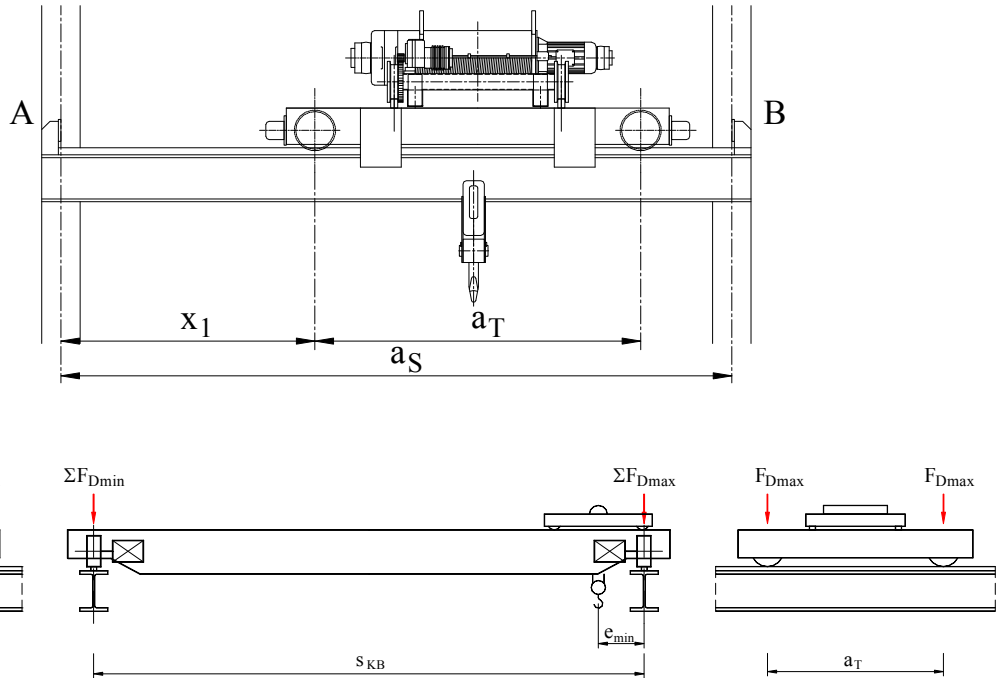


Örnek 2 EC Vinç Yolu, TK eşit, Giriş

Değerler Eurocode3 örneğinden alınmıştır.

1. Vinç ve vinç yolu hakkında bilgiler



Sütunlar mesafesi

Vincin kaldırma kapasitesi

Arabanın kendi ağırlık kuvveti

Vincin kendi ağırlık kuvveti

Vincin giriş boyu veya ray açıklığı

Kancanın vinç rayına en küçük mesafesi

Vinç tekerleklerinin eksen mesafesi

Hol boyu

Kaldırma hızı

Vincin yükleme sınıfı

Vincin yükleme grubu

$$a_S := 7 \cdot \text{m}$$

$$F_{Yü} := 100 \cdot \text{kN}$$

$$F_{Ar} := 10 \cdot \text{kN}$$

$$F_{Vi} := 60 \cdot \text{kN}$$

$$s_{KB} := 15 \cdot \text{m}$$

$$e_{\min} := 0 \cdot \text{m}$$

$$a_T := 2.5 \cdot \text{m}$$

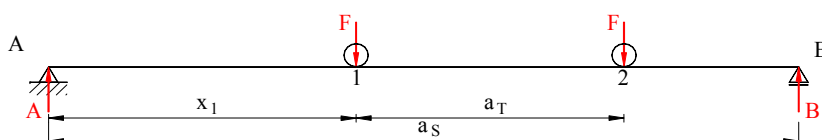
$$L_{Hol} := 7 \cdot \text{m}$$

$$v_K := 6 \cdot \text{m} \cdot \text{min}^{-1}$$

$$YS := "S1"$$

$$YG := "C5"$$

Kritik kesitin A dayanağına mesafesi



$$x_1 := 0.25 \cdot (2 \cdot a_S - a_T)$$

$$x_1 = 2.875 \text{ m}$$

$$x_2 := x_1 + a_T$$

$$x_2 = 5.375 \text{ m}$$

Faktörler :

Boyuna kuvvetler faktörü

$$\varphi_B := 0.2$$

Dinamik faktör

$$\varphi_{dy} := 1.5$$

Statik faktör

$$\varphi_{st} := 1.35$$

Genel emniyet faktörü

$$\gamma_M := 1.1$$

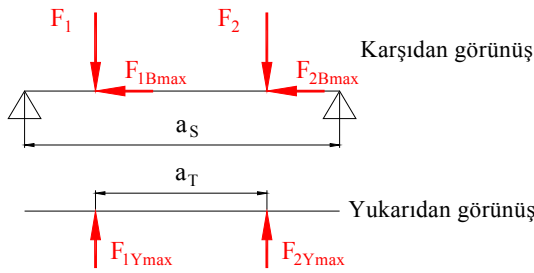
Lokal kuvvet emniyet faktörü

$$\gamma_{M1} := 1.05$$

Yorulma gerilmeleri farkı faktörü

$$\gamma_{Mf} := 1.15$$

Tekerlek kuvvetleri

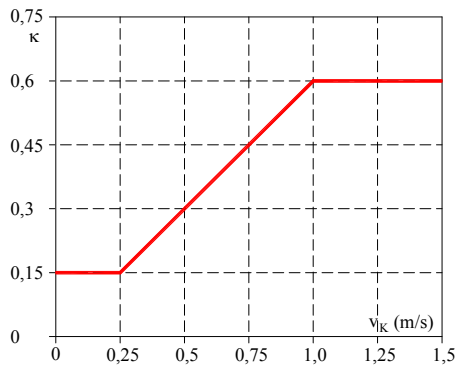


Raya dik dikey kuvvetler:

$$F_G := \frac{F_{Vi}}{4} + \frac{F_{Ar} \cdot (s_{KB} - e_{min})}{2s_{KB}} \quad F_G = 20 \cdot \text{kN}$$

$$F_{YG} := \frac{F_{Yü} \cdot (s_{KB} - e_{min})}{2s_{KB}} \quad F_{YG} = 50 \cdot \text{kN}$$

$$F_D := F_G + F_{YG} \quad F_D = 70 \cdot \text{kN}$$

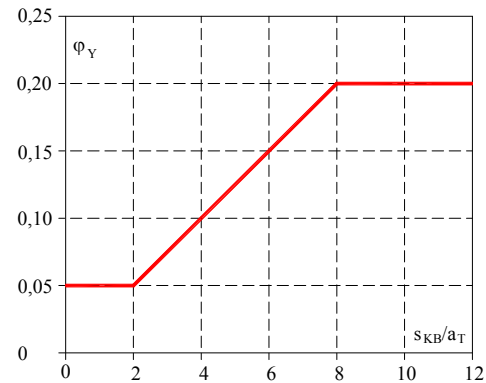


$$v_K = 0.1 \cdot \frac{\text{m}}{\text{s}}$$

$$\kappa_K := 0.15$$

$$\varphi_K := 1 + \kappa_K \cdot \frac{F_{Yü}}{2 \cdot F_D}$$

$$\varphi_K = 1.1071$$



Yatay kuvvetler faktörü $\frac{s_{KB}}{a_T} = 6$

$$\varphi_Y := 0.15$$

Tekerlek kuvvetleri eşit

$$F_{Dmax} := \varphi_K \cdot (F_{YG} + F_G) \quad F_{Dmax} = 77.5 \cdot \text{kN}$$

Raya dik yatay kuvvetler:

$$F_Y := \varphi_Y \cdot F_{Dmax} \quad F_Y = 11.63 \cdot \text{kN}$$

Ray boyuna kuvvetler:

$$F_B := \varphi_B \cdot F_{Dmax} \quad F_B = 15.5 \cdot \text{kN}$$

Malzeme S235

Akma mukavemeti

$$t_f := 28 \cdot \text{mm} \quad t_f > 16$$

$$f_y := 225 \cdot \text{MPa}$$

Elastiklik modülü

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

Emniyetli torsiyon mukavemeti

$$f_{\tau EM} := \frac{f_y}{\gamma_M \cdot \sqrt{3}}$$

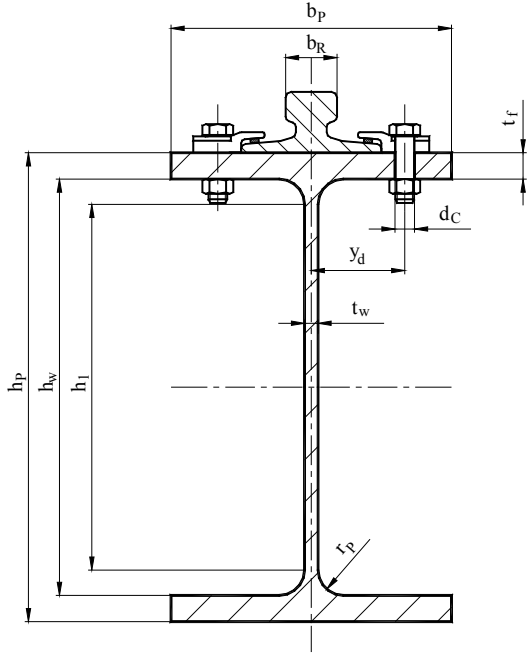
$$f_{\tau EM} = 118 \cdot \text{MPa}$$

Emniyetli basma mukavemeti

$$f_{\sigma EM} := \frac{f_y}{\gamma_M}$$

$$f_{\sigma EM} = 205 \cdot \text{MPa}$$

Seçilen vinç yolu ve değerleri



P1, Profil HE-B 500 ray A 55 ile, Çelik S235 (St 37)

$h_P := 500 \cdot \text{mm}$	$b_P := 300 \cdot \text{mm}$	$I_{yP} := 1072 \cdot 10^6 \cdot \text{mm}^4$
$t_f := 28 \cdot \text{mm}$	$t_w := 14.5 \cdot \text{mm}$	$W_{yP} := 4288 \cdot 10^3 \cdot \text{mm}^3$
$r_P := 27 \cdot \text{mm}$	$z_P := 0.5 \cdot h_P$	$I_{zP} := 126.2 \cdot 10^6 \cdot \text{mm}^4$
$A_P := 23900 \cdot \text{mm}^2$	$m_P := 187.6 \cdot \text{kg} \cdot \text{m}^{-1}$	$W_{zP} := 842 \cdot 10^3 \cdot \text{mm}^3$
Profil flanşının alanı	$A_F := b_P \cdot t_f$	$A_F = 8400 \cdot \text{mm}^2$
Profil dikme alanı	$h_1 := h_P - 2 \cdot t_f - 2 \cdot r_P$	$h_1 = 390 \cdot \text{mm}$
	$A_{Di} := h_1 \cdot t_w$	$A_{Di} = 5655 \cdot \text{mm}^2$
	$h_W := h_P - 2 \cdot t_f$	$h_W = 444 \cdot \text{mm}$
	$I_{zük} := \frac{b_P^3 \cdot t_f}{12}$	$I_{zük} = 63 \cdot 10^6 \cdot \text{mm}^4$

P2, Vinç rayı A 55

$h_S := 65 \cdot \text{mm}$	$h_R := 59 \cdot \text{mm}$	$b_R := 55 \cdot \text{mm}$	$I_{yR} := 178 \cdot \text{cm}^4$
$A_R := 4050 \cdot \text{mm}^2$		$m_R := 31.8 \cdot \text{kg} \cdot \text{m}^{-1}$	$I_{zR} := 337 \cdot \text{cm}^4$
$y_d := 95 \cdot \text{mm}$	$z_{Rx} := 26.2 \cdot \text{mm}$	$z_R := h_P + 26.2 \cdot \text{mm}$	$z_R = 526.2 \cdot \text{mm}$
Sistemin alanı	$A_{Si} := A_P$		$A_{Si} = 23900 \cdot \text{mm}^2$

$I_{zR} = 3370000 \cdot \text{mm}^4$

$z_S := z_P$	$z_S = 250.00 \cdot \text{mm}$
$z_{SP} := z_S - z_P$	$z_{SP} = 0.00 \cdot \text{mm}$
$z_{SR} := z_R - z_S$	$z_{SR} = 276.20 \cdot \text{mm}$
$h_{Tot} := h_P + h_R$	$h_{Tot} = 559.00 \cdot \text{mm}$
$e_u := z_S$	$e_u = 250.00 \cdot \text{mm}$
$e_o := h_P - e_u$	$e_o = 250 \cdot \text{mm}$
$I_y := I_{yP}$	$I_y = 1072.00 \cdot 10^6 \cdot \text{mm}^4$
$W_y := I_y \cdot z_S^{-1}$	$W_y = 4288.00 \cdot 10^3 \cdot \text{mm}^3$
$I_{züt} := I_{zük} + I_{zR}$	$I_{züt} = 66.37 \cdot 10^6 \cdot \text{mm}^4$
$W_{züt} := \frac{2I_{züt}}{b_P}$	$W_{züt} = 442.47 \cdot 10^3 \cdot \text{mm}^3$
$A_{üt} := A_F$	$A_{üt} = 8400 \cdot \text{mm}^2$

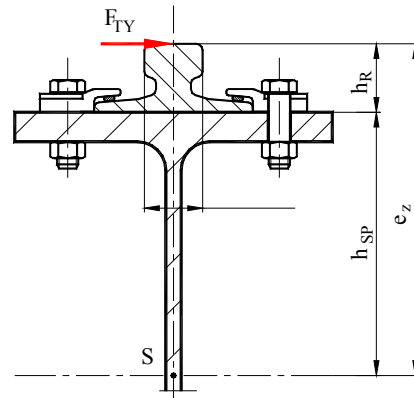
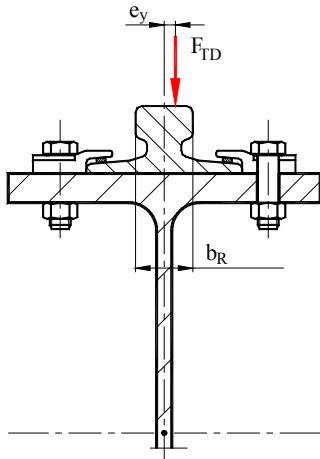
Kendi ağırlığı

Kendi ağırlığı	$q_{Tr} := m_P + m_R$	$q_{Tr} = 219.4 \cdot \text{kg} \cdot \text{m}^{-1}$
Birim ağırlığı	$q := q_{Tr} \cdot g$	$q = 2151.6 \cdot \text{N} \cdot \text{m}^{-1}$

Tekerlek kuvvetlerinin torsiyon momenti:

$$e_y := 0.25b_R$$

$$e_y = 13.75 \cdot \text{mm}$$



$$M_{tmax} := 2 \cdot F_{Dmax} \cdot (e_y + 0.5 \cdot h_P \cdot \varphi_Y)$$

$$M_{tmax} = 7.94 \cdot \text{kN} \cdot \text{m}$$

$$e_o = 250 \cdot \text{mm}$$

$$M_{tmin} := 2 \cdot F_{Dmax} \cdot (e_y - 0.5 \cdot h_P \cdot \varphi_Y)$$

$$M_{tmin} = -3.68 \cdot \text{kN} \cdot \text{m}$$

Eşdeğer gerilmeler farkı faktörü

$$\lambda_1 := 1 \quad \lambda_3 := 1$$

YS = "S1"

YG = "C5"

$$KK := \frac{F_{Vi}}{F_{Yü}}$$

$$KK = 0.6$$

$$\lambda_4 := 0.45$$

$$\lambda_E := \lambda_1 \cdot \lambda_3 \cdot \lambda_4$$

$$\lambda_E = 0.45$$

Son