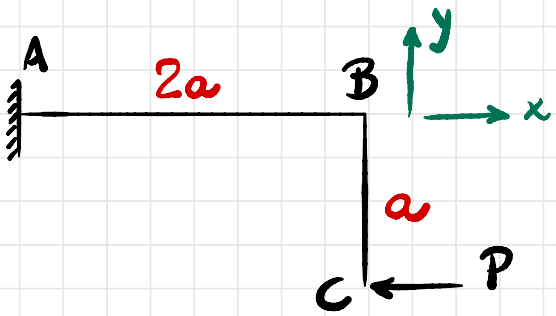
Pórticos Planos

Como ficam os esforços solicitantes quando a viga está na vertical?



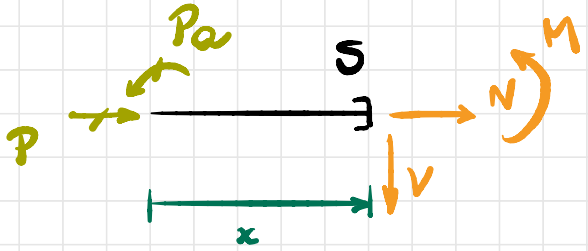
Reações de apoio ⇒ equilíbrio:

$$\sum F_H = 0: \quad H_A - P = 0 \Rightarrow \boxed{H_A = P}$$

$$\sum F_V = 0: \quad \boxed{V_A = 0}$$

$$\circlearrowleft(+) \sum M_{(A)} = 0: \quad M_A - P \cdot a = 0 \Rightarrow \boxed{M_A = Pa}$$

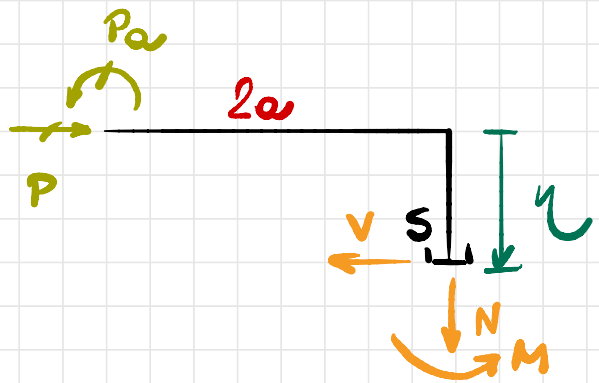
Fazendo os cortes antes e depois de B:



$$\sum F_H = 0: \quad P + N = 0 \Rightarrow \boxed{N = -P}$$

$$\sum F_V = 0: \quad \boxed{V = 0}$$

$$\circlearrowleft \sum M_S = 0: \quad M + Pa = 0 \Rightarrow \boxed{M = -Pa}$$

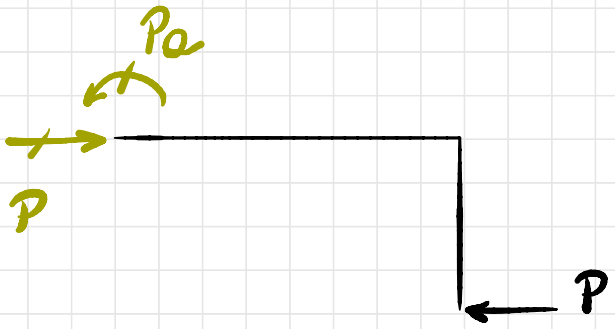


$$\sum F_H = 0: \quad P - V = 0 \Rightarrow \boxed{V = P}$$

$$\sum F_V = 0: \quad \boxed{N = 0}$$

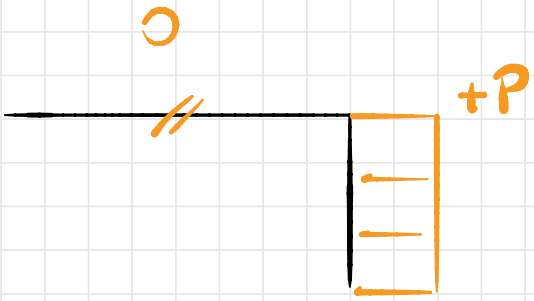
$$\circlearrowleft \sum M_S = 0: \quad Pa + M - P\eta = 0 \Rightarrow \boxed{M = P(\eta - a)}$$

Traçando os diagramas:

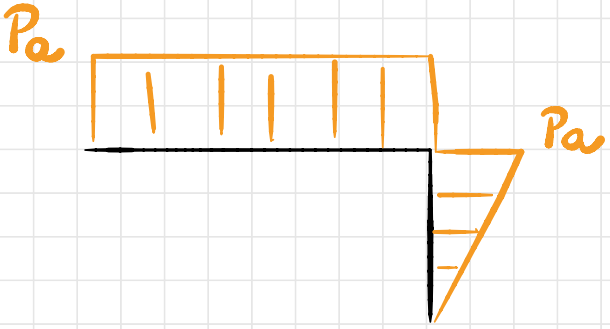


Observe que normal em uma barra é vista como cortante na outra!

N

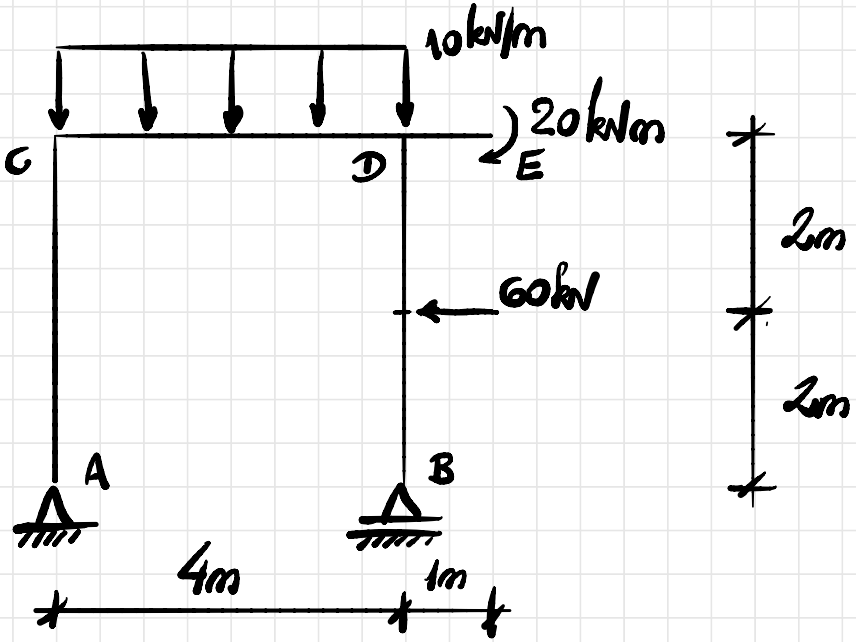


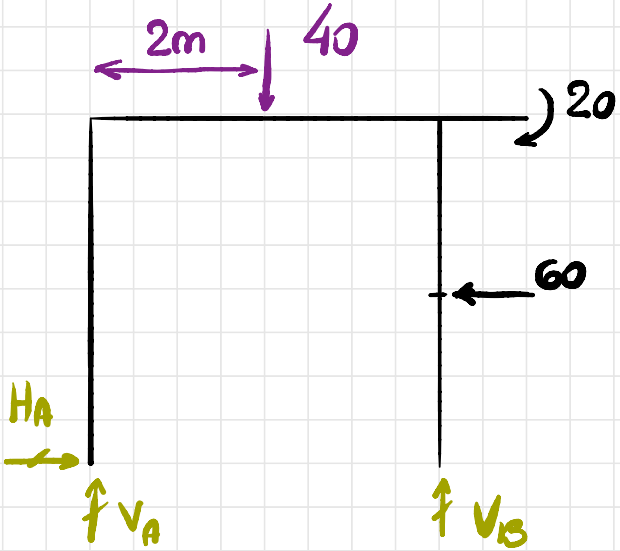
V



M

Exemplo: traçar os diagramas de esforços solicitantes para a estrutura a seguir:





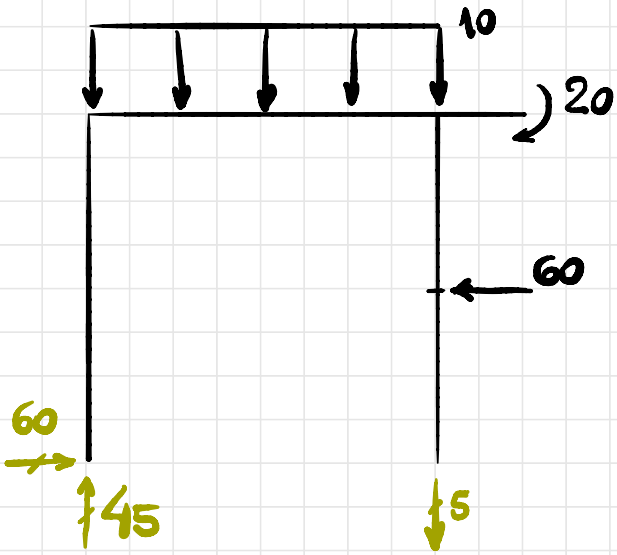
$$\sum F_H = 0: \quad H_A = 60\,kN$$

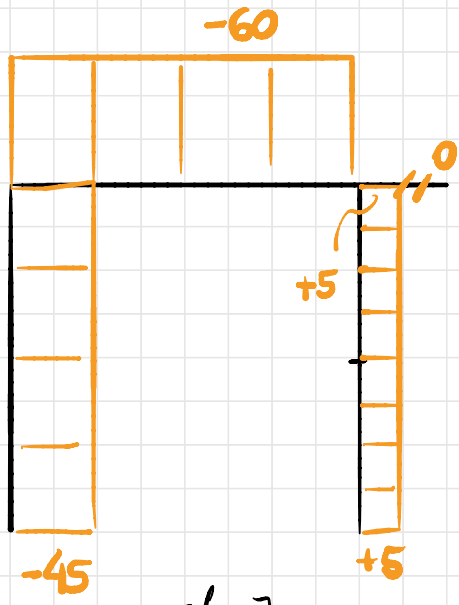
$$\sum F_V = 0: \quad V_A + V_B = 40$$

$$\circlearrowleft \sum M_A = 0: \quad -40.2 - 20 + 60.2 + V_B.4 = 0$$

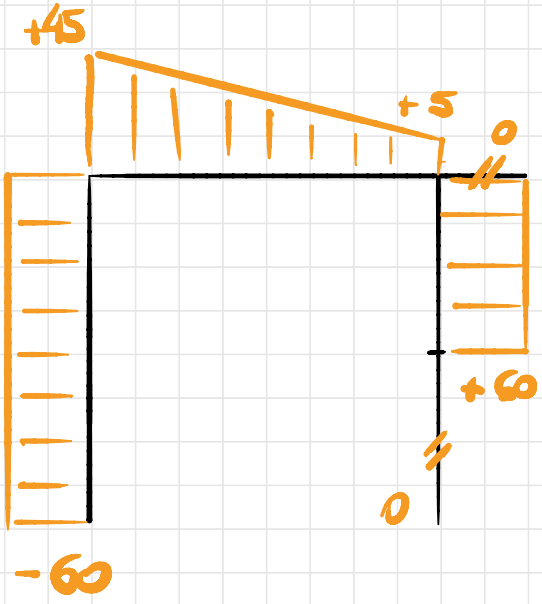
$$\therefore V_B = -5\,kN \Rightarrow V_A = 45\,kN$$

Traçando os diagramas:

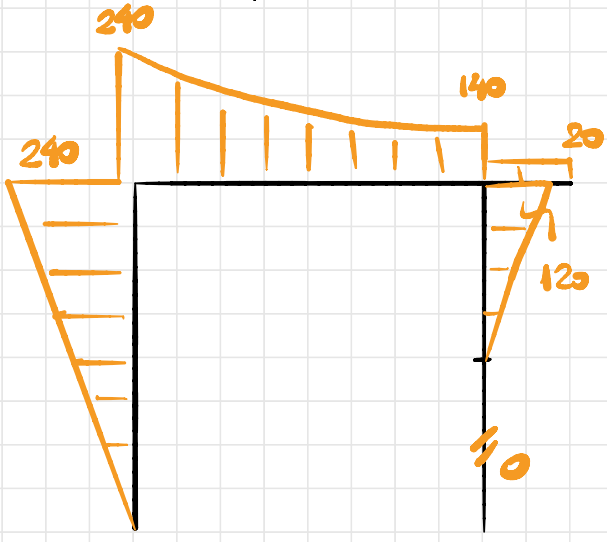




N[kN]

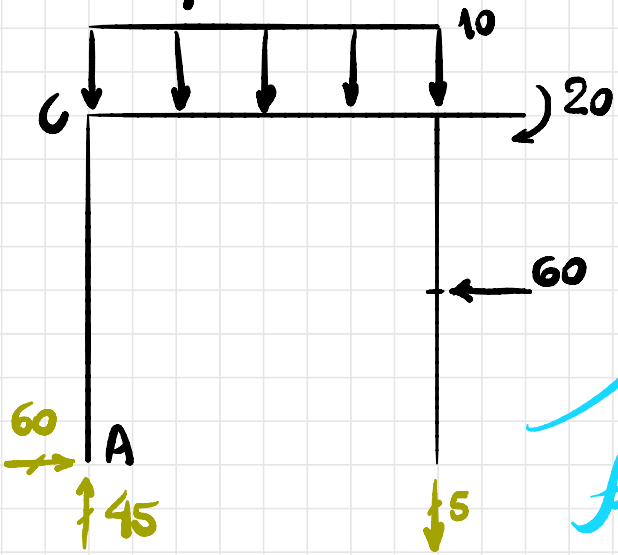


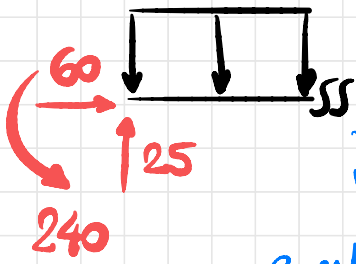
V[kN]



M[kNm]

Transporte de A para C:

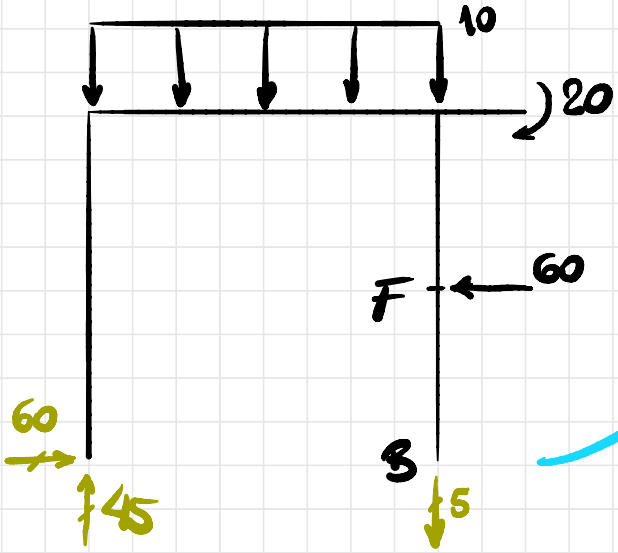




a estrutura continua

Ver as forças e calcular os momentos causados.

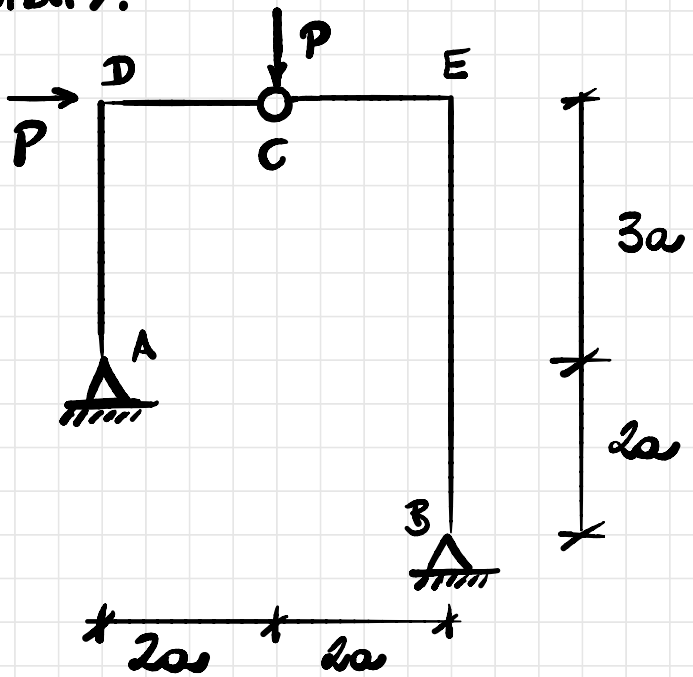
Transporte de B para F:



não gera momento em F!

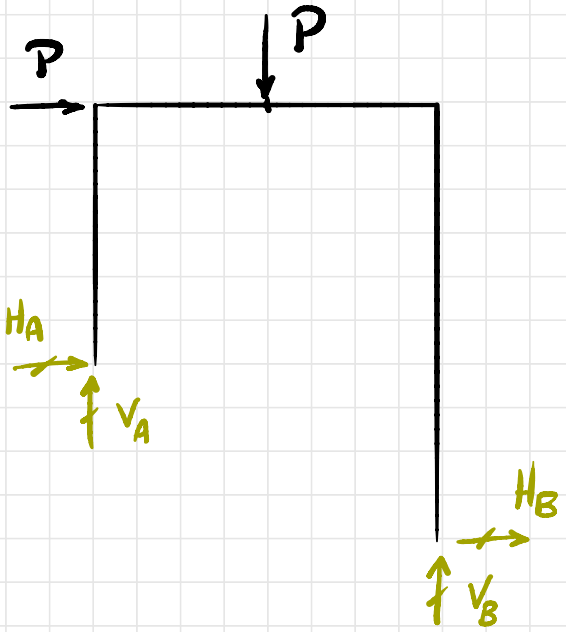
Pórtico Articulado

Pórtico com articulação interna (como uma viga Gerber):



Reações de apoio:

- Estrutura completa
- Corte em C



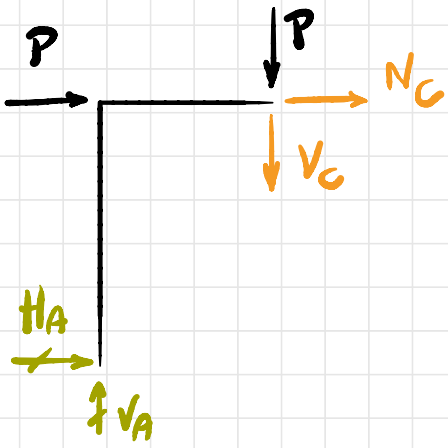
$$\sum F_H = 0: \; P + H_A + H_B = 0 \Rightarrow H_A + H_B = -P$$

$$\sum F_V = 0: \; V_A - P + V_B = 0 \Rightarrow V_A + V_B = P$$

$$\curvearrowleft + \sum M_B = 0: \; -H_A \cdot 2a - V_A \cdot 4a - P \cdot 5a + P \cdot 2a = 0$$

$$2H_A + 4V_A = -3P$$

Corte em C:



$\circlearrowleft(+) \sum M_C = 0$:

$+ H_A \cdot 3a - V_A \cdot 2a = 0$

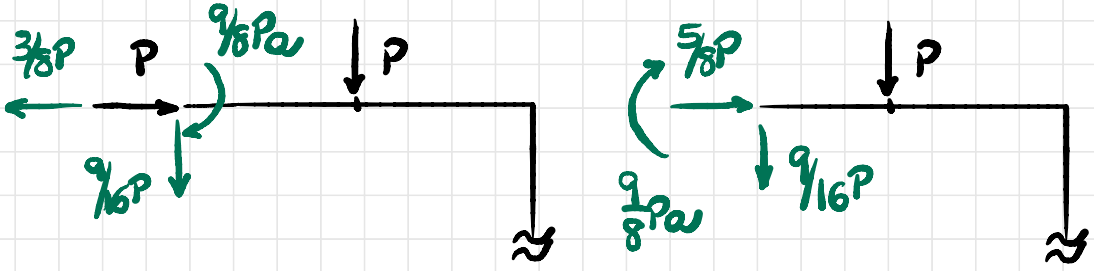
$H_A = \frac{2}{3} V_A$

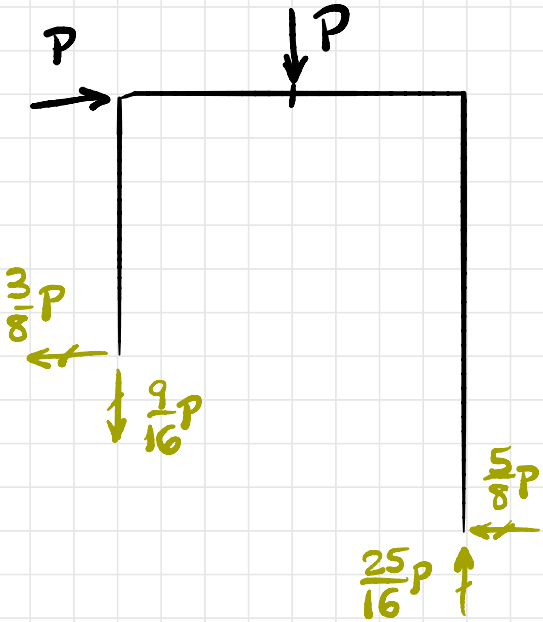
$2.\left(\frac{2}{3} V_A\right) + 4V_A = -3P$

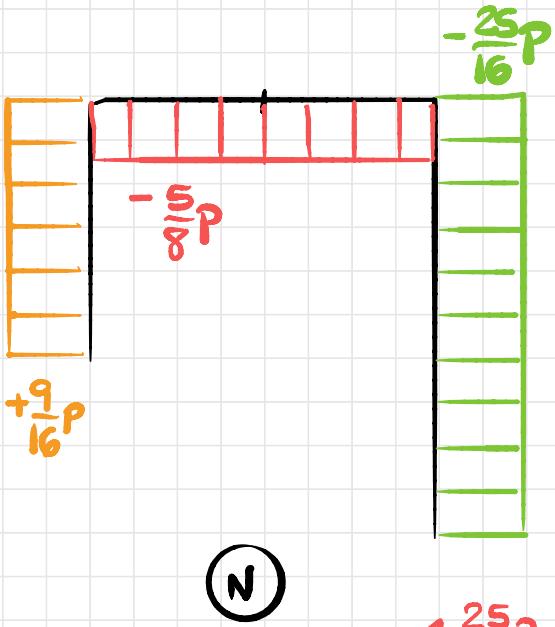
$\frac{4+12}{3} V_A = -3P \Rightarrow \boxed{V_A = -\frac{9}{16}P}$

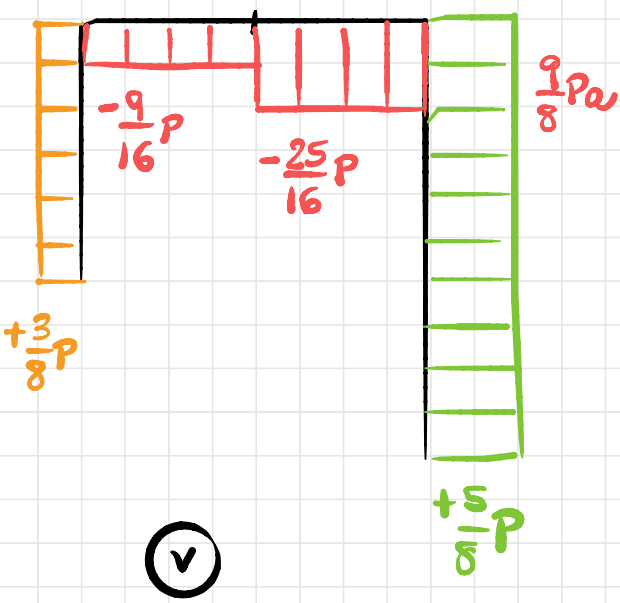
$\boxed{H_A = -\frac{3}{8}P}$ $\boxed{H_B = -\frac{5}{8}P}$ $\boxed{V_A = \frac{25}{16}P}$

Transporte para D:




P
P
3/8 P
9/16 P
5/8 P
25/16 P


-25/16 P
-5/8 P
+9/16 P
N


-9/16 P
-25/16 P
9/8 Pa
+3/8 P
+5/8 P
V


25/8 Pa
9/8 Pa
25/8 Pa
M