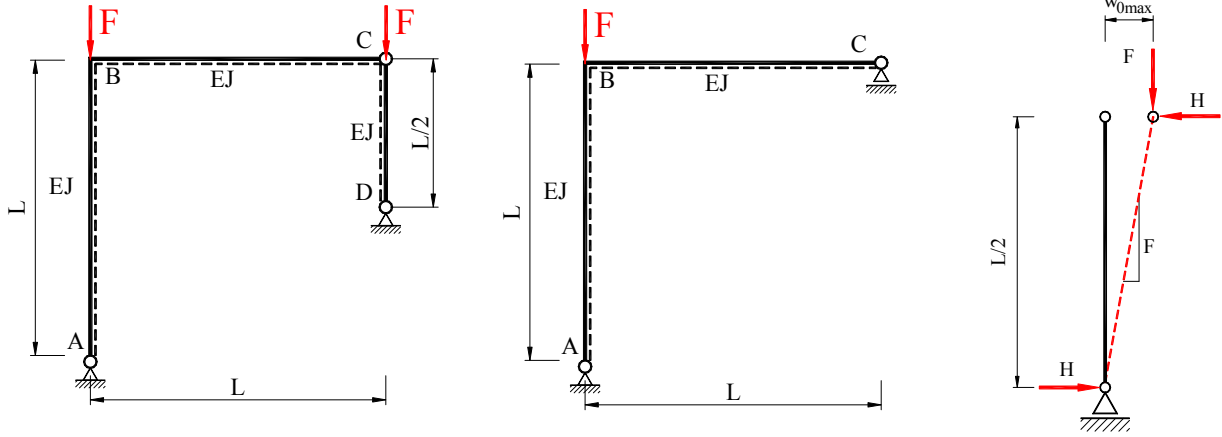


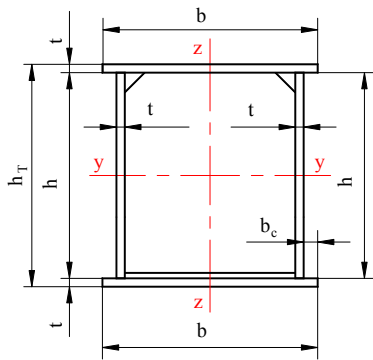
Bir düzlemdeki çerçevenin sabit ezlemsizlik momentli dik çubuğu

Sistem ve bilinen değerler:



$$F_G \cdot w_{0\max} = H_F \cdot \frac{L_S}{2} \quad H_F = 2F_G \cdot w_{0\max}$$

Ayak kesiti



$$t := 8 \cdot \text{mm}$$

$$b := 420 \cdot \text{mm}$$

$$h := 384 \cdot \text{mm}$$

$$b_\varphi := 10 \cdot \text{mm}$$

$$L_S := 8 \cdot \text{m}$$

$$\text{WSt} := \text{"S235"}$$

$$f_y := 235 \cdot \text{MPa}$$

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

$$F_B := 400 \cdot \text{kN}$$

$$h_T := h + 2 \cdot t$$

$$h_T = 400 \cdot \text{mm}$$

$$A_0 := 2 \cdot t \cdot (b + h)$$

$$A_0 = 12864 \cdot \text{mm}^2$$

$$z := 0.5 \cdot (h + t)$$

$$z = 196 \cdot \text{mm}$$

$$J_{SY} := 2 \cdot \frac{b \cdot t^3}{12} + 2 \cdot \frac{t \cdot h^3}{12} + 2 \cdot t \cdot b \cdot z^2$$

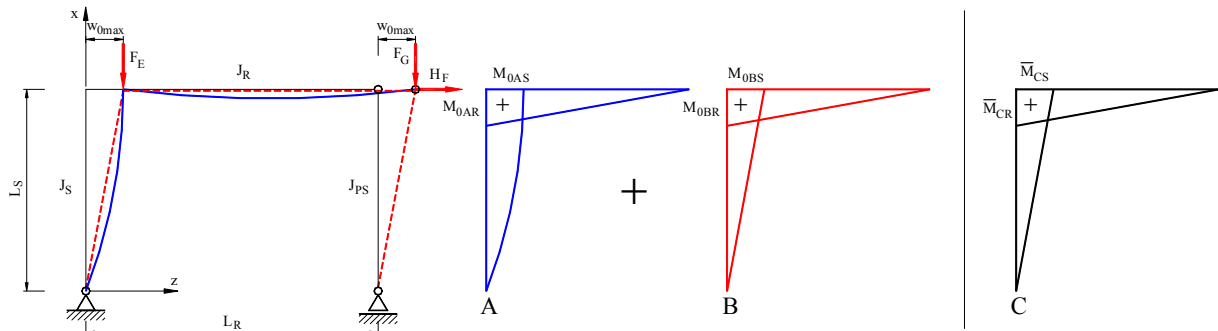
$$J_{SY} = 333.7 \cdot 10^6 \cdot \text{mm}^4$$

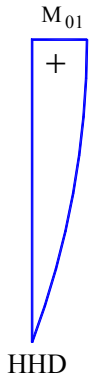
$$y := 0.5 \cdot (b + t) - b_\varphi \quad y = 204 \cdot \text{mm}$$

$$J_{SZ} := 2 \cdot \frac{b^3 \cdot t}{12} + 2 \cdot \frac{t^3 \cdot h}{12} + 2 \cdot t \cdot h \cdot y^2$$

$$J_{SZ} = 354.5 \cdot 10^6 \cdot \text{mm}^4$$

CD çubuğunun burkulma boyu bilindiğinden normal Euler metoduyla hesaplanır. AB çubuğu çerçevenin parçası olduğundan burkulma boyunu bulmak imkansızdır. Bundan dolayı AB çubuğunun hesabı Vianello metodu ve "y" eksenine yapılır.



AB çubuğunda F_B etkili 1. sehim

$$w_{11} = \int_0^{L_S} \frac{M_{01} \cdot M_C}{E \cdot J_{SY}} dx$$

$$E \cdot J_{SY} = \text{sabit}$$

Integral tablosundan

Parabol + Üçgen

$$w_{11} = \frac{5}{12} \cdot \frac{F_B \cdot w_{0\max} \cdot L_C^2}{E \cdot J_{SY}}$$

$$F_B \cdot w_{0\max} = \text{sabit}$$

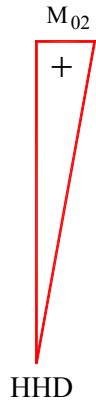
$$w_{11} := \frac{5}{12} \cdot \frac{L_S^2}{E \cdot J_{SY}}$$

$$w_{11} = 3.805 \times 10^{-7} \cdot \frac{1}{N}$$

Momentlerin değeri:

$$M_C = L_S$$

$$M_{01} = F_B \cdot w_{0\max}$$

AB çubuğunda H_F etkili 2. sehim

$$w_{12} = \int_0^{L_S} \frac{M_{02} \cdot M_C}{E \cdot J_{SY}} dx$$

$$E \cdot J_{SY} = \text{sabit}$$

Integral tablosundan

Üçgen + Üçgen

$$w_{12} = \frac{1}{3} \cdot \frac{2 \cdot F_B \cdot w_{0\max} \cdot L_S^2}{E \cdot J_{SY}}$$

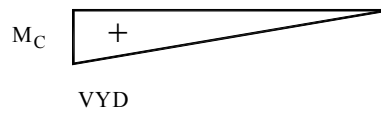
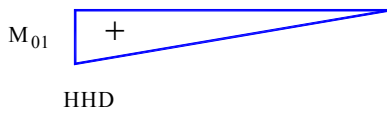
$$F_B \cdot w_{0\max} = \text{sabit}$$

$$w_{12} := \frac{2}{3} \cdot \frac{L_S^2}{E \cdot J_{SY}}$$

$$w_{12} = 6.089 \times 10^{-7} \cdot \frac{1}{N}$$

$$M_{02} = H_F \cdot L_S = 2F_B \cdot w_{0\max}$$

$$M_C = L_S$$

BC Kirişinde F_B etkili 3. sehim

$$M_{01} = F_B \cdot w_{0\max}$$

$$M_C = L_S$$

$$w_{13} = \int_0^{L_S} \frac{M_{01} \cdot M_C}{E \cdot J_{SY}} dx$$

$$E \cdot J_{SY} = \text{sabit}$$

Integral tablosundan

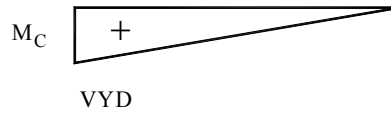
Üçgen + Üçgen

$$w_{13} = \frac{1}{3} \cdot \frac{F_B \cdot w_{0\max} \cdot L_S^2}{E \cdot J_{SY}}$$

$$F_B \cdot w_{0\max} = \text{sabit}$$

$$w_{13} := \frac{1}{3} \cdot \frac{L_S^2}{E \cdot J_{SY}}$$

$$w_{13} = 3.044 \times 10^{-7} \cdot \frac{1}{N}$$

BC Kirişinde H_F etkili 4. sehim

$$M_{02} = 2 \cdot F_B \cdot w_{0\max}$$

$$M_C = L_S$$

$$w_{14} = \int_0^{L_S} \frac{M_{02} \cdot M_C}{E \cdot J_{SY}} dx$$

$$E \cdot J_{SY} = \text{sabit}$$

İntegral tablosundan

Üçgen + Üçgen

$$w_{14} = \frac{1}{3} \cdot \frac{2 \cdot F_B \cdot w_{0\max} \cdot L_S^2}{E \cdot J_{SY}}$$

$$F_B \cdot w_{0\max} = \text{sabit}$$

$$w_{14} := \frac{2}{3} \cdot \frac{L_S^2}{E \cdot J_{SY}}$$

$$w_{14} = 6.089 \times 10^{-7} \frac{1}{N}$$

$$w_{01} = F_B \cdot w_{0\max} \cdot (w_{11} + w_{12} + w_{13} + w_{14})$$

$$F_B = F_{kr1}$$

$$w_{01} = w_{0\max}$$

kabul edersek

$$F_{kr1} := \frac{1}{w_{11} + w_{12} + w_{13} + w_{14}}$$

$$F_{kr1} = 525.6 \cdot \text{kN}$$

$$S_{He} := \frac{F_{kr1}}{F_B}$$

$$S_{He} = 1.314$$

Teori dosyasındaki sonuç

$$F_{kr1t} := 0.480 \cdot \frac{E \cdot J_{SY}}{L_S^2}$$

$$F_{kr1t} = 525.6 \cdot \text{kN}$$

Konstrüksiyon yeteri kadar emniyetlidir.

SON