

STRUKTUR BAJA I



Perhitungan Dimensi
Batang Tekan

Contoh dimensionering batang tekan:

➤ Dengan profil Baja Kanal

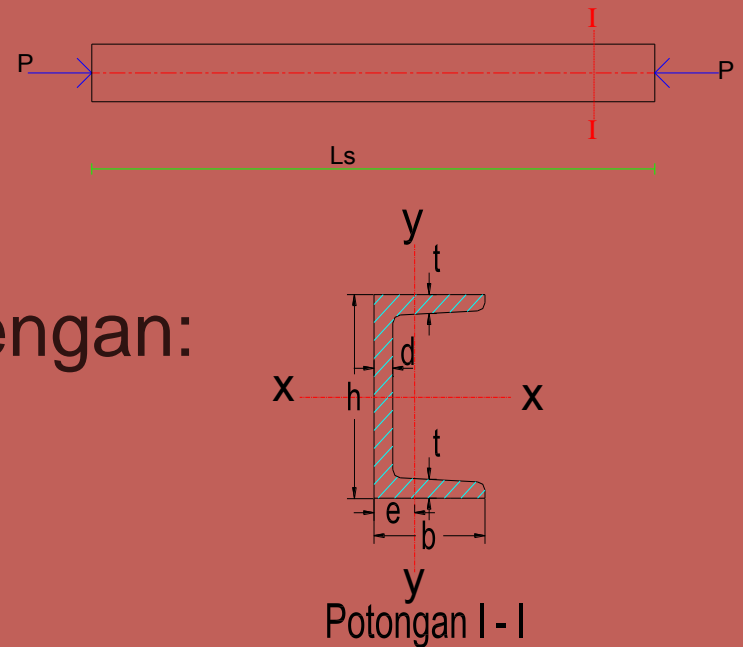
$$\text{Diket : } P = - 3500 \text{ kg}$$

$$L_s = L_k = 3,00 \text{ m}$$

$$\bar{\sigma} = 1400 \text{ kg} / \text{cm}^2$$

Hitung dimensi batang dengan:

✓ profil baja kanal



- Taksir harga I_{\min} dengan rumus

$$I_{\min} = 1,69PL_k^2$$

dimana P (ton), L_k (m) dan I_{\min} (cm^4)

$$I_{\min} = 1,69 \times 3,5 \times (3)^2 = 53,235 \text{ cm}^4$$

Lihat tabel profil --> ambil [- 6 $\frac{1}{2}$ → didapat:

$$I_x = 57,5 \text{ cm}^4$$

$$I_y = 14,1 \text{ cm}^4 < 53,235 \text{ cm}^4 \text{ --> tidak}$$

memenuhi syarat, maka dimensi diperbesar.

Note: harus dilihat kemungkinan tekuk ke arah sumbu x dan y

Ambil [- 14

Dari tabel profil diperoleh:

$$I_x = 605 \text{ cm}^4$$

$$I_y = 62,7 \text{ cm}^4 > 53,235 \text{ cm}^4 \rightarrow \text{ok}$$

$$F = 20,4 \text{ cm}^2$$

$$i_x = 5,45 \text{ cm}$$

$$i_y = 1,75 \text{ cm} = i_{\min}$$

Kontrol:

$$\lambda = \frac{L_k}{i_{\min}} = \frac{300\text{cm}}{1,75\text{cm}} = 171\text{cm} \Rightarrow \text{Tabel didapat}$$

$$\alpha = 0,145$$

$$\omega = 1/\alpha = 6,897$$

$$\sigma = \frac{\omega P}{F_{br}} = \frac{6,897 \times 3500\text{kg}}{20,4\text{cm}^2}$$

$$= 1183,31\text{kg/cm}^2 < \bar{\sigma} = 1400\text{kg/cm}^2 \Rightarrow \text{ok}$$

➤ Dengan profil Baja I INP

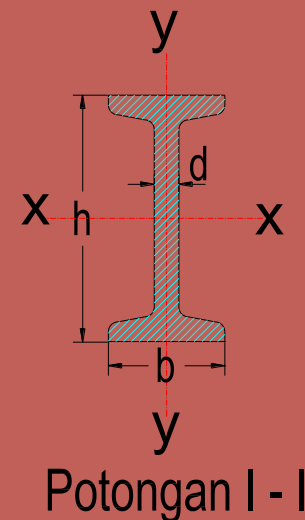
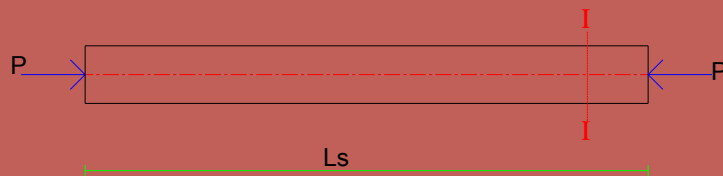
$$\text{Diket : } P = - 5000 \text{ kg}$$

$$L_s = L_k = 3,00 \text{ m}$$

$$\bar{\sigma} = 1400 \text{ kg} / \text{cm}^2$$

Hitung dimensi batang dengan:

✓ profil baja INP



- Taksir harga I_{\min} dengan rumus

$$I_{\min} = 1,69PL_k^2$$

dimana P (ton), L_k (m) dan I_{\min} (cm^4)

$$I_{\min} = 1,69 \times 5 \times (3)^2 = 76,05 \text{ cm}^4$$

Lihat tabel profil \rightarrow ambil INP - 8 \rightarrow didapat:

$$I_x = 77,8 \text{ cm}^4$$

$$I_y = 6,29 \text{ cm}^4 < 76,05 \text{ cm}^4 \rightarrow \text{tidak}$$

memenuhi syarat, maka dimensi diperbesar.

Note: harus dilihat kemungkinan tekuk ke arah sumbu x dan y

Kontrol:

$$\lambda = \frac{L_k}{i_{\min}} = \frac{300\text{cm}}{1,71\text{cm}} = 175\text{cm} \rightarrow \text{Tabel didapat}$$

$$\alpha = 0,138$$

$$\omega = 1/\alpha = 7,246$$

$$\sigma = \frac{\omega P}{F_{br}} = \frac{7,246 \times 5000 \text{ kg}}{27,9 \text{ cm}^2}$$

$$= 1298,57 \text{ kg/cm}^2 < \bar{\sigma} = 1400 \text{ kg/cm}^2 \Rightarrow \text{ok}$$

Ambil INP - 18

Dari tabel profil diperoleh:

$$I_x = 1450 \text{ cm}^4$$

$$I_y = 81,3 \text{ cm}^4 \quad I_{\min} = 76,05 \text{ cm}^4 \rightarrow$$

ok

$$F = 27,9 \text{ cm}^2$$

$$i_x = 7,20 \text{ cm}$$

$$i_y = 1,71 \text{ cm} = i_{\min}$$

Contoh dimensionering batang tekan:

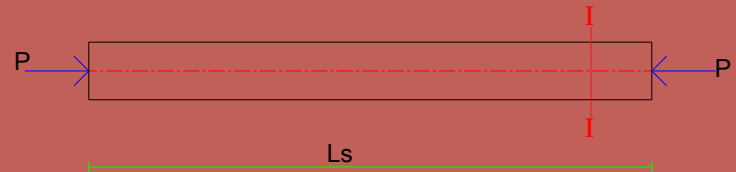
➤ Dengan profil rangkap

$$\text{Diket : } P = - 3000 \text{ kg}$$

$$L_s = L_k = 3,00 \text{ m}$$

$$\bar{\sigma} = 1400 \text{ kg} / \text{cm}^2$$

$$\text{Tebal plat kopleng (t) = 1 cm}$$



Hitung dimensi batang dengan:

- profil rangkap baja Baja L sama kaki
- profil rangkap baja Baja L tidak sama kaki

- Untuk profil baja siku sama kaki:
 - ✓ Taksir harga I_{\min} dengan rumus

$$I_{\min} = 1,69 PL_k^2$$

$$I_{\min} = 1,69 \times 3 \times (3)^2 = 45,63 \text{ cm}^4$$

$$I_{1\text{profil}} = 45,63 \text{ cm}^4 / 2 = 22,815 \text{ cm}^4$$

Lihat tabel profil → ambil \perp 75.75.8 →
didapat:

$$I_x = I_y = 58,9 \text{ cm}^4$$

$$I_{\xi} = (\text{lihat tabel}) \text{ cm}^4$$

$$I_{\eta} = I_{\min} = 24,4 \text{ cm}^4 > 22,815 \text{ cm}^4 \rightarrow \text{ok}$$

$$F_{1\text{profil}} = 11,50 \text{ cm}^2$$

$$i_x = i_y = 2,26 \text{ cm} ;$$

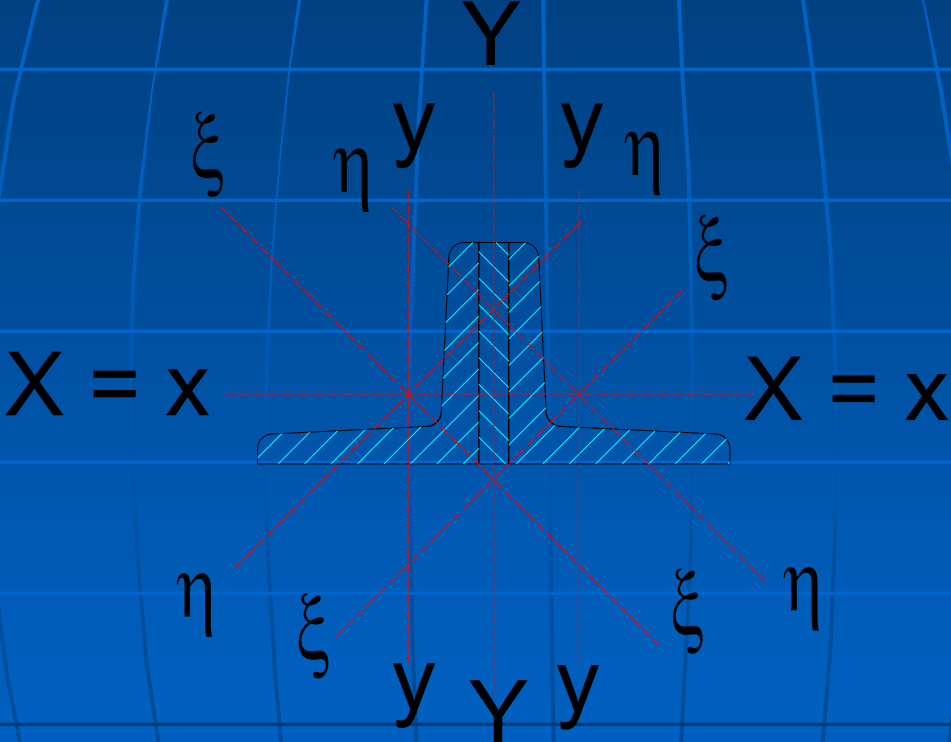
$$i_\xi = 2,85 \text{ cm}$$

$$i_\eta = 1,46 \text{ cm} = i_{\text{min}}$$

$$e = 2,13 \text{ cm}$$

Harus dilihat kemungkinan tekuk
thd sumbu X (sumbu bahan) dan
sumbu Y (sumbu bebas bahan)
dan sumbu η

Potongan I - I



Kontrol:

Terhadap sumbu bahan (X)

$$\lambda = \frac{L_k}{i_x} = \frac{300\text{cm}}{2,26\text{cm}} = 133\text{cm} \Rightarrow \text{Tabel didapat}$$



$$\alpha = 0,239$$



$$\omega = 1/\alpha = 4,184$$

$$\sigma = \frac{\omega P}{F_{tot}} = \frac{4,184 \times 3000\text{kg}}{2 \times 11,5\text{cm}^2}$$

$$= 545,74\text{kg/cm}^2 < \bar{\sigma} = 1400\text{kg/cm}^2 \Rightarrow \text{ok}$$

Kontrol:

Terhadap sumbu bebas bahan (Y)

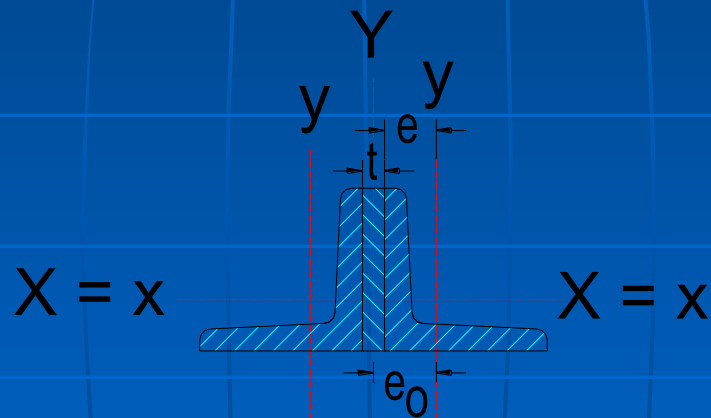
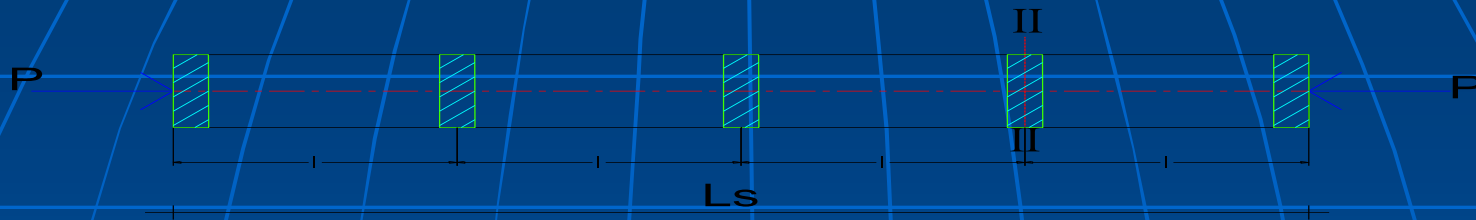
Dipasang plat kopling (n) 5 buah

$$l = \frac{L_s}{(n-1)} = \frac{300\text{cm}}{(5-1)} = 75\text{cm}$$

Tebal plat kopling (t) = 1 cm

$$e_0 = e + \frac{1}{2} t$$

$$= (2,13 + \frac{1}{2} \cdot 1) = 2,63 \text{ cm}$$



Potongan II - II

$$I_Y = \Sigma I_y + \Sigma F \cdot e_o^2$$

$$\Sigma I_y = 2(58,4) \text{ cm}^4 = 117,8 \text{ cm}^4$$

$$\Sigma F \cdot e_o^2 = 2 \left\{ 11,5 \times (2,63)^2 \right\} = 159,1 \text{ cm}^4$$

$$I_Y = 117,8 + 159,1 = 276,9 \text{ cm}^4$$

$$i_Y = \sqrt{\frac{I_Y}{F_{tot}}} = \sqrt{\frac{276,9}{2 \times 11,5}} \text{ cm}^2 = 3,47 \text{ cm}$$

$$\lambda = \frac{L_k}{i_x} = \frac{300\text{cm}}{3,47\text{cm}} = 87\text{cm} \quad \rightarrow \quad \text{Tabel didapat}$$

$$\alpha = 0,53$$

$$\omega = 1/\alpha = 1,887$$

Untuk bangunan:

$$l \leq \frac{1}{2} \lambda_x \left(4 - 3 \frac{\omega_y P}{F_{tot} \bar{\sigma}} \right)$$

$$l \leq \frac{1}{2} \lambda_x \left(4 - 3 \frac{\omega_y P}{F_{tot} \bar{\sigma}} \right) = \frac{1}{2} 133 \left(4 - 3 \frac{1,887 \times 3000}{2 \times 11,5 \times 1400} \right) \text{cm}$$

$$= 66,5(4 - 0,53) \text{cm} = 231 \text{cm} > 75 \text{cm} \Rightarrow \text{ok}$$

Note: dalam mendimensi batang tekan harus dilihat terhadap kemungkinan tekuk ke arah sumbu $x; y; \xi$ dan η