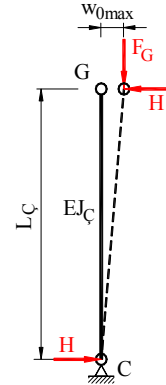
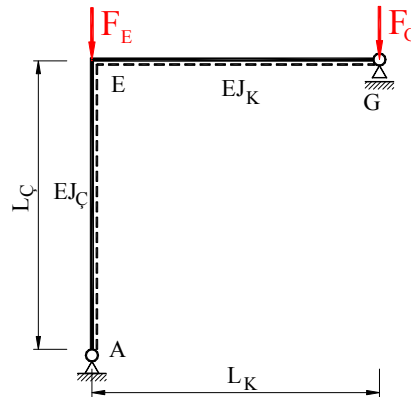
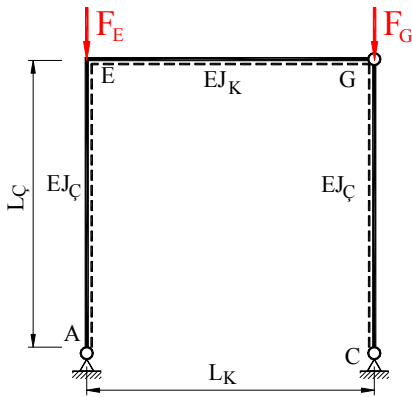
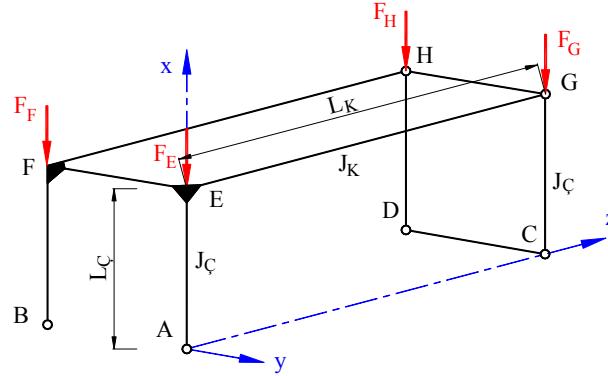


İki düzlemdeki çerçevelerin sabit kesitli ortak dik çubuğu

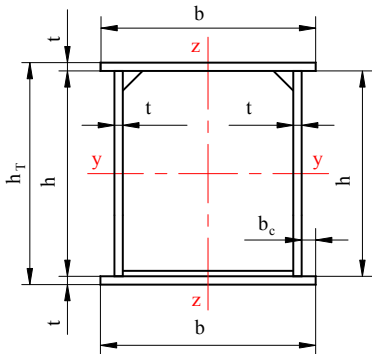
Sistem ve bilinen değerler:



$$F_E \cdot w_{0\max} = H_F \cdot L_C$$

$$H_F = \frac{F_E \cdot w_{0\max}}{L_C}$$

Ayak kesiti



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

$$L_C := 8 \text{ m}$$

$$L_K := 18 \text{ m}$$

$$L_U := 2 \text{ m}$$

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

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

$$b_c := 10 \text{ mm}$$

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

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

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

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

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

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

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

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

$$y := 0.5 \cdot (b + t) - b_c$$

$$y = 204 \text{ mm}$$

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

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

GC çubuğunda burkulma boyu bilindiğinden normal Euler metoduyla hesaplanır. AE çubuğu çerçevenin parçası olduğundan burkulma boyunu bulmak imkansızdır. Budan dolayı AE çubuğunun hesabı Vianello metodu ve "y" eksenine yapılır.

xz kesiti

WSt := "S235"

$f_y := 235 \text{ MPa}$

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

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

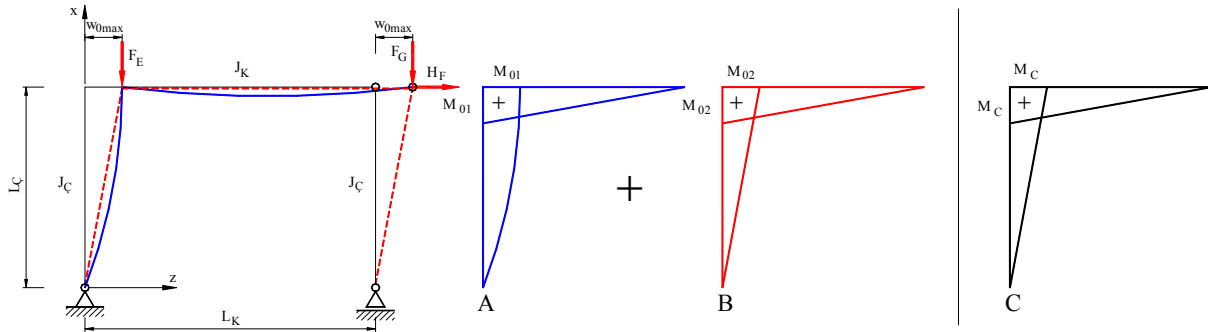
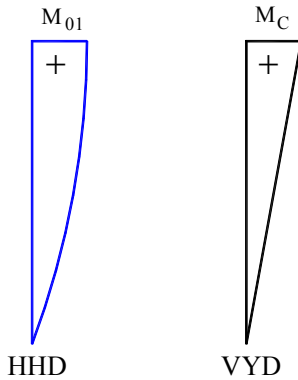
$F_G := 0.9 \cdot F_E$

$J_{Ky} := 7447 \cdot 10^6 \cdot \text{mm}^4$

$J_{Uy} := 703 \cdot 10^6 \cdot \text{mm}^4$

$$k_{xz} := \frac{L_C^2}{J_{Ky}} \quad k_{xz} = 8594 \frac{1}{\text{m}^2} \quad k_{xy} := \frac{L_U^2}{J_{Uy}} \quad k_{xy} = 5690 \frac{1}{\text{m}^2}$$

AE çubuğunun hesabı Vianello metodu ile xz düzleminde ve "y" eksenine göre yapılır.

**AE çubuğunda F_E etkili 1. sehim**

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

Momentler:

$M_C = L_C$

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

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

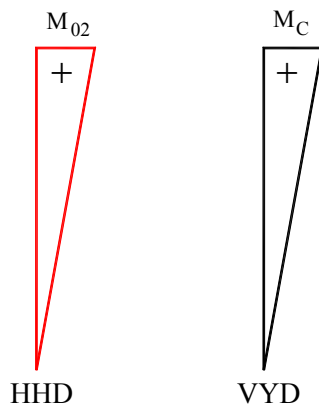
Integral tablosundan

Parabol + Üçgen

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

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

$$w_{11} := \frac{5}{12} \cdot \frac{L_C^2}{E \cdot J_{Cy}} \quad w_{11} = 3.805 \times 10^{-7} \cdot \frac{1}{\text{N}}$$

AE çubuğunda H_F etkili 2. sehim

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

Momentler:

$M_C = L_C$

$M_{02} = F_E \cdot w_{0\max}$

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

Integral tablosundan


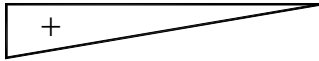
Üçgen + Üçgen

$$w_{12} = \frac{1}{3} \cdot \frac{F_E \cdot w_{0\max} \cdot L_C^2}{E \cdot J_{Cy}}$$

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

$$w_{12} := \frac{1}{3} \cdot \frac{L_C^2}{E \cdot J_{Cy}} \quad w_{12} = 3.044 \times 10^{-7} \cdot \frac{1}{\text{N}}$$


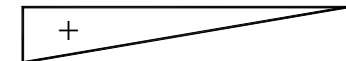
EG Kirişinde F_E etkili 3. sehim

M_{01}  M_C  $M_{01} = F_E \cdot w_{0max}$
 HHD VYD $M_C = L_K$

$w_{13} = \int_0^{L_K} \frac{M_{01} \cdot M_C}{E \cdot J_{Ky}} dx$ $E \cdot J_{yK} = \text{sabit}$
 İntegral tablosundan Üçgen + Üçgen $w_{13} = \frac{1}{3} \cdot \frac{F_E \cdot w_{0max} \cdot L_K^2}{E \cdot J_{Ky}}$

$F_E \cdot w_{0max} = \text{sabit}$ $w_{13} := \frac{1}{3} \cdot \frac{L_K^2}{E \cdot J_{Ky}}$ $w_{13} = 6.906 \times 10^{-8} \cdot \frac{1}{N}$

EG Kirişinde H_F etkili 4. sehim

M_{02}  M_C  $M_{02} = F_E \cdot w_{0max}$
 HHD VYD $M_C = L_Ç$

$w_{14} = \int_0^{L_K} \frac{M_{02} \cdot M_C}{E \cdot J_{yK}} dx$ $E \cdot J_{yK} = \text{sabit}$
 İntegral tablosundan Üçgen + Üçgen $w_{14} = \frac{1}{3} \cdot \frac{F_E \cdot w_{0max} \cdot L_K^2}{E \cdot J_{yK}}$

$F_E \cdot w_{0max} = \text{sabit}$ $w_{14} := \frac{1}{3} \cdot \frac{L_K^2}{E \cdot J_{Ky}}$ $w_{14} = 6.906 \times 10^{-8} \cdot \frac{1}{N}$

$w_{01} = F_E \cdot w_{0max} \cdot (w_{11} + w_{12} + w_{13} + w_{14})$ $F_E = F_{kr1}$ $w_{01} = w_{0max}$ kabul edersek

$$F_{kr1} := \frac{1}{w_{11} + w_{12} + w_{13} + w_{14}} \quad F_{kr1} = 1214.9 \cdot \text{kN}$$

Teori dosyasındaki sonuçlar

$$F_{kr1t} := \frac{12 \cdot E}{\frac{9 \cdot L_Ç^2}{J_{Çy}} + \frac{8 \cdot L_K^2}{J_{Ky}}} \quad F_{kr1t} = 1214.9 \cdot \text{kN}$$

$$F_{kr2t} := \frac{12 \cdot E}{\frac{9 \cdot L_Ç^2}{J_{Çy}} + \frac{8 \cdot L_U^2}{J_{Uy}}} \quad F_{kr2t} = 1422.4 \cdot \text{kN}$$

Kritik kuvvet 1215 kN dur ve konstrüksiyon yeteri kadar emniyetlidir.**SON**