- DESIGN CONSIDERATIONS OF CASTINGS

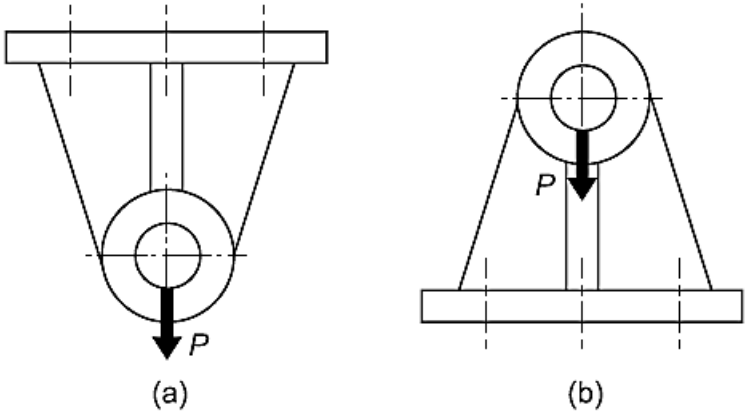


Fig. 3.1 *(a) Incorrect (Part in Tension) (b) Correct (Part in Compression)*

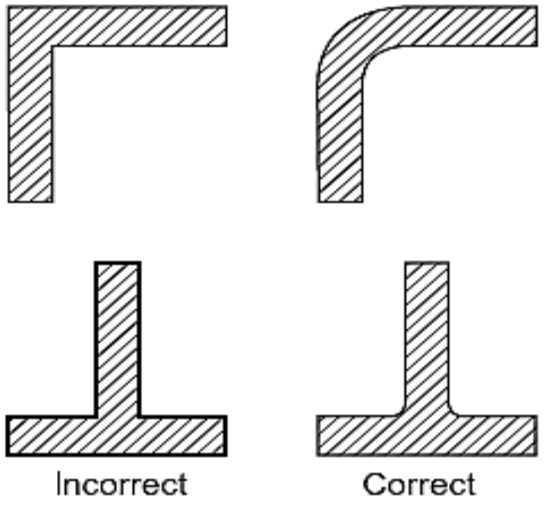


Fig. 3.3 *Provision of Fillet Radius*

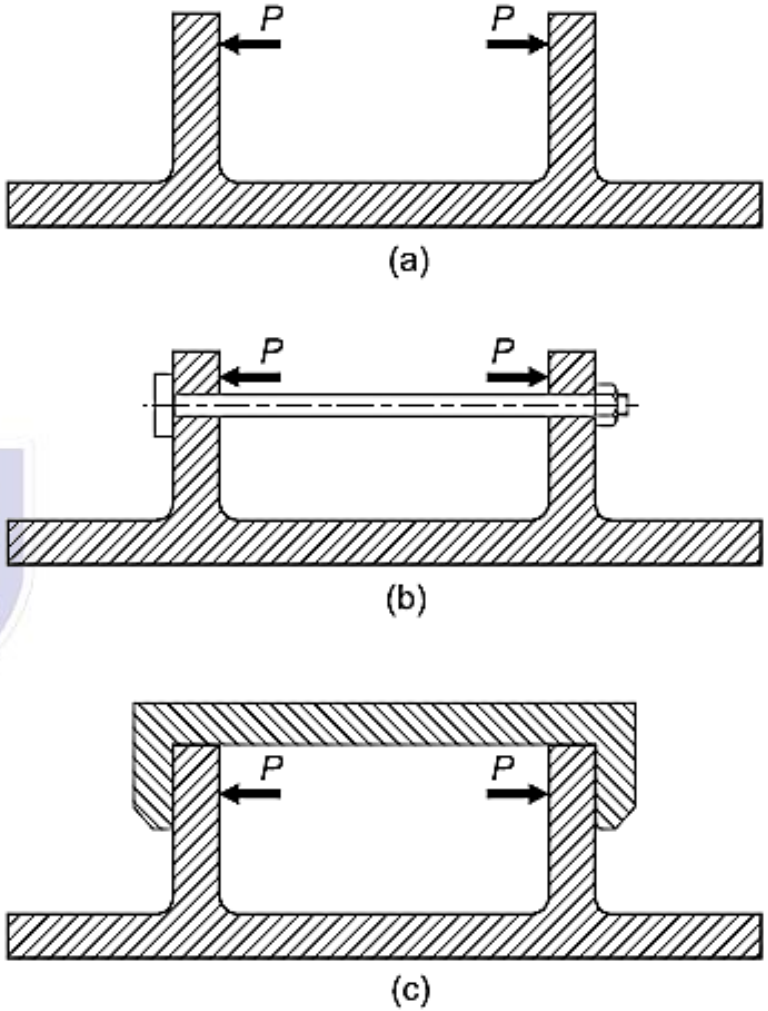


Fig. 3.2 *(a) Original Component (b) Use of Tie-rod (c) Use of Bearing-cap*

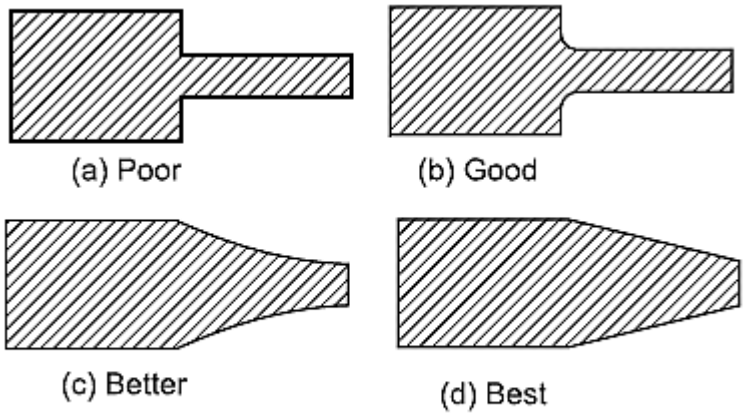
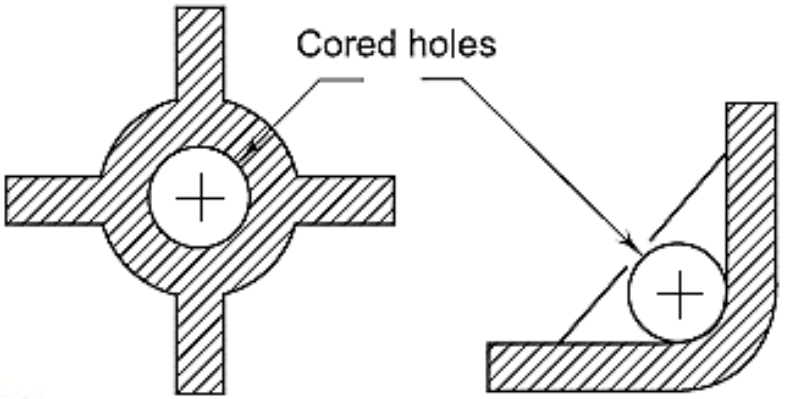


Fig. 3.4 *Change in Section-thickness*



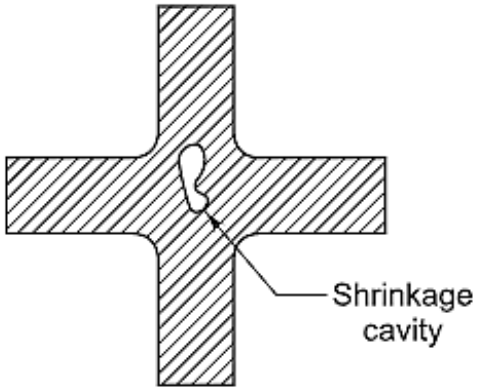


Fig. 3.5

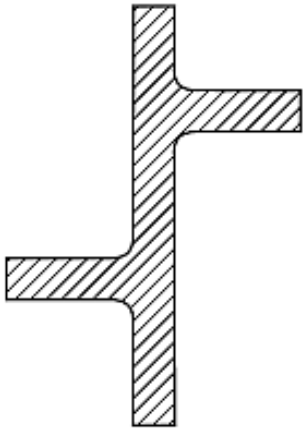


Fig. 3.7 *Staggered Ribs*

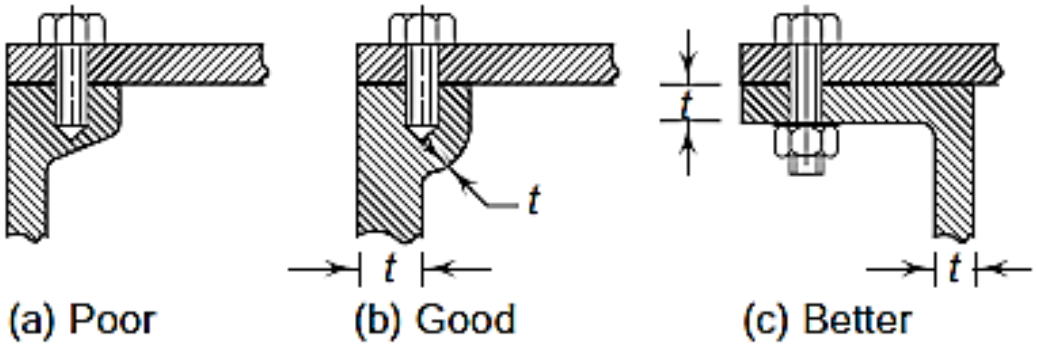


Fig. 3.8 *Uniform Wall-thickness*

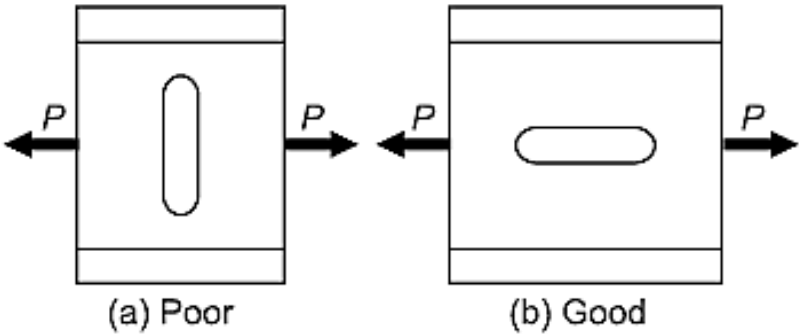


Fig. 3.9 *Cored Holes in Ribs*

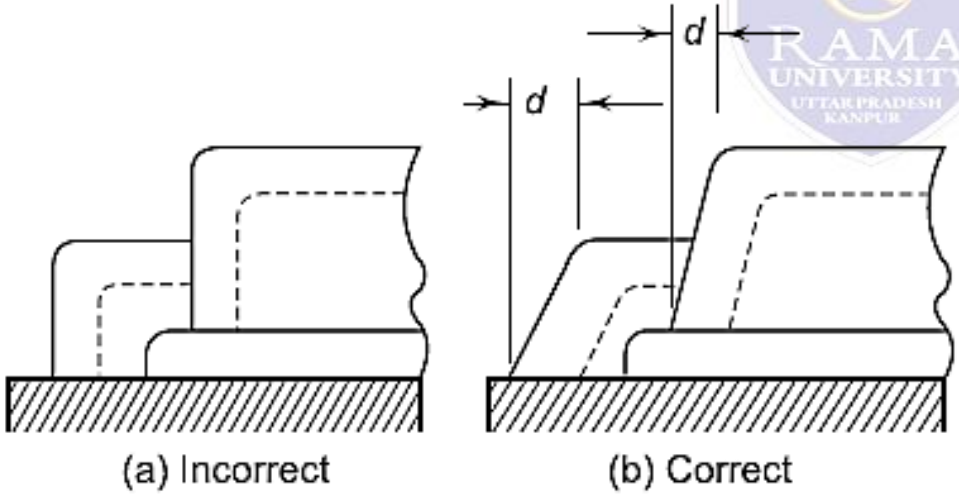


Fig. 3.10 *Provision of Draft*

- DESIGN CONSIDERATIONS OF FORGINGS
- Forged components are widely used in automotive and aircraft industries. They are usually made of steels and non-ferrous metals. They can be as small as a gudgeon pin and as large as a crankshaft. Forged components are used under the following circumstances:
- (i) Moving components requiring light weight to reduce inertia forces, e.g., connecting rod of IC engines.
- (ii) Components subjected to excessive stresses, e.g., aircraft structures.
- (iii) Small components that must be supported by other structures or parts, e.g., hand tools and handles.
- (iv) Components requiring pressure tightness where the part must be free from internal cracks, e.g., valve bodies.
- (v) Components whose failure would cause injury and expensive damage are forged for safety.
- In order to obtain maximum benefit from forged components, the following principles should be adopted:
- (i) While designing a forging, advantage should be taken of the direction of fi bre lines. The grain structure of a crankshaft manufactured by the three principal methods, viz.,
- (ii) The forged component should be provided with an adequate draft as illustrated in Fig. 3.13. The draft angle is provided for an easy removal of the part from the die impressions. The angles a and b are drafts for outside and inside surfaces
- (iii) There are two important terms related to forgings, as illustrated in Fig. 3.14. The parting line is a plane in which the two halves of the forging dies meet and in which fl ash is formed. A forging plane is a plane, which is perpendicular to the die motion. In most of the cases, the parting line and forging plane coincide, as illustrated in Fig. 3.15.
- (iv) The forging should be provided with adequate fi llet and corner radii. A small radius results in folds on the inner surface and cracks on the outer surface. A large radius is undesirable, particularly if the forged component is to be machined, during which the fi bre lines are broken. Sharp corners result in increasing diffi culties in fi lling the material, excessive forging forces, and poor die life.
- (v) Thin sections and ribs should be avoided in forged components. A thin section cools at a faster rate in the die cavity and requires excessive force for plastic deformation. It reduces the die life, and the removal of the component from the die cavities becomes diffi cult. For steel forgings, the recommended value of the minimum section thickness is 3 mm.

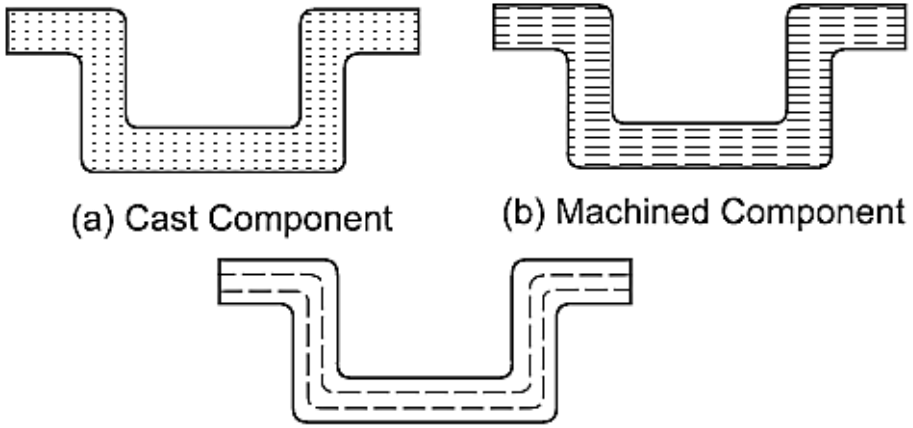
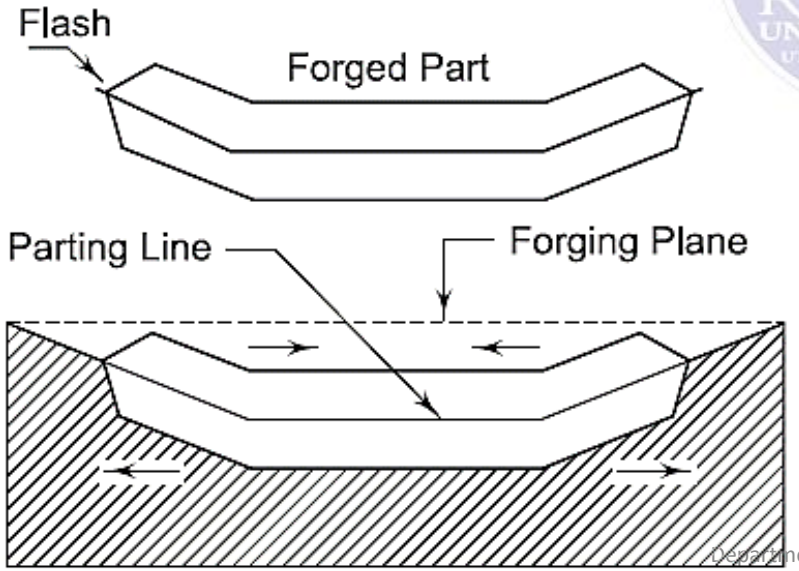


Fig. 3.12 *Grain Structure*



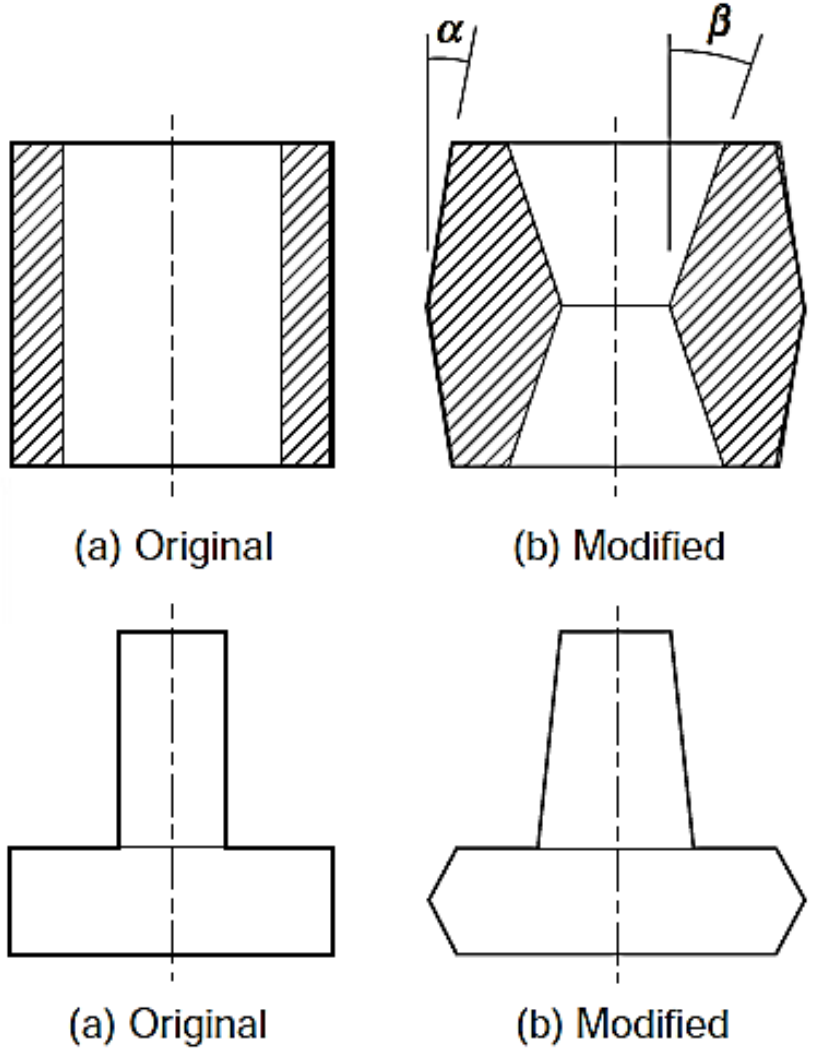


Fig. 3.13 *Draft for Forgings*