«مقاومة الحواف»

substitute into eq ②

$$F_1 = \frac{A_1}{\Sigma A} P$$

$$\therefore \tau = \frac{F_1}{A_1} = \frac{P}{\Sigma A} \quad , \quad f_2 = \frac{F_2}{A_2} = \frac{P}{\Sigma A}$$

$$\therefore \tau = \tau_1 = \tau_2 = \tau_3$$

* يجب القول انه لا تكون تركيز في مكان عامة وبذلك يصبح (Shear) كبير في مكان عامة مما يؤدي الى ثنى الحمل. أو الرزيم.

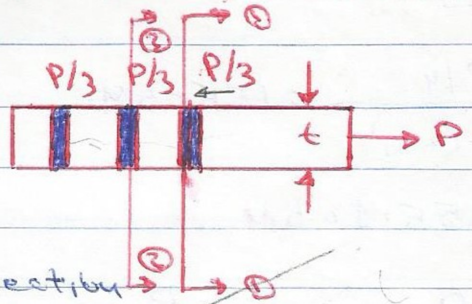
* الاجهاد (Tensile) يكون قليل وذلك بأثيرة على مساحة كبيرة.

* اسوأ (Tensile) في مكان (ال (rivet))).

① Tensile stress:-

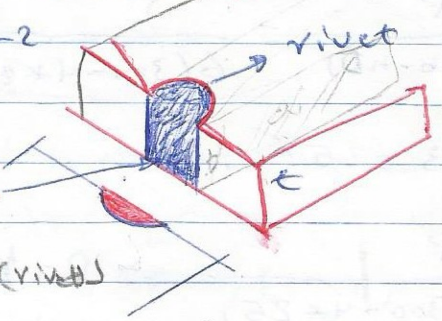
the worst case for sectional area through the holes due to lesser net area.

- Here find the large force and the lesser area



$\sigma_t = \frac{P}{t(b-D)}$ — at section 1-1

$\sigma_t = \frac{P - P/3}{t(b-D)}$ ← (بشكل عام) — at section 2-2

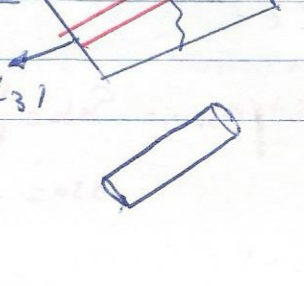


③ bearing stresses = $\frac{\text{bearing force}}{\text{projected area}}$

$= \frac{P/3}{D \cdot t}$ → للـ (rivet) الواحد

④ shear stress of the plate (punching shear). between a rivet hole and the edge (حافة) of plate

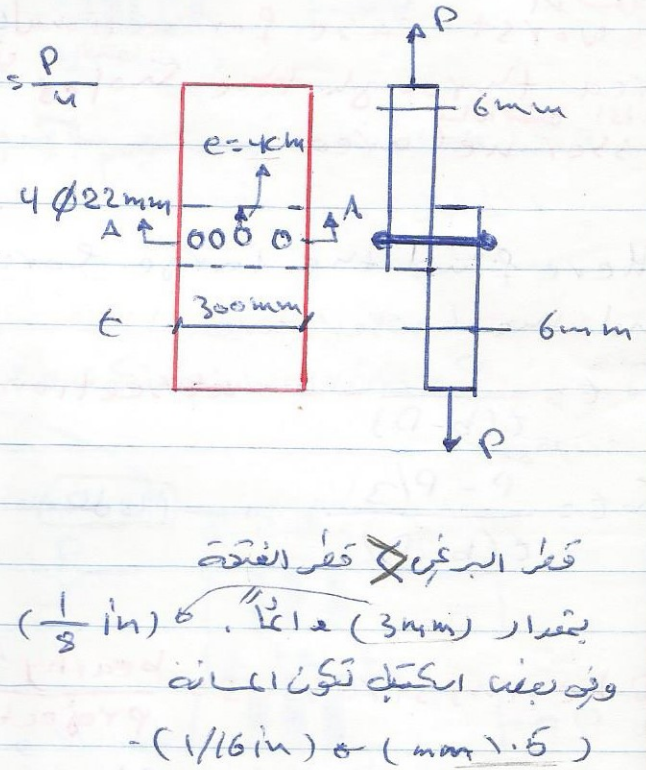
$\tau = \frac{\text{bearing force of the plate}}{\text{shearing area}} = \frac{P/3}{2tL_1 \text{ (or) } (2tL_2) \text{ or } (2tL_3)}$



«مقاومة المواد»

* to prevent tearing of the edge of a plate back of the rivet hole the distance from the edge of the plate to centre of the rivet is $1\frac{3}{4}$ to 2 times the diameter of the rivet.

Ex 11 - For the lap joint show in fig below, determine the maximum allowable force (P) so that allowable stresses of tension ($\sigma_t = 136$ MPa), shear ($\tau = 102$ MPa) and bearing ($\sigma_b = 330$ MPa).



Ans: shear force for each bolt $= \frac{P}{4}$

$$\tau = \frac{P/4}{\pi \frac{D^2}{4}}$$

$$102 = \frac{P/4}{\frac{\pi}{4}(22)^2} = 155094$$

$$P = 155.10\ kN$$

$$\sigma_t = \frac{P}{t(b-nD)} = \frac{P}{6(300-4*25)}$$

$$D = 22+3 = 25\ mm$$

قطر البرغي ✗ قطر الفتحة بمقدار (3mm) علماً أن (1/8 in) وفي بعض الكتب تكون المسافة (1/16 in) أو (1.5 mm).

$$136 = \frac{P}{6(300-4*25)} \Rightarrow P = 163200\ N = 163.2\ kN$$

Puching shear of plate

$$\tau = \frac{P/4}{2et} \Rightarrow 102 = \frac{P/4}{2*40*6} \therefore P = 195840\ N = 195.84\ kN$$

كم مستطيل.

Bearing stress: $\sigma_b = \frac{P/4}{Dt}$

نطاق (rivets) ولم يعني أسلوب فاشل

$$330 = \frac{P/4}{22*6} \therefore P = 174240\ N = 174.24\ kN$$

$\therefore$ Max safe force $= 155.10$ kN

كم هذه القوة تقسم على عامل الأمان وبذلك