DESIGN OF PLATE AND ANGLE TENSION MEMBERS-DESIGN OF BUILT UP TENSION MEMBERS-CONNECTIONS IN TENSION MEMBERS

1. The tension member of a roof truss consist of a single ISA 100 x 75 x 10 mm thick, connected at the end to a gusset plate with the longer leg vertical with 20 mm diameter rivet. Find the safe tension the member can withstand. Permissible tensile stress may be taken as 150 N/mm^2.

Solution

Diameter of rivet hole = 20 + 1.5 = 21.5 mm

Net effective area provided

Where, A_1 = Net sectional area of the connected leg,

A_2 = Area of the unconnected leg, and

$$K = \frac{3A_1}{3A_1 + A_2}$$

In our case,

$$A_1 = \left(100 - \frac{10}{2}\right)10 - 21.5 \times 10 = 735\ mm^2$$

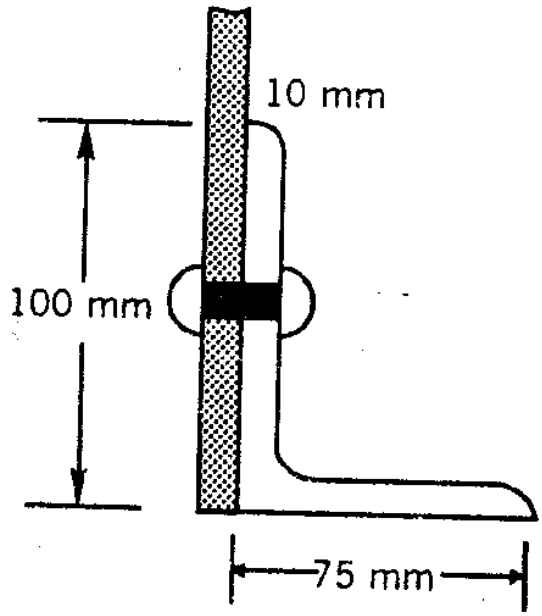
$$A_2 = \left(75 - \frac{10}{2}\right)10 = 700\ mm^2$$

$$K = \frac{3 \times 735}{3 \times 735 + 700} = 0.759$$

$$A_{eff} = 735 + 700 \times 0.759 = 1{,}266\ mm^2$$

Safe axial tension = Aeff x Safe stress

= 1,266 x 150 = 1,89,900 N = 189.9 kN.

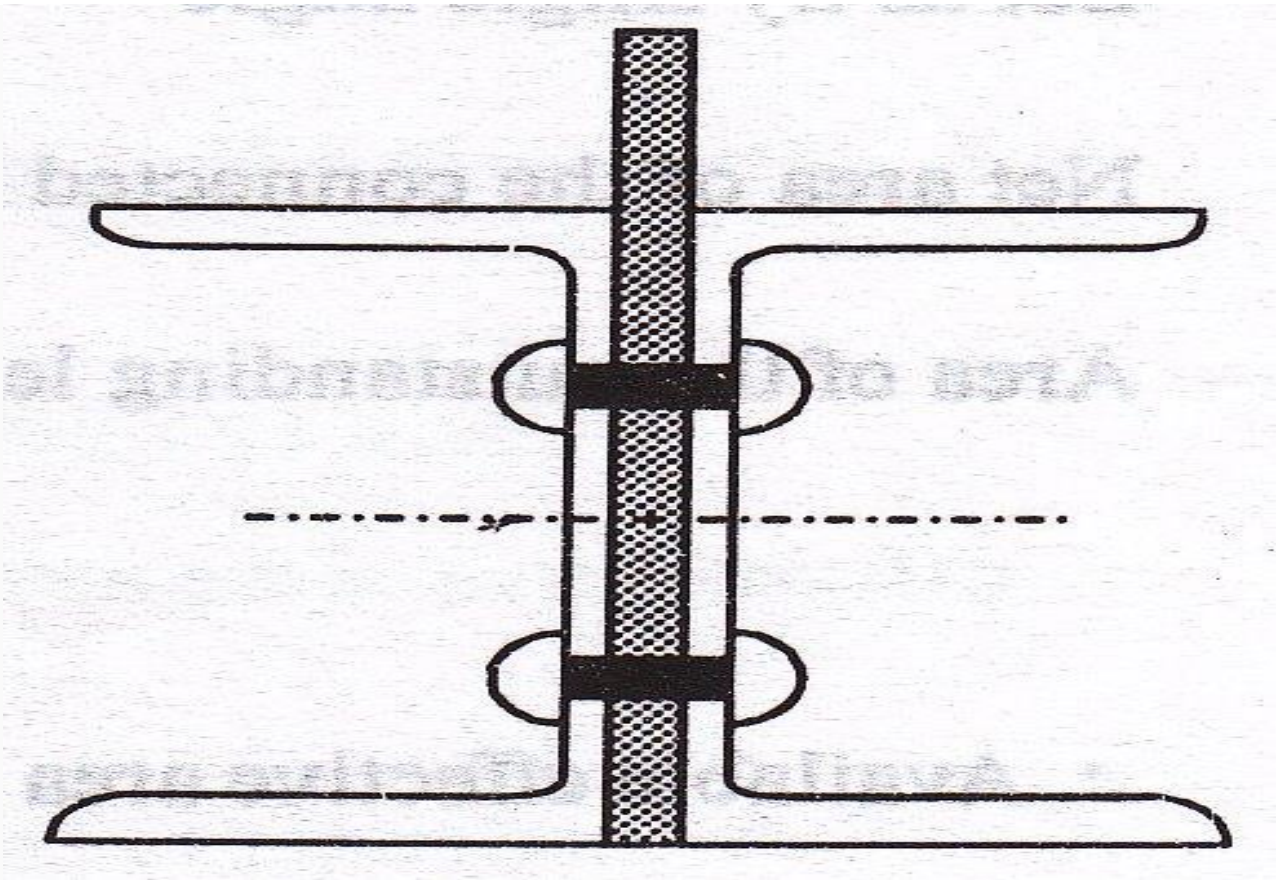


2.The tie in a bridge truss carries an axial tension of 350 kN. The member is to consist of two channels connected back to back on either side of a gusset plate. The diameter of rivets used for the connection is 16 mm. Two rivets are likely to appear in section. Design the member. Safe stress in tension is 150 N/mm^2.

Solution

Net area required

Referring to steel tables, let us select two channels ISLC, 125



Dimensions of section = 125 mm x 65 mm

t_f = 6.6 mm

t_w = 4.4 mm

Gross area A_g = 1,367 mm^2 per channel

Diameter of rivet hole = 16 + 1.5 = 17.5 mm

Making allowance for four rive holes,

Net area provided = 2 x 1367 – (4 x 17.5 x 4.4) = 2,426 mm^2.

But the required area is only 2,333 mm^2. Therefore, the section selected is safe.