

$a_1 := 740 \cdot \text{mm}$

$e_0 := 3720 \cdot \text{mm}$

$o := 7760 \cdot \text{mm}$

$h := 10460 \cdot \text{mm}$

$\alpha_{Ay1} := 10 \cdot \text{deg}$

$h - o = 2700 \cdot \text{mm}$

$c_1 := o \cdot \tan(\alpha_{Ay1})$

$c_1 = 1368 \cdot \text{mm}$

$L_1 := e_0 + 2 \cdot c_1$

$L_1 = 6457 \cdot \text{mm}$

$F_H := 322 \cdot \text{kN}$

$k_{105} := 1$

$E := 210000 \cdot \text{MPa}$

$J_1 := 51.459 \cdot 10^6 \cdot \text{mm}^4$

$J_2 := J_1$

$J_2 = 51.459 \cdot 10^6 \cdot \text{mm}^4$

$F_D := F_H \cdot \frac{(L_1 - a_1 - c_1)}{L_1}$

$F_D = 216.9 \cdot \text{kN}$

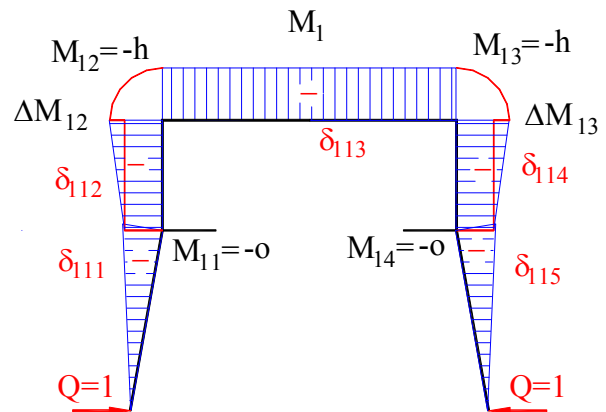
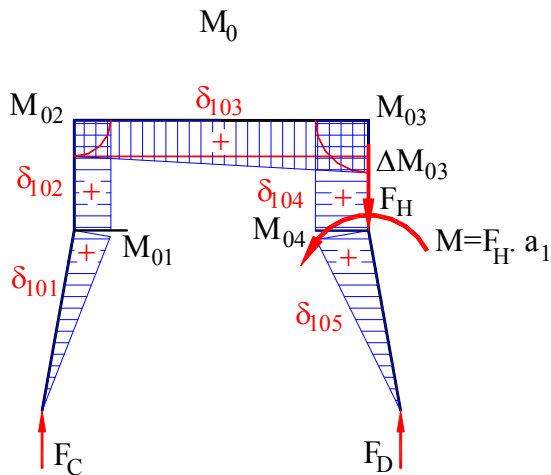
$F_C := F_H \cdot \frac{(a_1 + c_1)}{L_1}$

$F_C = 105.1 \cdot \text{kN}$

$s_1 := \sqrt{o^2 + c_1^2}$


$o = 7760 \cdot \text{mm}$

$s_1 = 7879.7 \cdot \text{mm}$



|  |  |   |   |                                   |
|--|--|---|---|-----------------------------------|
| $X_1 = H_D = H_C$  | $X_1 = -\frac{\delta_{10}}{\delta_{11}}$ | $M_H := F_H \cdot a_1$                            | $M_H = 238.3 \text{ m} \cdot \text{kN}$ | $Q := 1$                          |
| $M_{01} := F_C \cdot c_1$  |  | $M_{01} = 143.9 \text{ m} \cdot \text{kN}$        | $M_{11} := -o$                          | $M_{11} = -7.8 \text{ m}$         |
| $M_{02} := F_C \cdot c_1$  |  | $M_{02} = 143.9 \text{ m} \cdot \text{kN}$        | $M_{12} := -h$                          | $M_{12} = -10.5 \text{ m}$        |
|  |  |   | $\Delta M_{12a} := M_{12} - M_{11}$     | $\Delta M_{12a} = -2.7 \text{ m}$ |
| $M_{03} := F_H \cdot a_1 + F_D \cdot c_1$                        |  | $M_{03} = 535 \text{ m} \cdot \text{kN}$          | $\Delta M_{12} := -(h - o)$             | $\Delta M_{12} = -2.7 \text{ m}$  |
| $\Delta M_{03} := F_H \cdot a_1 + F_D \cdot c_1 - F_C \cdot c_1$ |  | $\Delta M_{03} = 391.1 \text{ m} \cdot \text{kN}$ | $M_{13} := -h$                          | $M_{13} = -10.5 \text{ m}$        |
| $M_{04} := F_H \cdot a_1 + F_D \cdot c_1$                        |  | $M_{04} = 535 \text{ m} \cdot \text{kN}$          | $M_{14} := -o$                          | $M_{14} = -7.8 \text{ m}$         |
|  |  |   | $\Delta M_{13} := -(h - o)$             | $\Delta M_{13} = -2.7 \text{ m}$  |
|  |  |   | $\Delta M_{13a} := M_{13} - M_{14}$     | $\Delta M_{13a} = -2.7 \text{ m}$ |

$\delta_{101}$



$$\delta_{101} = \int_0^{s_1} M_{01} \cdot M_{11} \cdot \frac{1}{E \cdot J_1} dx$$

$$\delta_{101} = \frac{1}{3} \cdot M_{01} \cdot M_{11} \cdot \frac{s_1}{E \cdot J_1}$$


$$\delta_{101} := -\frac{1}{3} \cdot F_C \cdot c_1 \cdot o \cdot \frac{s_1}{E \cdot J_1}$$

$\delta_{101} = -0.271 \text{ m}$

$\delta_{102}$

$\delta_{102} = \delta_{102a} + \delta_{102b}$

$\delta_{102a}$




$$\delta_{102a} = \int_0^{h-o} M_{01} \cdot \Delta M_{12} \cdot \frac{1}{E \cdot J_1} dx$$

$$\delta_{102a} = \frac{1}{2} \cdot M_{01} \cdot \Delta M_{12} \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{102a} := \frac{1}{2} \cdot F_C \cdot c_1 \cdot [-(h-o)] \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{102a} = -0.049 \text{ m}$$

$\delta_{102b}$



$$\delta_{102b} = \int_0^{h-o} M_{01} \cdot M_{11} \cdot \frac{1}{E \cdot J_1} dx$$

$$\delta_{102b} = M_{01} \cdot M_{11} \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{102b} := F_C \cdot c_1 \cdot (-o) \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{102b} = -0.279 \text{ m}$$

$$\delta_{102} = \delta_{102a} + \delta_{102b}$$


$$\delta_{102} := -\frac{F_C \cdot c_1 \cdot (h-o) \cdot (h+o)}{2 \cdot E \cdot J_1}$$

$\delta_{102} = -0.327 \text{ m}$

$\delta_{103}$

$\delta_{103} = \delta_{103a} + \delta_{103b}$

$\delta_{103a}$




$$\delta_{103a} = \int_0^{e_0} \Delta M_{03} \cdot M_{12} \cdot \frac{1}{E \cdot J_2} dx$$

$$\delta_{103a} = \frac{1}{2} \cdot \Delta M_{03} \cdot M_{12} \cdot \frac{e_0}{E \cdot J_2}$$

$$\delta_{103a} := [F_H \cdot a_1 + c_1 \cdot (F_D - F_C)] \cdot (-h) \cdot \frac{e_0}{2 \cdot E \cdot J_2}$$

$$\delta_{103a} = -0.704 \text{ m}$$

$\delta_{103b}$



$$\delta_{103b} = \int_0^{e_0} M_{02} \cdot M_{12} \cdot \frac{1}{E \cdot J_2} dx$$

$$\delta_{103b} = M_{02} \cdot M_{12} \cdot \frac{e_0}{E \cdot J_2}$$

$$\delta_{103b} := F_C \cdot c_1 \cdot (-h) \cdot \frac{e_0}{E \cdot J_2}$$

$$\delta_{103b} = -0.518 \text{ m}$$

$$\delta_{103} := (\delta_{103a} + \delta_{103b})$$

$$\delta_{103} = -1.222 \text{ m}$$

$\delta_{104}$

$$\delta_{104} = \delta_{104a} + \delta_{104b}$$

$\delta_{104a}$

$$\delta_{104a} = \frac{1}{2} \cdot M_{03} \cdot \Delta M_{13} \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{104a} := \frac{1}{2} \cdot (F_H \cdot a_1 + F_D \cdot c_1) \cdot [-(h-o)] \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{104a} = -180.457 \cdot \text{mm}$$

$\delta_{104b}$

$$\delta_{104b} = M_{04} \cdot M_{14} \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{104b} := (F_H \cdot a_1 + F_D \cdot c_1) \cdot (-o) \cdot \frac{h-o}{E \cdot J_1}$$

$$\delta_{104b} = -1037.293 \cdot \text{mm}$$

$$\delta_{104} = \delta_{104a} + \delta_{104b}$$

$$\delta_{104} := -\frac{(h-o) \cdot (h+o)}{2 \cdot E \cdot J_1} \cdot (F_H \cdot a_1 + F_D \cdot c_1)$$

$$\delta_{104} = -1.218 \text{ m}$$

$\delta_{105}$

$$\delta_{105} = \frac{1}{3} \cdot M_{04} \cdot M_{14} \cdot \frac{s_1}{E \cdot J_1}$$

$$\delta_{105} := \frac{1}{3} \cdot (F_H \cdot a_1 + F_D \cdot c_1) \cdot (-o) \cdot \frac{s_1}{E \cdot J_1} \cdot k_{105}$$

$$\delta_{105} = -1.009 \text{ m}$$

$$\delta_{10} := \delta_{101} + \delta_{102} + \delta_{103} + \delta_{104} + \delta_{105}$$

$$\delta_{10} = -4.048 \text{ m}$$

$$\delta_{11} = \delta_{111} + \delta_{112} + \delta_{113} + \delta_{114} + \delta_{115}$$

$\delta_{111}$

$$\delta_{111} = \frac{1}{3} \cdot M_{11} \cdot M_{11} \cdot \frac{s_1}{E \cdot J_1}$$

$$\delta_{111} := \frac{1}{3} \cdot (-o) \cdot (-o) \cdot \frac{s_1}{E \cdot J_1}$$

$$\delta_{111} = 0.015 \cdot \frac{\text{m}}{\text{kN}}$$


$\delta_{112}$

$$\delta_{112} = \frac{1}{6} \cdot \left[ M_{11} \cdot \left[ (2 \cdot M_{11} + M_{12}) + M_{12} \cdot (M_{11} + 2 \cdot M_{12}) \right] \cdot \frac{h - o}{E \cdot J_1} \right]$$

$$\delta_{112} = \frac{1}{6} \cdot [(-o) \cdot (-2 \cdot o - h) - h \cdot (-o - 2 \cdot h)] \cdot \frac{h - o}{E \cdot J_1}$$

$$\delta_{112} := \frac{1}{3} \cdot (o^2 + h \cdot o + h^2) \cdot \frac{h - o}{E \cdot J_1}$$

$$\delta_{112} = 0.021 \cdot \frac{\text{m}}{\text{kN}}$$

$\delta_{113}$  

$$\delta_{113} = \int_0^{e_0} M_{12} \cdot M_{12} \cdot \frac{1}{E \cdot J_2} dx$$

$$\delta_{113} = M_{12} \cdot M_{12} \cdot \frac{e_0}{E \cdot J_2}$$

$$\delta_{113} := (-h) \cdot (-h) \cdot \frac{e_0}{E \cdot J_2}$$


$$\delta_{113} = 0.038 \cdot \frac{\text{m}}{\text{kN}}$$

$\delta_{114}$  

Symmetrie

$$\delta_{114} := \delta_{112}$$

$$\delta_{114} = 0.021 \cdot \frac{\text{m}}{\text{kN}}$$

$\delta_{115}$  

Symmetrie

$$\delta_{115} := \delta_{111}$$

$$\delta_{115} = 0.015 \cdot \frac{\text{m}}{\text{kN}}$$

$$\delta_{11} := \delta_{111} + \delta_{112} + \delta_{113} + \delta_{114} + \delta_{115}$$

$$\delta_{11} = 0.109 \cdot \frac{\text{m}}{\text{kN}}$$

$$H_C = H_D = X_1 \quad X_1 := -\frac{\delta_{10}}{\delta_{11}}$$

$$H_C := X_1$$

$$H_C = 37.235 \cdot \text{kN}$$

$$H_D := X_1$$

$$H_D = 37.235 \cdot \text{kN}$$

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**ENDE**