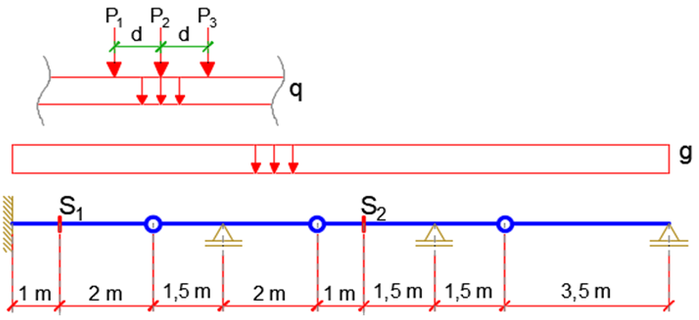
TE2_E02-06

- Obter o máximo e o mínimo esforço cortante que pode ocorrer na seção S1 e o máximo e mínimo momento fletor que pode ocorrer na seção S2



- Dados:

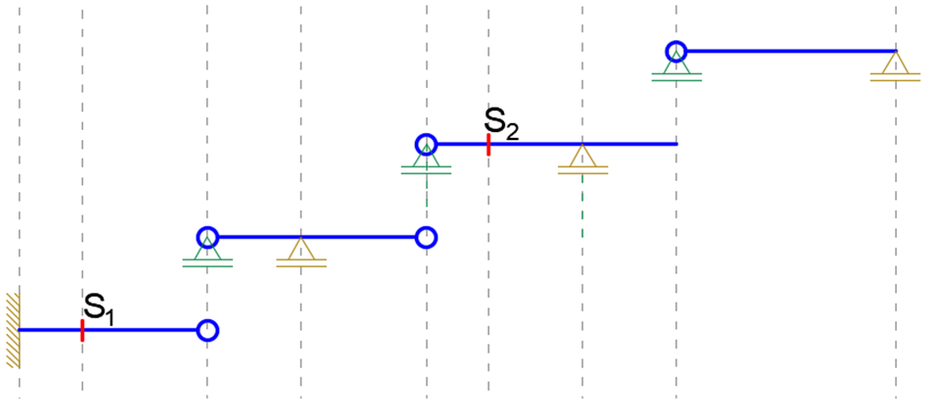
$a := 3,5\ m$ $L := 7,0\ m$ $b := 4,5\ m$

$d := 1,0\ m$ $d1 := 3,0\ m$ $d2 := 1,0\ m$

$P1 := 40,0\ kN$ $P2 := 100,0\ kN$ $P3 := 60,0\ kN$

$q := 10\ \frac{kN}{m}$ $g := 30\ \frac{kN}{m}$

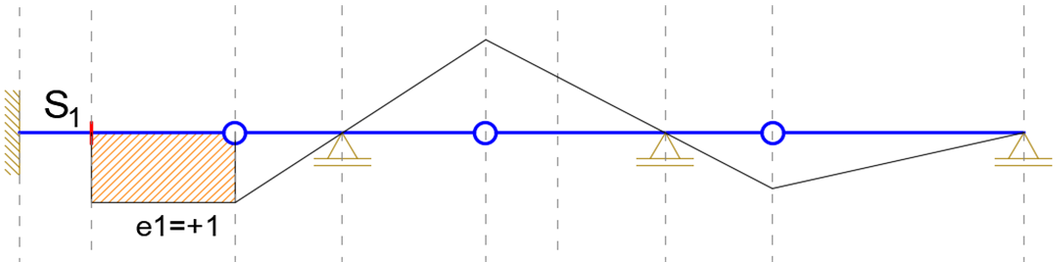
Esquema Funcional:



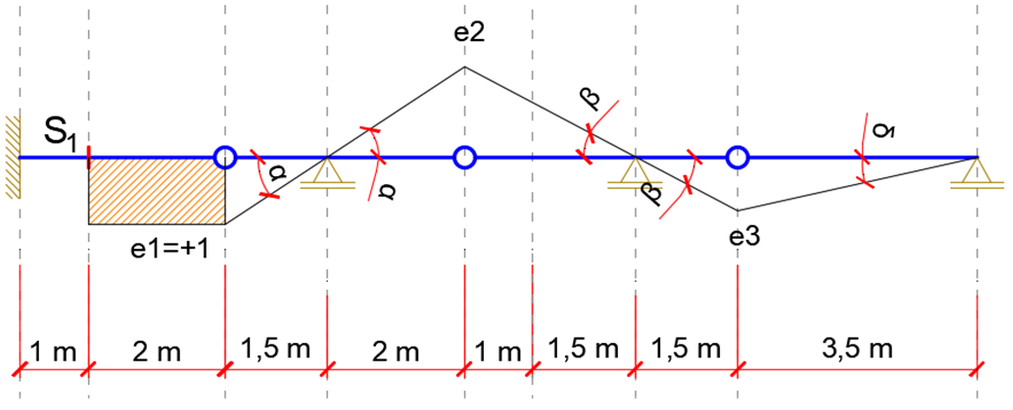
S1 está no balanço

S2 está entre apoios

LI de Esforço Cortante em S1:



Traçado da LI de partida (na viga onde está a seção de interesse - em laranja) e prolongamento esquemático (sem valores)



$e1 := 1$

$tg\alpha := \frac{1}{1,5} = 0,6667$

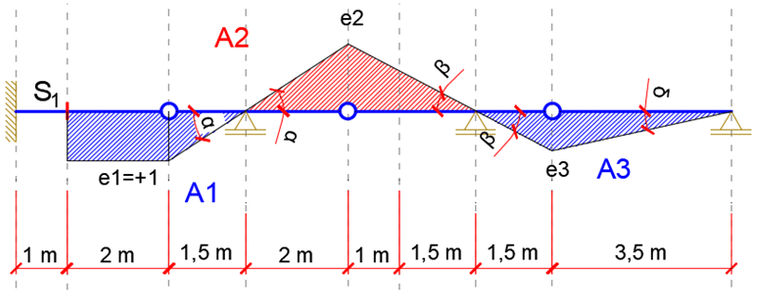
$e2 := tg\alpha \cdot 2 = 1,3333$

$tg\beta := \frac{e2}{1+1,5} = 0,5333$

$e3 := tg\beta \cdot 1,5 = 0,8$

$tg\delta := \frac{e3}{3,5} = 0,2286$

Cálculo das Áreas:



$A1 := 2\ \text{m} \cdot 1 + 1,5\ \text{m} \cdot \frac{1}{2} = 2,75\ \text{m}$

$A2 := (2 + 1 + 1,5)\ \text{m} \cdot \frac{-e2}{2} = -3\ \text{m}$

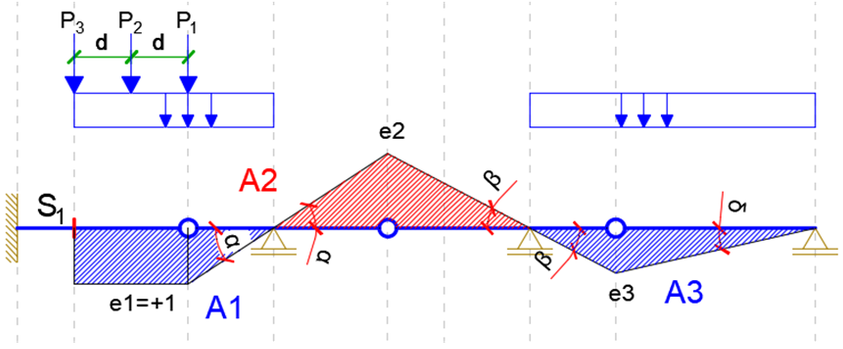
$A3 := (1,5 + 3,5)\ \text{m} \cdot \frac{e3}{2} = 2\ \text{m}$

Cortante devido a carga permanente: $Vs1_perm := g \cdot (A1 + A2 + A3) = 52,5\ \text{kN}$

Cortante Máximo:

Carga de multidão: $Vs1_max_mult := q \cdot (A1 + A3) = 47,5\ \text{kN}$

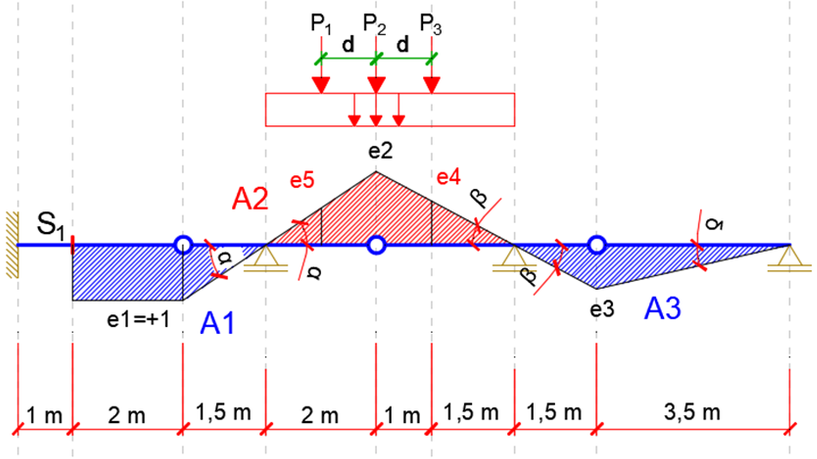
Carga de rodas: $Vs1_max_rod := P1 \cdot e1 + P2 \cdot e1 + P3 \cdot e1 = 200\ \text{kN}$



$Vs1_max := Vs1_max_rod + Vs1_max_mult + Vs1_perm = 300\ \text{kN}$

Cortante Mínimo:

Carga de multidão: $Vs1_min_mult := q \cdot A2 = -30\ \text{kN}$



$e2 := -e2 = -1,3333$

$e4 := tg\beta \cdot \left(-\frac{(1\ \text{m} + 1,5\ \text{m} - d)}{\text{m}}\right) = -0,8$

$e5 := tg\alpha \cdot \left(-\frac{(2\ \text{m} - d)}{\text{m}}\right) = -0,6667$

Carga de rodas: $Vs1_min_rodas := P1 \cdot e5 + P2 \cdot e2 + P3 \cdot e4 = -208\ \text{kN}$

$Vs1_min := Vs1_min_rodas + Vs1_min_mult + Vs1_perm = -185,5\ \text{kN}$