SNS COLLEGE OF TECHNOLOGY

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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

19CET3042-DESIGN OF STEEL STRUCTURES

III YEAR / VI SEMESTER

Unit 2 :TENSION MEMBERS

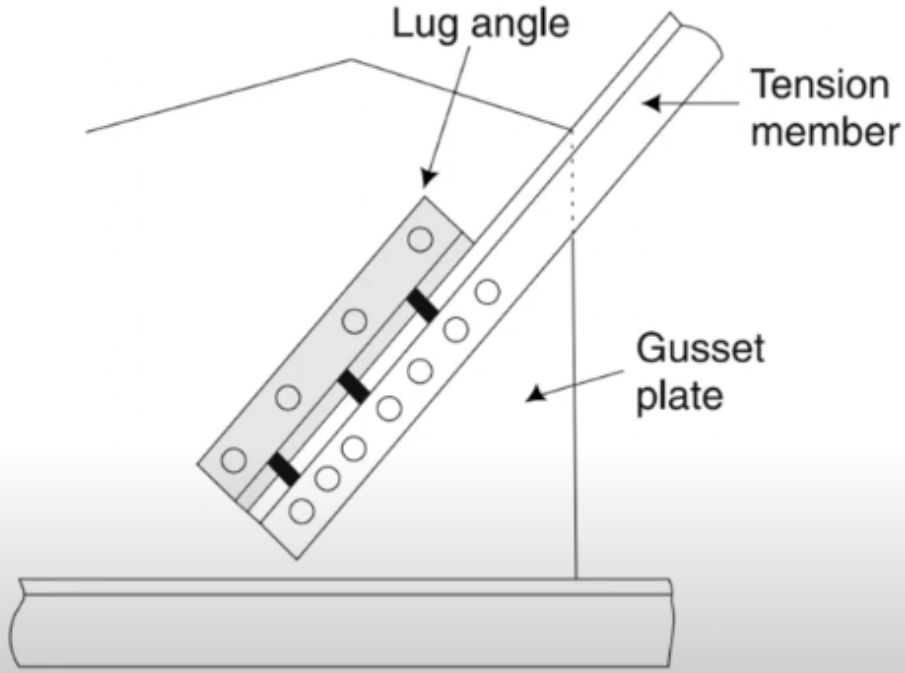
Lug Angles

Introduction

- - Definition of Lug Angles
- - Importance in structural connections
- - Applications in engineering and construction

7.10 LUG ANGLES

To make the connection at joints, a certain length of the tension member and that of the gusset plate is utilized. If the load is heavy and the number of bolts/length of weld required for making the connection are large, the size of the gusset plate required may be uneconomical and may be awkward. As an alternative to this an additional angle is used along with the tension member to reduce the length of joint and consequently the size of gusset plate. Such an angle is called a *lug angle*. Lug angles are found to be more effective at the beginning of the connection only due to non-uniform distribution of the load among the connecting bolts. However, in most of the cases the cost of lug angles, their connection and fabrication will be more. This offsets any saving in the gusset plates, thereby defeating the purpose [Ref. Fig. 7.16]. Lug angle can be eliminated by providing unequal angle sections with wider leg as a connected leg, and bolts can be provided in two rows and staggered.



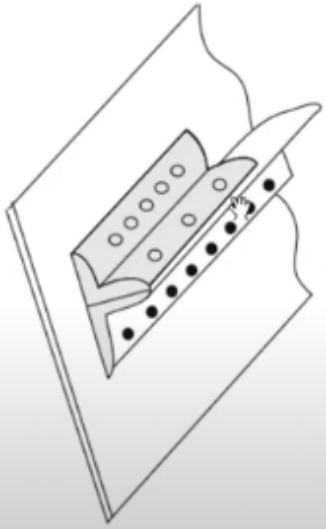


Fig. 7.16 Connections of Bars and Rods

with the following:

a) Design force in the bolts or per unit length in the fillet weld group resulting from any shear force or axial force shall be considered to be equally shared by all bolts in the group or uniformly distributed over the length of the fillet weld group.

b) Design force resulting from a design bending moment shall be considered to vary linearly with the distance from the relevant centroidal axes:

   1) In bearing type of bolt group plates in the compression side of the neutral axis

appropriate.

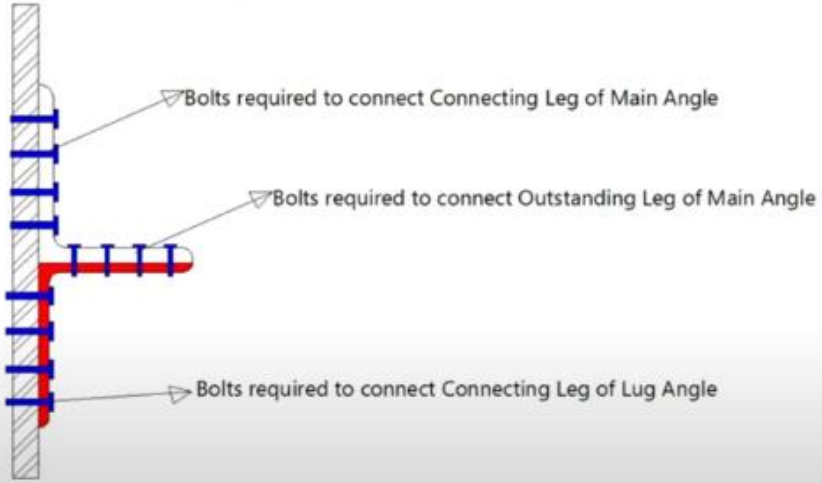
10.12 Lug Angles

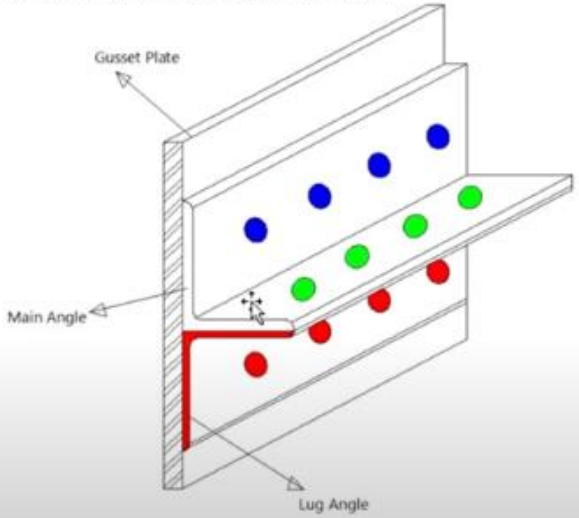
10.12.1 Lug angles connecting outstanding leg of a channel-shaped member shall, as far as possible, be disposed symmetrically with respect to the section of the member.

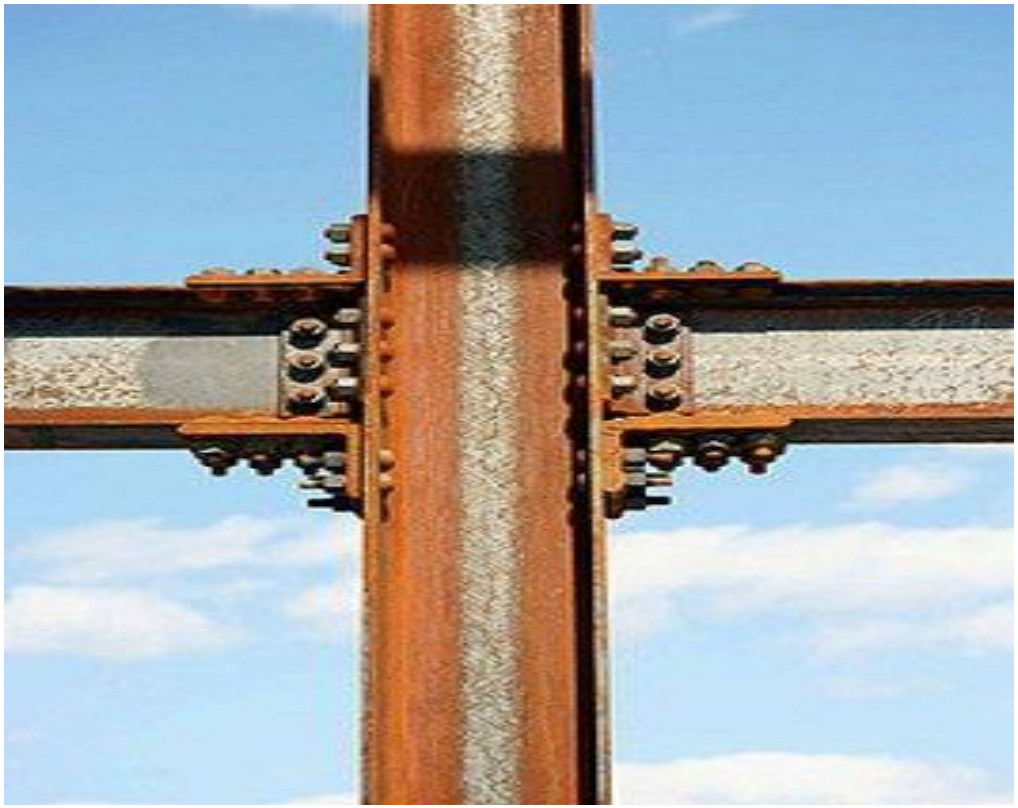
10.12.2 In the case of angle members, the lug angles and their connections to the gusset or other supporting member shall be capable of developing a strength not less than 20 percent in excess of the force in the outstanding leg of the member, and the attachment of the lug angle to the main angle shall be capable of

If lug angle is not provided, total number of bolt required	=	7.73097409
	≈	8
Number of Bolt required to connect Connecting leg of main angle to gusset plate	=	4

less than 20 percent in excess of the force in the outstanding leg of the member, and the attachment of the lug angle to the main angle shall be capable of developing a strength not less than 40 percent in excess of the force in the outstanding leg of the angle.







Purpose of Lug Angles

- - Provide additional support to tension members
- - Reduce eccentricity in connections
- - Enhance load distribution in structural assemblies

Components of Lug Angles

- - Main angle section
- - Lug plate
- - Bolts, rivets, or welds for connections

Design Considerations

- - Load calculation and stress analysis
- - Connection detailing for efficiency
- - Adherence to design codes (IS 800, AISC, etc.)

ypes of Lug Angle Connectio

- - Bolted lug angles
- - Riveted lug angles
- - Welded lug angles

Advantages of Lug Angles

- - Improved force distribution
- - Reduces bending effects on main members
- - Facilitates efficient fabrication and assembly

Disadvantages of Lug Angle

- - Additional detailing required
- - Potential for increased fabrication cost
- - Requires precise installation

Applications of Lug Angles

- - Bridges and trusses
- - Industrial and residential steel structures
- - Heavy load-bearing connections

Example Calculations

- - Sample problem illustrating lug angle design
- - Step-by-step solution for determining required dimensions and fasteners

Conclusion

- - Summary of key points
- - Importance in structural stability
- - Future trends in lug angle design