



Class Example T-2i

Revisions:

- Jan 21, 2020 - added this title page
- Jan 21, 2020 - corrected units of F_y , F_u on page 1 to MPa



Class Example - T-2:

Design Example - partially done in class
2020-01-16

Design double-lap (plate) tension member
for $T_f = 400 \text{ kN}$.

Use 300W Steel (see top of page 3-4 HB)

Assume $t < 65 \text{ mm}$

$\therefore F_y = 300 \text{ MPa}$ (Table 6-3, HB)
 $F_u = 440 \text{ MPa}$

Bolted connection:

$\frac{3}{4}"$ bolts (A325)

22 mm punched holes

Not yet
covered
in class.

Shear resistance per bolt
 $= 79.0 \times 2 = 158 \text{ kN}$ (HB Table 3-4)

bolts req'd $= \frac{400}{158} = 2.53$

use 4 bolts (an even number)

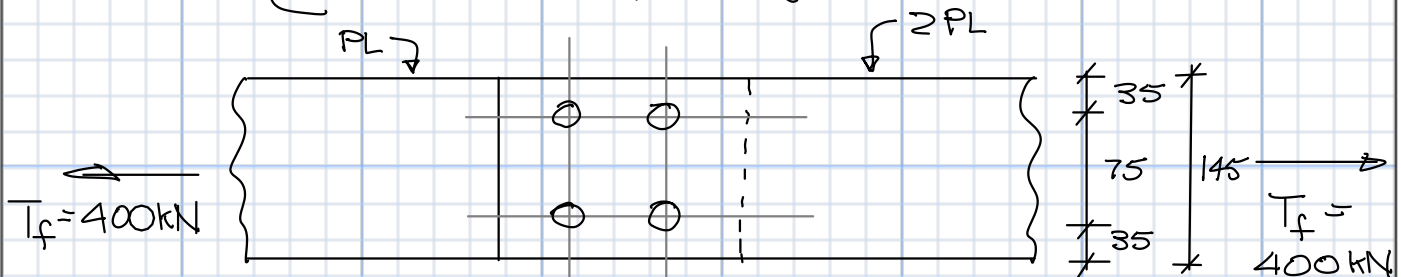
Min spacing $= 2.7 \times 19 = 51.3 \text{ mm}$

use 75 mm

Min edge dist (Table 6) $= 32 \text{ mm}$

Min plate width $= 32 + 75 + 32 = 139 \text{ mm}$

use 145 mm (edge dist. rounded to 35)





Req'd plate thickness: (inner plate)

Gross Area Yield:

$$A_g = 145t \text{ mm}$$

$$T_r = \phi A_g F_y$$

$$= 0.9 \times 145t \text{ mm} \times 0.300 \frac{\text{kN}}{\text{mm}^2} \geq 400 \text{ kN}$$

$$\underline{t \geq 10.2 \text{ mm}}$$

Net Area Fracture:

$$w_n = 145 - 2 \times (22 + 2) \text{ mm}$$

$$= 97 \text{ mm}$$

$$A_n = 97t \text{ mm}$$

$$T_r = \phi A_n F_u$$

$$= 0.75 \times 97t \text{ mm} \times 0.44 \frac{\text{kN}}{\text{mm}^2} \geq 400 \text{ kN}$$

$$\underline{t \geq 12.5 \text{ mm}} \quad \leftarrow \text{governs}$$

Use $t = 16 \text{ mm}$, inner ← Ans.

$t = 7 \text{ mm}$, outer plates (2)

(see p. 6-154 HB)

Note: p 6-154 shows 16 mm thickness preferred over 14 (which would be adequate) $\frac{1}{2}$ of that is OK for outer plates and 7 mm is a preferred thickness. So use 7 for outer, 16 for outer