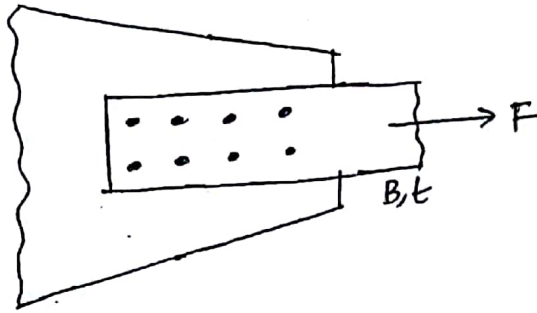


4. Tension member (Tie member)



A structural member subjected to axial tension is called a "Tension member" or "Tie".
The members & Connections are so arranged that eccentricity in the connection & Bending stresses are not developed.

→ Types of failure ;

→ A Tension member may fail in any of the following modes ;

1. Gross section yielding ;

→ Considerable deformation of the member in longitudinal direction may take place before it fractures, making the structure unserviceable. Hence we must also consider yielding on gross-section.

2. Net Section rupture ;

→ The fracture of the member occurs when the net cross-section of the member reaches the ultimate stress.

3. Block shear failure : when a block of material separates out from the member due to shear on one plane & tension on another the failure is called block shear failure.

⇒ Design strength of Tension member ;

1. For gross section yielding ;

$$T_{dg} = \frac{f_y \cdot A_g}{\gamma_{mo}}$$

where ; $\gamma_{mo} = 1.1$

A_g → gross area

Note :

→ When a Tension member is subjected to Tensile force although the ^e Net cross-section

yields first, the deformation within the length of ^{the} connection will be smaller than the deformation in the remainder of ^{the} tension member, It is because the Net section exist within the small length of member, most of the length of member will have an unreduced cross-section, So attainment of yield stress on gross area will result in larger total elongation.

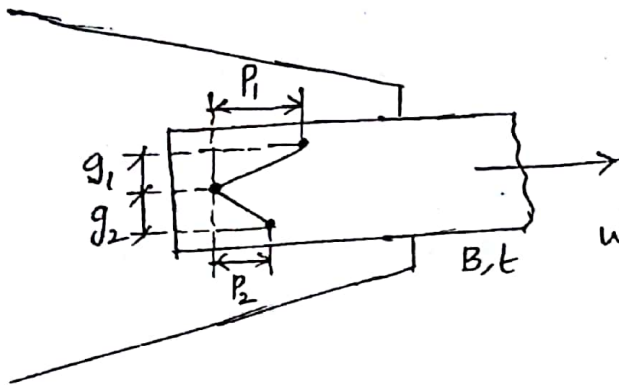
• For Net section rupture (fracture);

1) In plates & Flats;

$$T_{dn} = \frac{0.9 f_u \cdot A_n}{\gamma_m}$$

Where; $\gamma_m \rightarrow 1.25$

A_n = net area



$$A_n = \left(B - n d_o + \sum_{i=1}^m \frac{p_i^2}{4g_i} \right) t$$

$$A_n = \left(B - 3d_o + \frac{p_1^2}{4g_1} + \frac{p_2^2}{4g_2} \right) t$$

where; $n \rightarrow$ no. of bolts along failure line

$d_o \rightarrow$ dia of bolt line

$m \rightarrow$ no. of inclined lines

$\rightarrow$ for each inclined line we add a term $\frac{p^2}{4g}$

$\rightarrow$ At the critical section; A_n is minimum