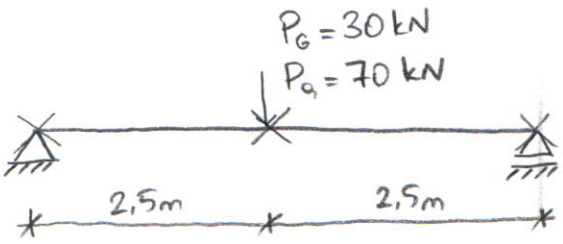
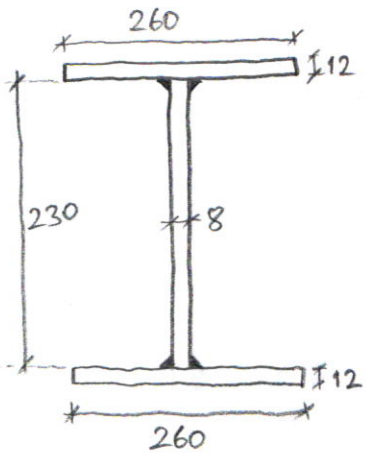


Malzeme: S355



Yapma I enkesitten oluşturulan basit kiriş, ölü ve hareketli yükler altındadır. Basınç etkisindeki kiriş başlığı mesnetlerde ve açıklık ortasında yanal olarak desteklenmiştir. Kirişin eğilme etkisinde kontrolünü yapınız.

A simple beam formed by built-up I section is subjected to dead and live loads. Beam flange in compression is laterally supported at end points and mid-span. Check the beam under flexure.

$d = 230+12+12 = 254$
$t_f = 12$
$t_w = 8$
$b = 260$
$h = 230$

$A = 26.1,2.2 + 23.0,8 = 80,8\ cm^2$

$$I_x = \frac{0,8.23^3}{12} + \left[\frac{26.1,2^3}{12} + 26.1,2.(11,5+0,6)^2\right].2 = 9954,61\ cm^4$$

$$I_y = \frac{23.0,8^3}{12} + \frac{1,2.26^3}{12}.2 = 3516,18\ cm^4$$

$$W_{ex} = \frac{I_x}{y} = \frac{9954,61}{11,5+1,2} = 783,83\ cm^3 \qquad i_x = \sqrt{\frac{I_x}{A}} = 11,1\ cm \qquad i_y = \sqrt{\frac{I_y}{A}} = 6,6\ cm$$

$$W_{px} = b.t_f(d-t_f) + t_w\left(\frac{d}{2}-t_f\right)^2 = 26.1,2.(25,4-1,2) + 0,8.\left(\frac{25,4}{2}-1,2\right)^2 = 860,84\ cm^3$$

→ Yerel burkulma kontrolü (Local buckling control)

- Gövde için (for web)

$$\lambda = \frac{h}{t_w} = \frac{230}{8} = 28,75 \quad < \quad \lambda_p = 3,76\sqrt{\frac{E}{F_y}} = 3,76\sqrt{\frac{20000}{35,5}} = 89,25$$

kompakt (compact)

• Başlık için (for flange) (Table 5.1B)

$\lambda = \frac{b}{2t_f} = \frac{260}{2.12} = 10,83$ $\quad \lambda_p = 0,38\sqrt{\frac{E}{F_y}} = 0,38\sqrt{\frac{20000}{35,5}} = 9,02$

$\lambda_r = 0,95\sqrt{\frac{k_c . E}{F_L}}$ $\quad k_c = \frac{4}{\sqrt{h/t_w}} = \frac{4}{\sqrt{23/0,8}} = 0,75$ $\quad 0,35 \leq k_c < 0,76$

k_c uygundur (acceptable)

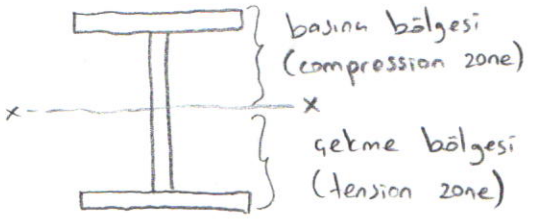
$W_{ext}/W_{exc} \geq 0,7 \rightarrow F_L = 0,7F_y$

W_{ext} = x ekseni etrafında çekme bölgesi için elastik mukavemet momenti

W_{exc} = " " " basınç " " " " " "

W_{ext} = elastic section modulus referred to compression zone about x-axis

W_{exc} = " " " " " tension " " "



kesit x eksenine göre simetriktir $W_{ext} = W_{exc}$
(the section is symmetric about x-axis)

$W_{ext}/W_{exc} = 1$ $\quad F_L = 0,7 . 35,5 = 24,85$ kN/cm²

$\lambda_r = 0,95\sqrt{\frac{0,75 . 20000}{24,85}} = 23,34$ $\quad \lambda_p < \lambda < \lambda_r$ başlık kompakt değil (flange is non-compact)

Yanal Burulmalı Burkulma (Lateral Torsional Buckling)

$L_b = 250$ cm

$L_p = 1,76 . i_y\sqrt{\frac{E}{F_y}} = 1,76 . 6,6\sqrt{\frac{20000}{35,5}} = 275,71$ $\quad L_b < L_p$

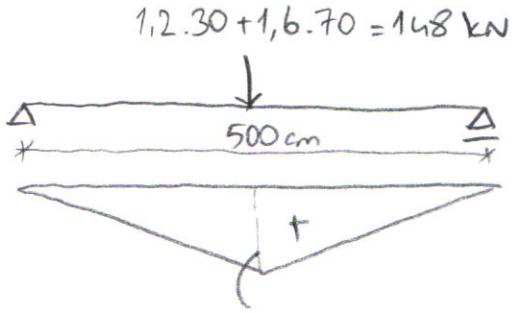
$M_n = M_p = F_y . W_{px} = 35,5 . 860,52 = 30548,46$ kNcm

Yerel Burkulma (Local Buckling) (web: compact, flange: non-compact)

$$M_n = M_p - (M_p - 0,7 F_y W_{ex})\left(\frac{\lambda_f - \lambda_{pf}}{\lambda_{rf} - \lambda_{pf}}\right)$$

$$M_n = 30548,46 - (30548,46 - 0,7 . 35,5 . 783,83)\left(\frac{10,83 - 9,02}{23,34 - 9,02}\right) = 29149,21 \text{ kNcm}$$

$M_n = \min(30548,46 ; 29149,21) = 29149,21 \ kNcm$



$$M_{max} = \frac{148.500}{4} = 18500 \ kNcm$$

$M_d = \phi M_n = 0,90.29149,21 = 26234,29 \ kNcm > M_{max} = 18500 \ kNcm$ ✓