Class Example – T-2i

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

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

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

Assume $t < 65$ mm

$\therefore F_y = 300$ kN (Table 6-3, HB)

$F_u = 440$ kN

Bolted connection:

3/4" bolts (A325) 22 mm punched holes

Not yet covered in class.

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

bolts reqd = $\frac{400}{158} = 2.53$

use 4 bolts (an even number)

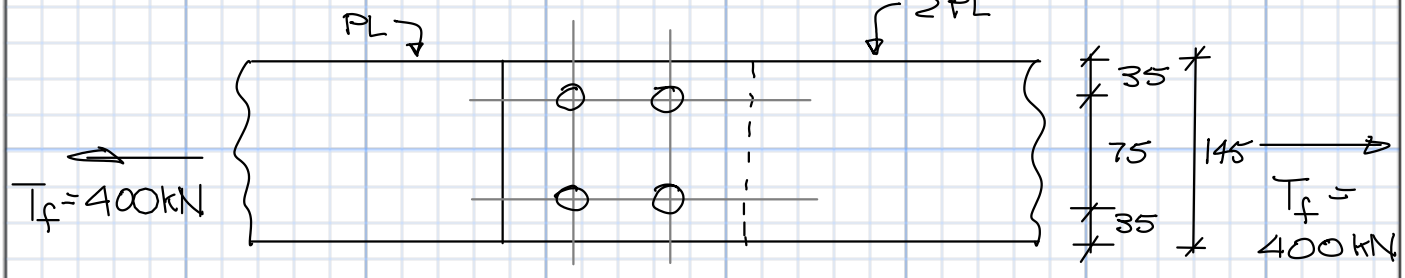
Min spacing = $2.7 \times 19 = 51.3$ mm

use 75 mm

Min edge dist (Table 6) = 32 mm

Min plate width = $32 + 75 + 32 = 139$ mm

use 145 mm (edge dist. rounded to 35)



Req'd plate thickness: (inner plate)

Gross Area Yield:

$A_g = 145t$ mm

$T_r = \phi A_g F_y$

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

$t \geq 10.2\text{mm}$

Net Area Fracture:

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

$= 97$ mm

$A_n = 97t$ mm

$T_r = \phi_0 A_n F_u$

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

$t \geq 12.5$ mm ← governs

Use $t = 16$ mm, inner ← Ans.

$t = 7$ mm, outer plates (2)

(see p. 6-154 HB)

Note: p 6-154 shows 16 mm thickness preferred over 14 (which would be adequate) ½ of that is OK for outer plates and 7 mm is a preferred thickness. So use 7 for outer, 16 for outer