Riveted Joints

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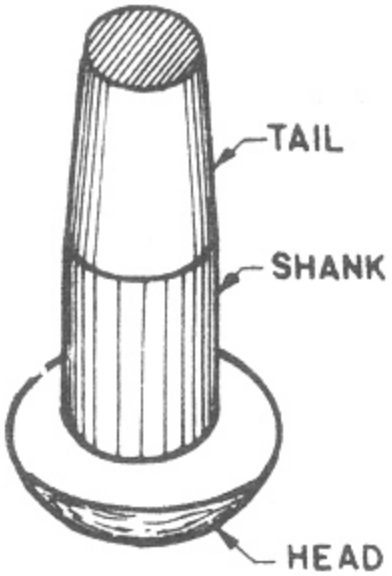
INTRODUCTION



- Mainly there are three parts of rivet;

  1. Head
  2. Shank
  3. Tail
- Material

  Tough & Ductile like; LCS, Brass, Al etc.
- Manufacturing Process

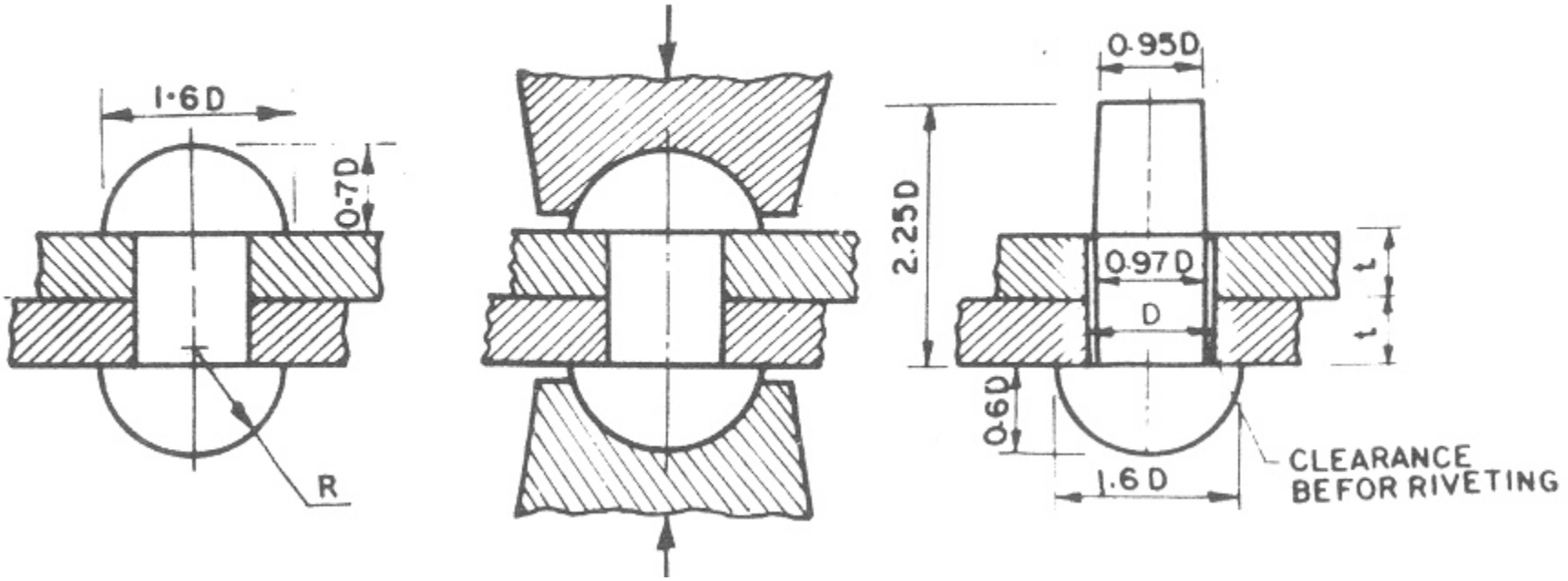
  1. Cold Heading

     - In this , subsequently heated to reduce stresses.

  2. Hot Forging

     - Cooling done gradually.

Method of Riveting & Standard Nomenclature



Types of rivets

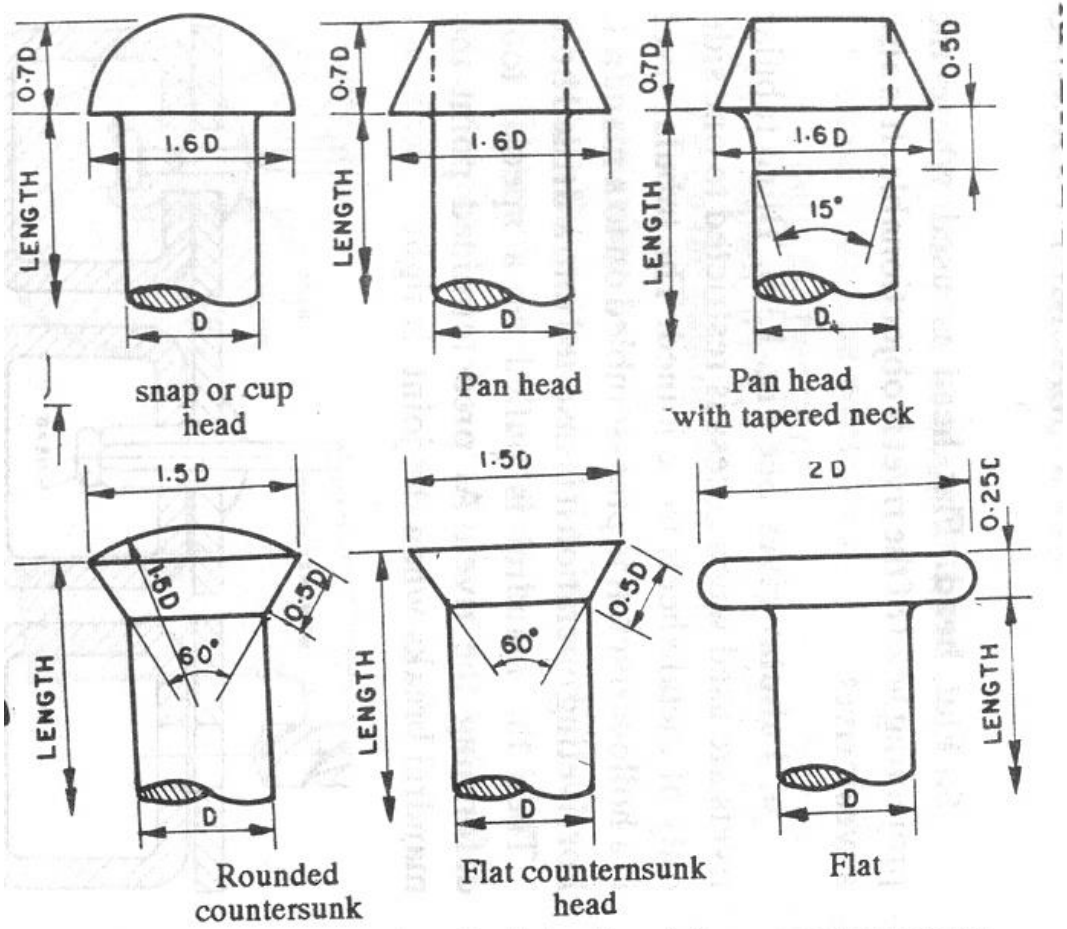
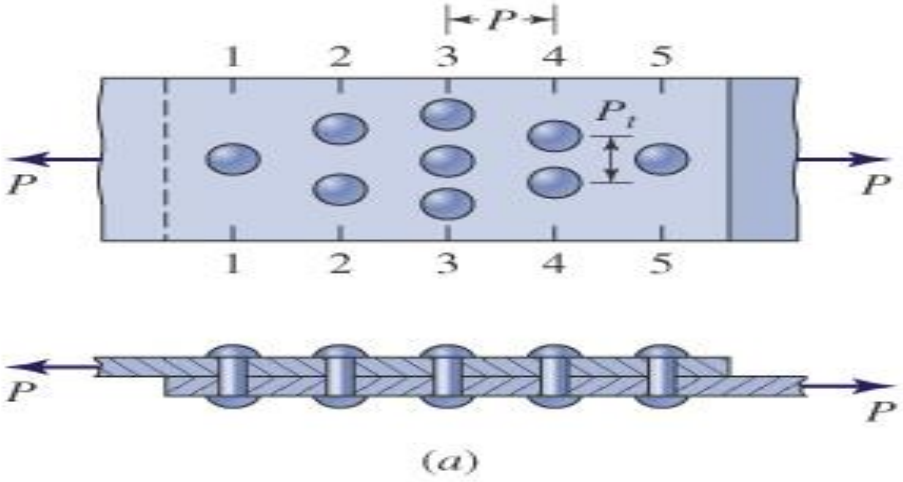


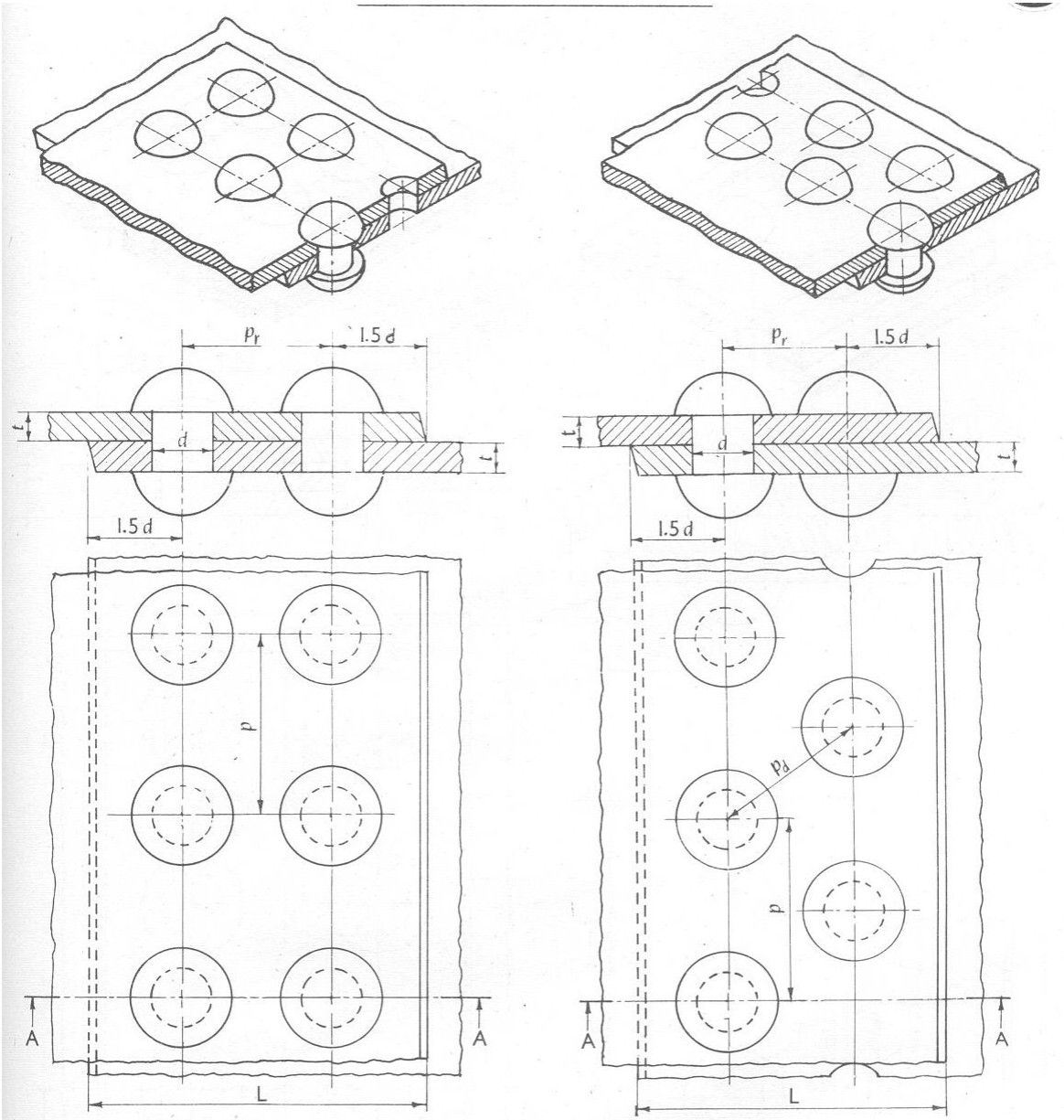
Fig.13.6 (a) Indian Standard rivet heads for general purposes (length of shank L = 2.5D to 10D) (see I.S. : 1929 and I.S. : 2155 for preferred length diameter combination)

Type of Joints

[A] Lap Joint: One plate overlaps another plate to be joined by rivets

1. Single
2. Double – Chain/Zigzag
3. Triple – Chain/Zigzag



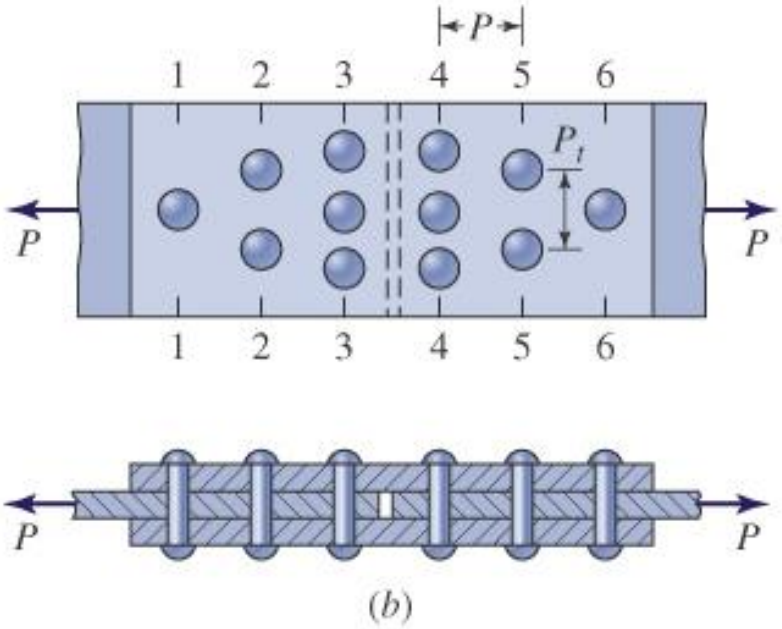


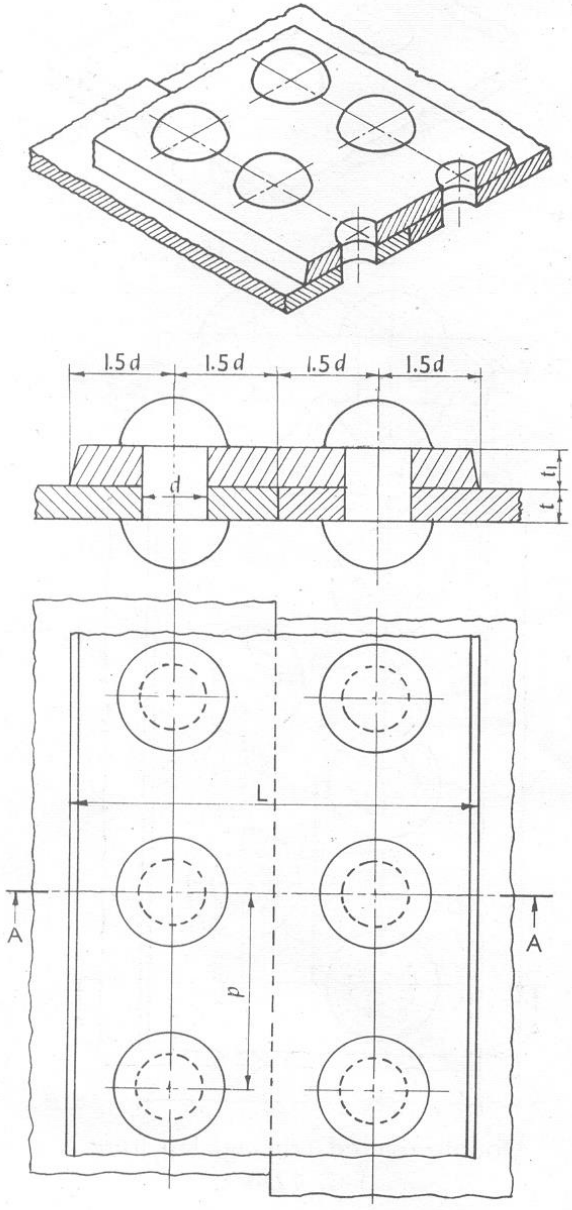
Double-riveted (chain) lap joint
FIG. 12-7

Double-riveted (zigzag) lap joint
FIG. 12-8

[B] Butt Joint: Main plates are kept in alignment touching with each other & cover plates are kept either in one /both side

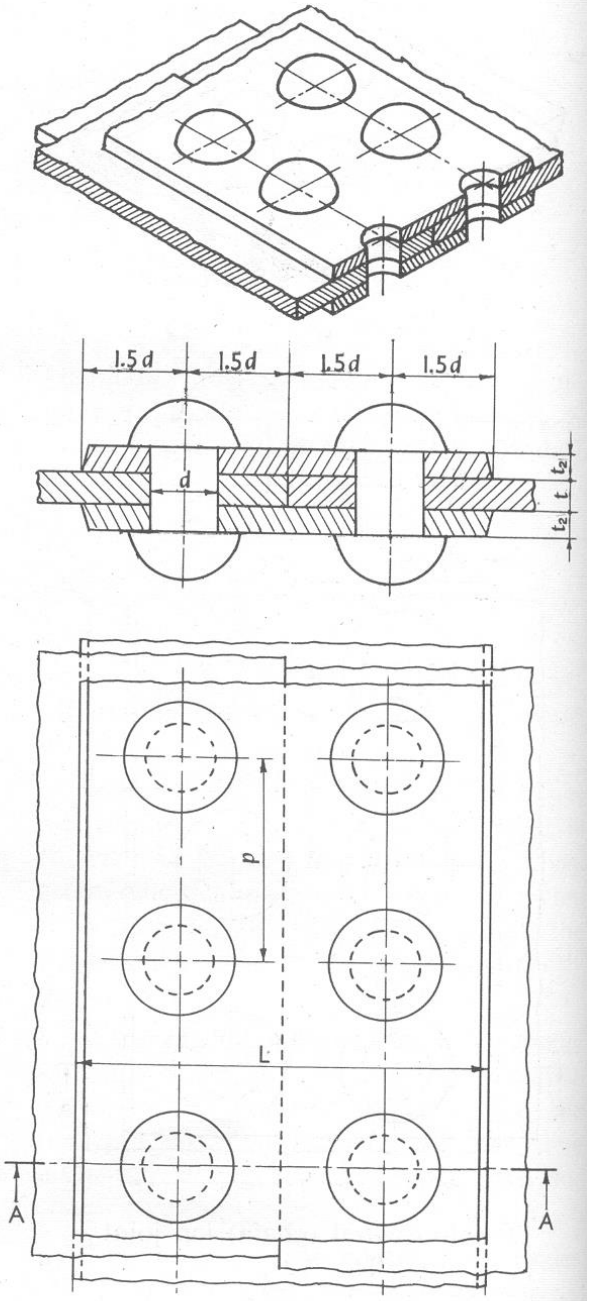
- Single Cover Plate
  - Single
  - Double: Chain/Zigzag
  - Triple: Chain/Zigzag
- Double Cover Plate
  - Single
  - Double: Chain/Zigzag
  - Triple: Chain/Zigzag





Single-riveted (single strap) butt joint

FIG. 12-9



Single-riveted (double straps) butt joint

FIG. 12-10

TERMINOLOGY

- Gage Line
- Pitch (p)
- Back Pitch (Pb)
- Doagonal Pitch (Pd)
- Marginal Pitch (m = 1.5 d)

Applications

- Used to make permanent fastening; in

✓ Structural work

✓Ship Building

✓Bridges

✓Tanks and Boiler Shell

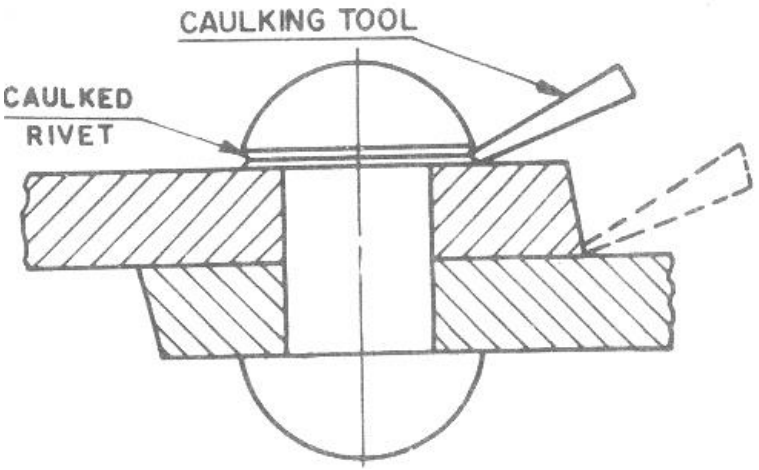
Advantages

- Production rate is high
- Maintenance cost is low
- Metallic and Non metallic materials can be joined freely with Non uniform thickness
- Unskilled labour can do this job

Disadvantage

- Can’t easily disassembled as likely permanent joints
- Strength is low
- Not water or Air Proof

Caulking and Fullering



Caulking: Operation of burring down the edges of the plates and heads of the rivets to form a metal to metal joint

Fullering is a better option

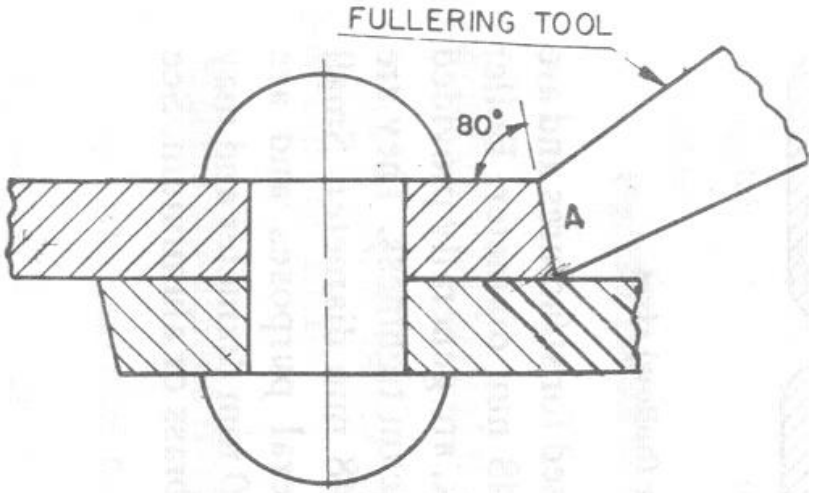


Fig. 13.4 Fullering

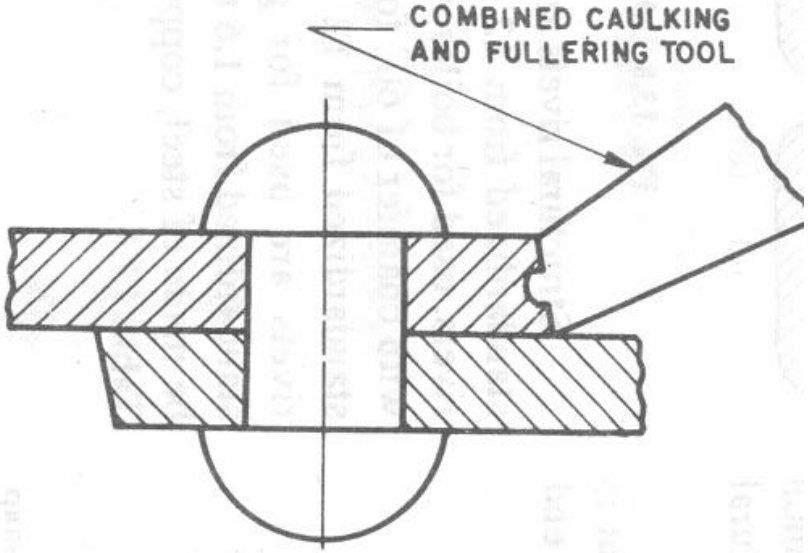
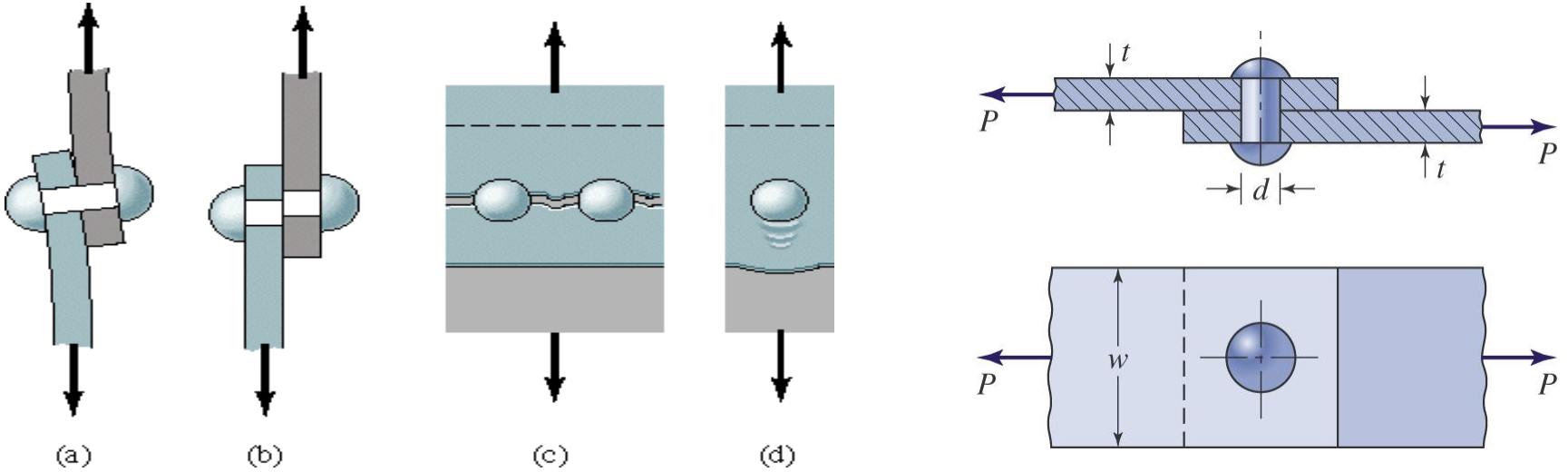


Fig. 13.5 Combined caulking and fullering

Failure Modes of Riveted Fasteners Under Shear



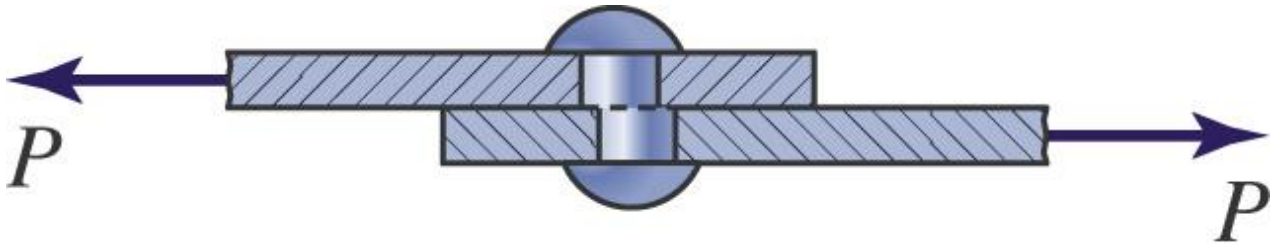
Failure modes due to shear loading of riveted fasteners. (a) Bending of member; (b) shear of rivet; (c) tensile failure of member; (d) bearing of rivet on member or bearing of member on rivet.

Failure Calculation

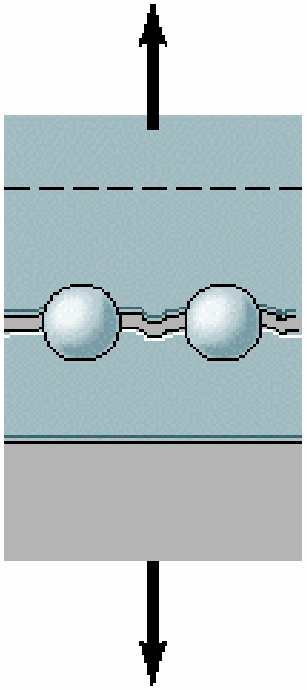
1. Rivet Shear Failure

Shear Stress $t = F/A$

Where $A = \Pi d^2/4 \times n$



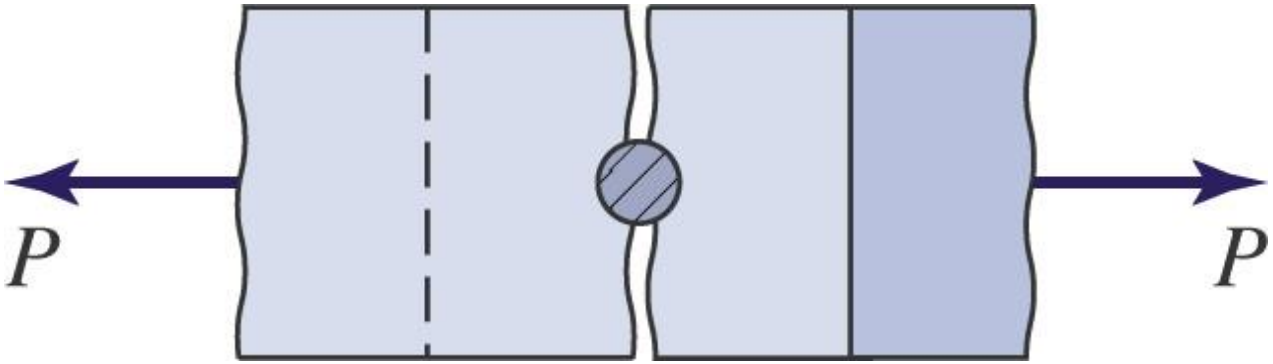
2. Rivet Tensile Failure



Tensile stress fc

= F/A

Where; A = t/(p – d)

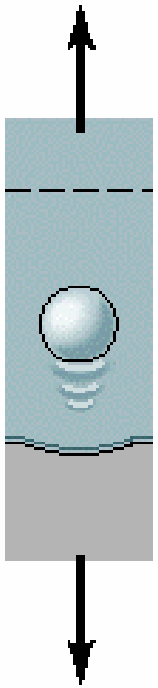


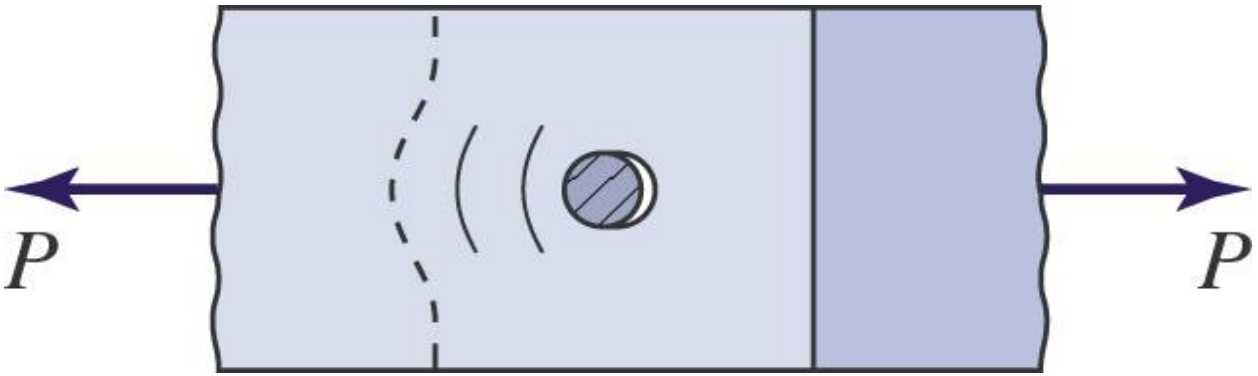
- Rivet Crushing (Bearing) Failure

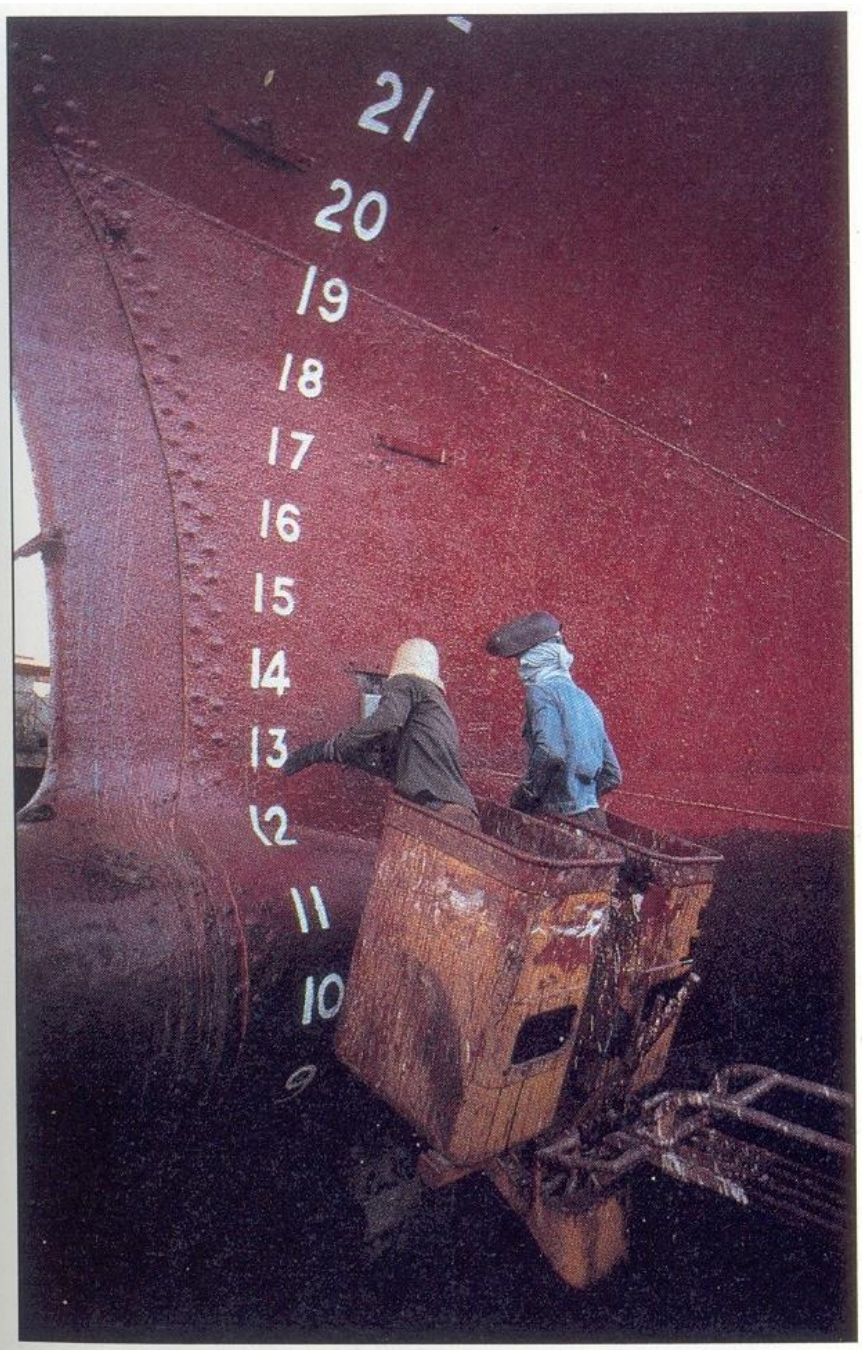
Crushing Stress fc

= F/A

Where; A = d x t x n



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