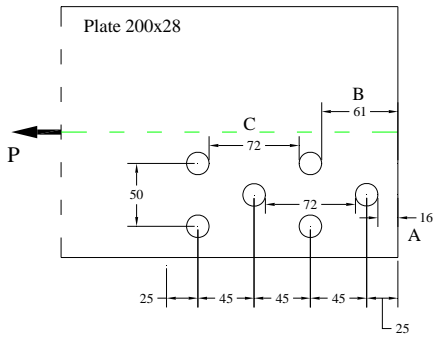


JAWABAN NO.2

***** Kekuatan Pelat penyambung *****



***** Keruntuhan tumpu**

Tinjau bagian pelat tepi A:

$$R_n = 1.5L_c t F_u \leq 3.0dt F_u \text{ deformasi layan tidak masalah (AISC-LRFD J3-2b)}$$

$$R_n = 1.5 * 16 * 28 * 475 \leq 3.0 * 16 * 28 * 475$$

$$R_n = 319,200 \leq 638,400 \rightarrow \therefore R_{nA} = 319.200 \text{ kN}$$

Tinjau bagian pelat tengah B :

$$R_n = 1.5L_c t F_u \leq 3.0dt F_u$$

$$R_n = 1.5 * 61 * 28 * 475 \leq 3.0 * 16 * 28 * 475$$

$$R_n = 1,216,950 \leq 638,400 \rightarrow \therefore R_{nB} = 638.400 \text{ kN}$$

Tinjau bagian pelat tengah C :

$$R_n = 1.5L_c t F_u \leq 3.0dt F_u$$

$$R_n = 1.5 * 72 * 28 * 475 \leq 3.0 * 16 * 28 * 475$$

$$R_n = 1,436,400 \leq 638,400 \rightarrow \therefore R_{nC} = 638.400 \text{ kN}$$

Jadi kekuatan ijin pelat terhadap bahaya tumpu

$$P_u = \phi(R_{nA} + R_{nB} + R_{nC}) = 0.75(319.2 + 5 * 638.4) = 2633.4 \text{ kN}$$

***** Keruntuhan tarik**

$$A_g = 200 * 28 = 5600 \text{ mm}^2 : \text{leleh} \rightarrow P_u = \phi A_g F_y = 0.9 * 5600 * 250 / 1000 = 1260 \text{ kN}$$

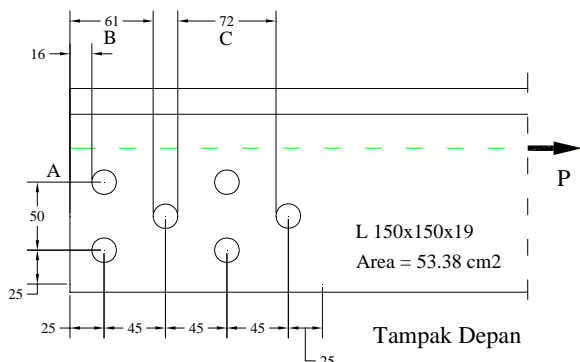
$$\text{Lurus } A_n = (200 - 2 * 18) * 28 = 4592 \text{ mm}^2 : \text{fraktur} \rightarrow P_u = \phi A_n F_u = 0.75 * 4592 * 475 / 1000 = 1636 \text{ kN}$$

$$\text{Staggers } w_n = w_g - \sum d + \sum \frac{s^2}{4g} = 200 - 3 * 16 + 2 \frac{45^2}{4 * 25} = 192.5 \text{ mm} \rightarrow A_n = 192.5 * 28 = 5390 \text{ mm}^2$$

Jadi kekuatan ijin pelat terhadap bahaya tarik

$$P_u = 1260 \text{ kN}$$

***** Kekuatan Profil Siku yang disambung *****



***** Keruntuhan tumpu**

Tinjau bagian profil siku tepi A:

$$R_n = 1.5L_c t F_u \leq 3.0 dt F_u \text{ deformasi layan tidak masalah (AISC-LRFD J3-2b)}$$

$$R_n = 1.5 * 16 * 19 * 475 \leq 3.0 * 16 * 19 * 475$$

$$R_n = 216,600 \leq 433,200 \rightarrow \therefore R_{nA} = 216.6 \text{ kN}$$

Tinjau bagian profil siku tengah B :

$$R_n = 1.5L_c t F_u \leq 3.0 dt F_u$$

$$R_n = 1.5 * 61 * 19 * 475 \leq 3.0 * 16 * 19 * 475$$

$$R_n = 825,788 \leq 433,200 \rightarrow \therefore R_{nB} = 433 \text{ kN}$$

Tinjau bagian profil siku tengah C :

$$R_n = 1.5L_c t F_u \leq 3.0 dt F_u$$

$$R_n = 1.5 * 72 * 19 * 475 \leq 3.0 * 16 * 19 * 475$$

$$R_n = 974,700 \leq 433,200 \rightarrow \therefore R_{nC} = 433 \text{ kN}$$

Jadi kekuatan ijin pelat terhadap bahaya tumpu

$$P_u = \phi(R_{nA} + R_{nB} + R_{nC}) = 0.75(2 * 216.6 + 4 * 433) = 1624 \text{ kN}$$

*** Keruntuhan tarik

$$A_g = 5338 \text{ mm}^2 : \text{leleh} \rightarrow P_u = \phi A_g F_y = 0.9 * 5338 * 250 / 1E3 = 1201 \text{ kN}$$

$$A_n = 5338 - 2 * 18 * 19 = 4654 \text{ mm}^2$$

Karena profil siku hanya tersambung pada satu sisi saja maka SHEAR-LAG harus ditinjau

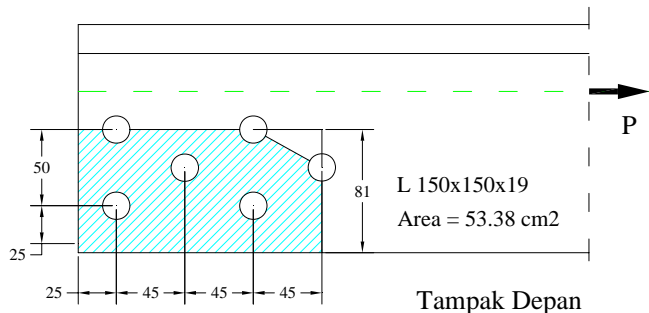
$$U = 1 - \left(\frac{\bar{x}}{L}\right) = 1 - \left(\frac{44}{135}\right) = 0.67 \leq 0.9$$

$$A_e = U A_n = 0.67 * 4654 = 3118 \text{ mm}^2$$

$$\text{Akibat fraktur} \rightarrow P_u = \phi A_e F_u = 0.75 * 3118 * 475 / 1E3 = 1110.8 \text{ kN} (**)$$

Jadi kekuatan ijin pelat terhadap bahaya tarik ditentukan oleh keruntuhan fraktur.

*** Keruntuhan blok geser



Diameter lobang baut M16 standar adalah 18 mm

Luas Geser

$$A_{gv} = 160 * 19 = 3040 \text{ mm}^2$$

$$A_{nv} = (160 - 2.5 * 18) * 19 = 2185 \text{ mm}^2$$

Luas Tarik

$$A_{gt} = 81 * 19 = 1539 \text{ mm}^2$$

$$A_{nt} = (81 - 0.5 * 18) * 19 = 1368 \text{ mm}^2$$

Kuat Putus Geser (AISC-LRFD J4-1) :

$$0.6 F_u A_{nv} = 0.6 * 475 * 2185 / 1E3 = 623 \text{ kN}$$

Kuat Putus Tarik (AISC-LRFD J4-2) :

$$F_u A_{nt} = 475 * 1368 / 1E3 = 650 \text{ kN}$$

Kuat Geser-Blok dimana $F_u A_{nt} > 0.6 F_u A_{nv}$ maka (AISC-LRFD J4-3a)

$$\phi R_n = \phi [0.6 F_y A_{gv} + F_u A_{nt}] \leq \phi [0.6 F_u A_{nv} + F_u A_{nt}] \text{ Mekanisme leleh geser dan putus tarik}$$

$$\phi R_n = 0.75 [0.6 * 250 * 3040 + 475 * 1368] \leq 0.75 [0.6 * 475 * 2185 + 475 * 1368]$$

$$\phi R_n = 829,350 \leq 954,393$$

Jadi kekuatan profil terhadap bahaya geser blok

$$P_u = 829.35 \text{ kN}$$

***** Kekuatan Baut Penyambung *****

Digunakan baut mutu tinggi A325M dimana kuat nominal terhadap geser 330 MPa, dan dianggap bidang geser kritis terletak pada daerah ulir-drat (kondisi umum)..

Kuat geser pada baut (satu sisi) adalah:

$$P_u = \phi n A_b F_v$$

$$P_u = 0.75 * 6 * \left(\frac{1}{4} \pi 16^2\right) * 330$$

$$P_u = 298.6 * 10^3 \text{ N}$$

Rangkuman perhitungan sambungan

	Komponen yang dievaluasi	Gaya maks , P _u (kN)	Keterangan
1	Pelat	1260	Leleh tarik
2	Profil siku	829	Geser blok
3	Baut mutu tinggi	299	Geser satu bidang

Dari ketiga komponen tersebut maka kekuatan baut paling menentukan (akan pecah terlebih dahulu). Jadi kekuatan sambungan tersebut adalah 299 kN.