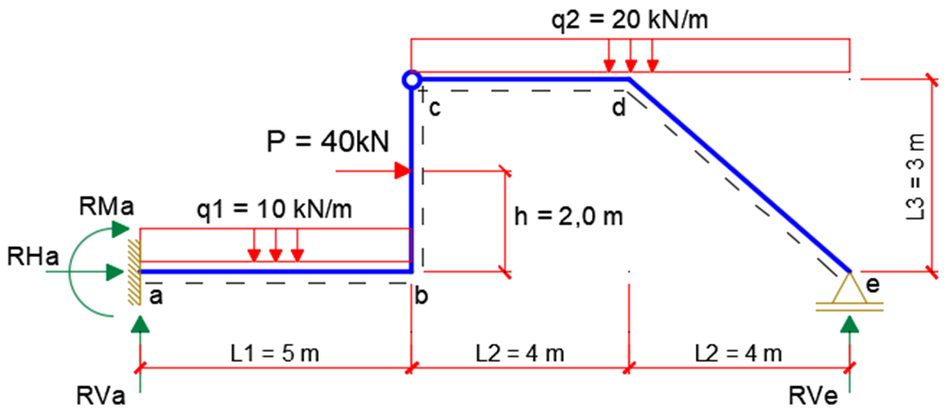
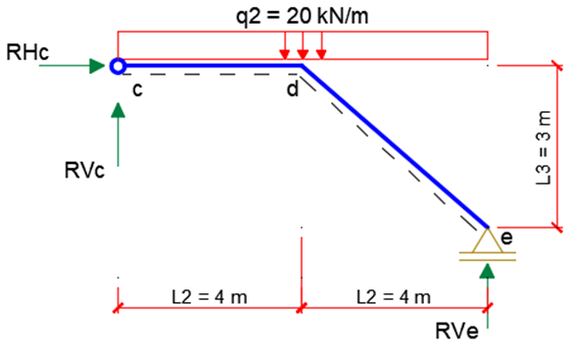
TE1_E06-03

Traçar os diagramas de esforço cortante e esforço normal para os trechos CD e DE do pórtico abaixo:



Dividindo a Estrutura na Rótula:



$L2 := 4\ m \qquad L3 := 3\ m \qquad q2 := 20\ \frac{kN}{m}$

$\Sigma Mc := 0$ giro antihorário (+)

$$RVe \cdot (2 \cdot L2) - q2 \cdot \frac{(2 \cdot L2)^2}{2} = 0$$

$$RVe := \frac{1}{2 \cdot L2} \cdot \left(q2 \cdot \frac{(2 \cdot L2)^2}{2} \right) = 80\ kN$$

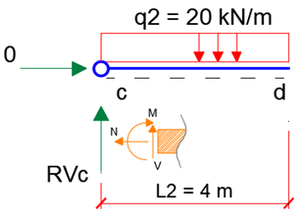
$\Sigma Fv := 0$ para cima (+)

$RVc + RVe - q2 \cdot 2 \cdot L2 = 0$

$RVc := -RVe + q2 \cdot 2 \cdot L2 = 80\ kN$

$\Sigma Fh := 0$ para direita (+) $\qquad RHc := 0\ kN$

Trecho "cd":

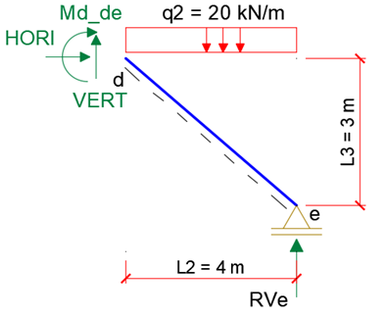


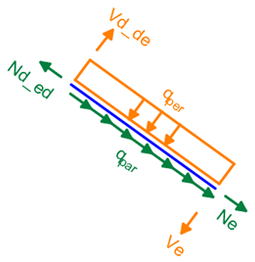
$Vcd(x) := RVc - q2 \cdot x$

$Ncd(x) := 0$

$Vd_cd := Vcd(L2) = 0$

Trecho "de": Calcular a forças que equilibram a barra "de" no sistema VERT/HORI e decompor todas as forças na barra para o sistemas PERP/PARAL.



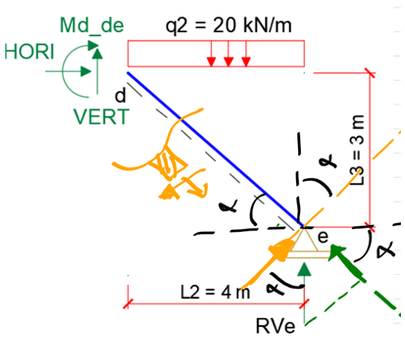


$\Sigma Fv = 0$ para cima (+)

$VERT + RVe - q2 \cdot L2 = 0$

$VERT := -RVe + q2 \cdot L2 = 0$

$HORI := 0$

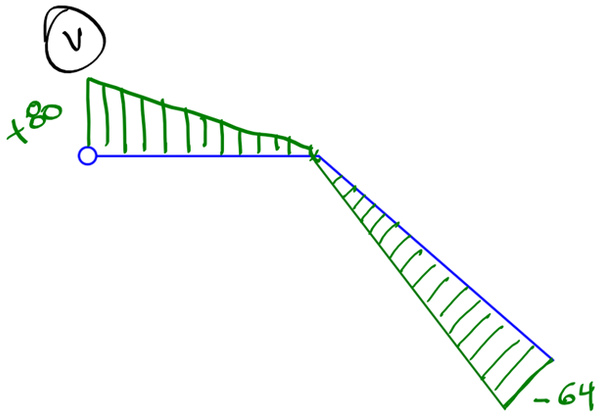


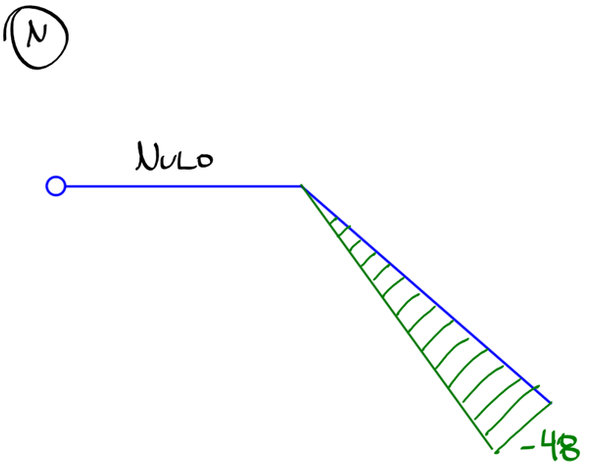
$$Lde := \sqrt{L2^{2} + L3^{2}} = 5\ \text{m}$$

$$cos\alpha := \frac{L2}{Lde} = 0,8 \qquad sen\alpha := \frac{L3}{Lde} = 0,6$$

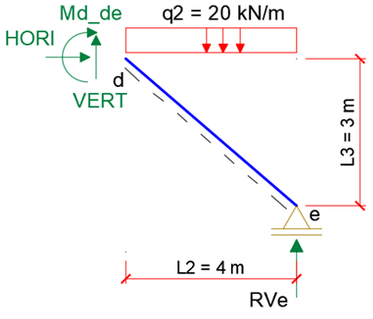
$$Ne := -RVe \cdot sen\alpha = -48\ \text{kN}$$

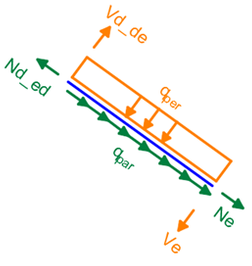
$$Ve := -RVe \cdot cos\alpha = -64\ \text{kN}$$





Alternativamente por Equações:





$$qper := q2 \cdot (cos\alpha)^{2} = 12,8\ \frac{\text{kN}}{\text{m}}$$

$$qpar := q2 \cdot cos\alpha \cdot sen\alpha = 9,6\ \frac{\text{kN}}{\text{m}}$$

$$Vde(x) := -qper \cdot x$$

$$Nde(x) := -qpar \cdot x$$

$$Ve := Vde(Lde) = -64\ \text{kN}$$

$$Ne := Nde(Lde) = -48\ \text{kN}$$