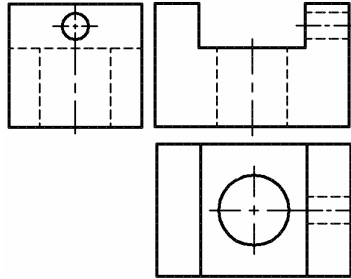


5. Sectional Views

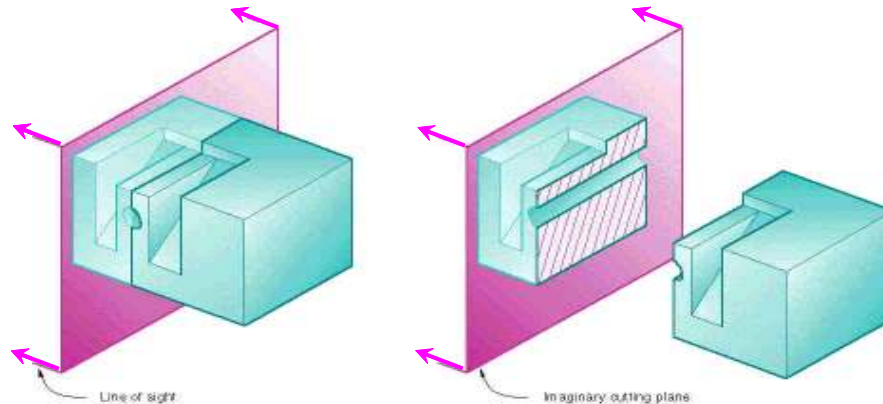
5.1 Overview

- Sectional views are used to show interior details clearly.
- A cutting-plane line shows where the object was cut to obtain the sectional view.
- Cross hatching in the sectional view shows the solid surface of the object which was cut through to produce the sectional view.
- Sectional views may replace standard views.
- Conventional practices, such as not showing hatching on ribs and webs, helps make sectional views easier to interpret correctly.
- Sectional views are used when important hidden details are in the interior of an object.
- These details appear as hidden lines in one of the orthographic principal views; therefore, their shapes are not very well described by pure orthographic projection.



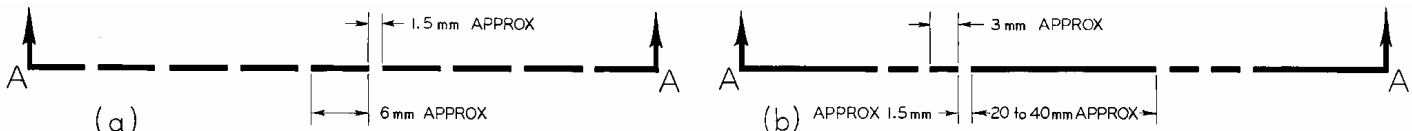
5.2 Cutting Plane

Sectional views show how an object would look if a cutting plane (or saw) cut through the object and the material in front of the cutting plane is removed



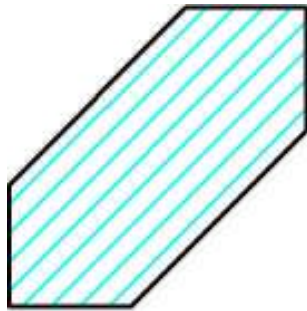
5.3 Cutting Plane line

- The cutting plane line is a thick dark line which uses one of the special patterns shown above.
- The cutting plane line can be left out when it is obvious, where it must lie from the appearance of the section itself.

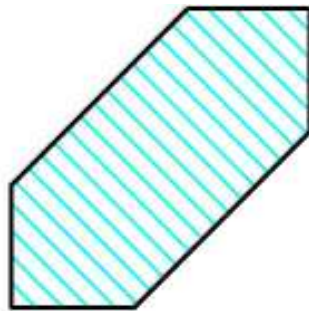


5.4 Section lining

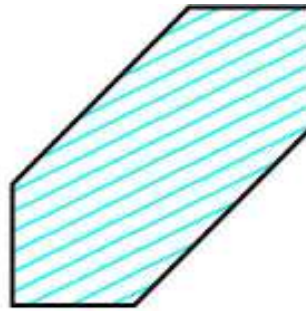
- Section lines (crosshatching) are used to show where the cutting plane passed through solid material
- They should be drawn inclined at 30°, 45° or 60°.
- Hatching should not run parallel or perpendicular to a major feature.
- Adjacent areas divided by a visible line in a sectional view do not contain hatching.



(A) Avoid!

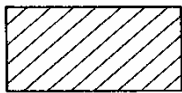


(B) Avoid!



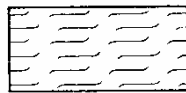
(C) Preferred

5.5 Hatch Patterns



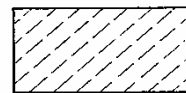
1

CAST OR MALLEABLE
IRON AND GENERAL
USE FOR ALL
MATERIALS



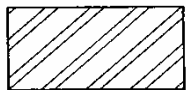
7

Cork, felt,
fabric, leather,
and fiber



13

Marble, slate,
glass, porcelain,



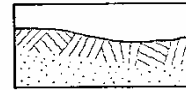
2

Steel

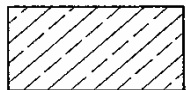


8

Sound
insulation

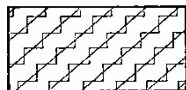


14



3

Bronze, brass,
copper, and
compositions

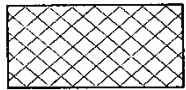


9

Thermal
insulation

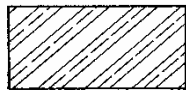


15



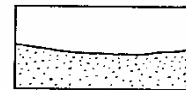
4

White metal,
zinc, lead, babbitt,
and alloys



10

Titanium and
refractory
material



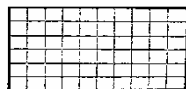
16

Sand



5

Magnesium,
aluminum, and
aluminum alloys



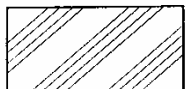
11

Electric windings,
electromagnets,
resistances, etc.



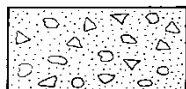
17

Water and
other liquids



6

Rubber, plastic,
and electrical
insulation



12

Concrete

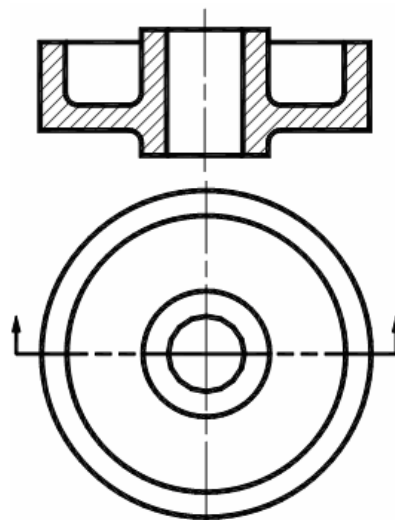
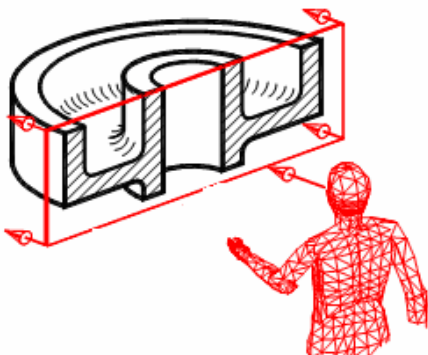


18

Across grain }
With grain } Wood

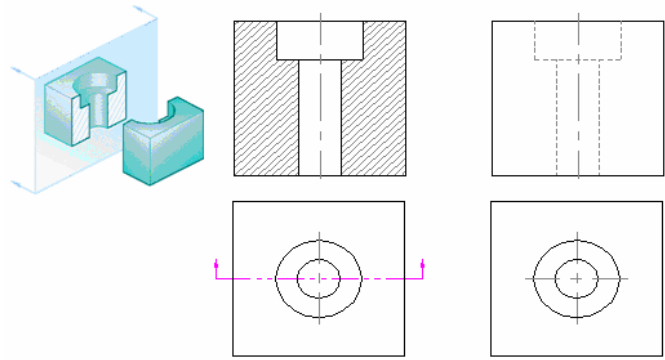
5.6 Visualization

- All visible edges and contours behind the cutting plane should be shown as continuous lines.
- Unnecessary hidden lines should be avoided in a sectional view.
- A section lined area should always be bounded by visible outlines and never by hidden lines



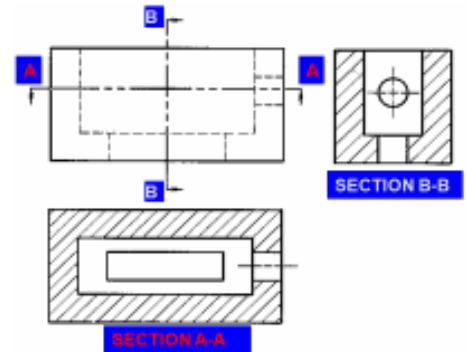
5.7 Types of Sectional Views

- Full sections
- Half sections
- Offset sections
- Broken-out sections
- Revolved sections
- Removed sections



5.7.1 Full Section

- In a full section view, the cutting plane cuts across the entire object
- Note that hidden lines become visible in a sectional view
- Cutting plane passes through entire object
- Hidden lines are omitted
- Visible lines “behind” the cutting plane must be shown
- Cutting plane is shown in the adjacent view as a line

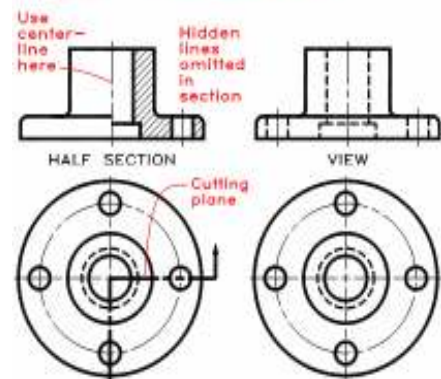
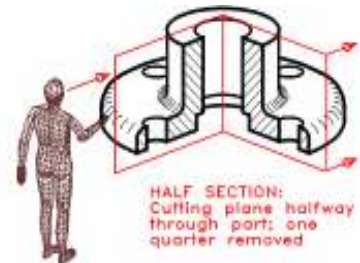


5.7.1.1 Multiple Sectioned Views

- Note the directions of arrows on the cutting plane.

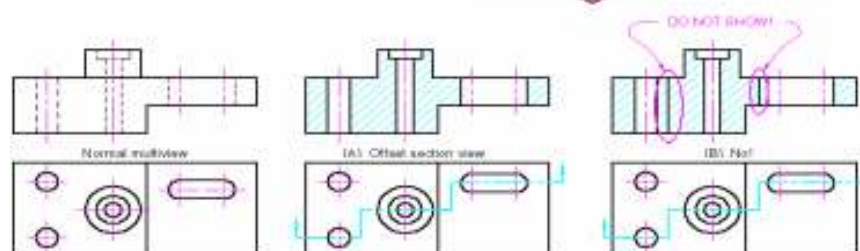
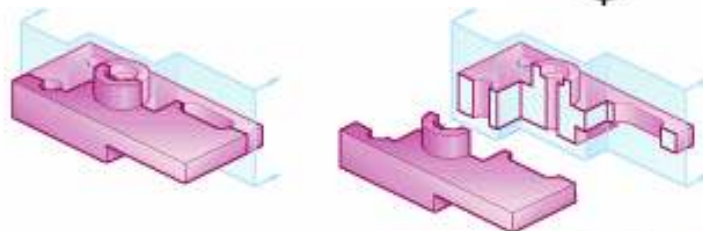
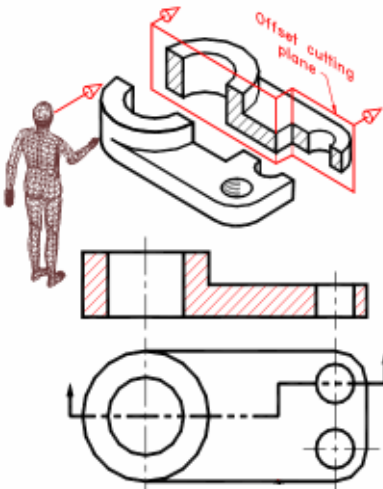
5.7.2 Half Section

- Half Section is used mainly for symmetric objects
- The cutting plane does not cut all the way through the object.
- The cutting plane cut only half way and intersects at the centerline.
- A quarter of assembly is removed
- Half of the view is cross-hatched
- All hidden lines are omitted
- A center line divides the two halves



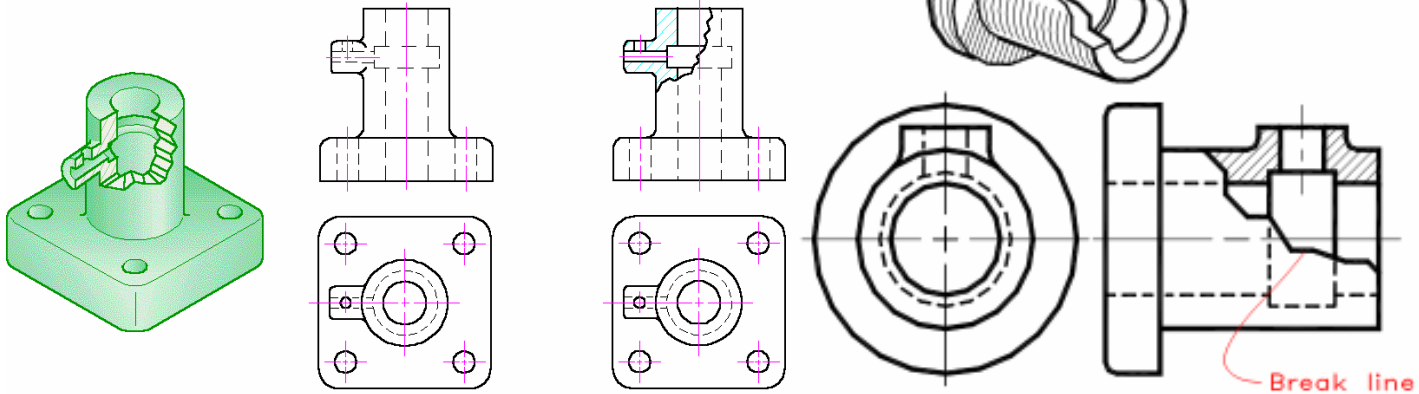
5.7.3 Offset Sections

- Offset sections are used to show interior features that do not lie along a straight line
- Bend the cutting plane to show more features
- Sectional view does not denote location of the offset



5.7.4 Broken Out Sections

- A broken-out section view is created by breaking off part of the object to reveal interior features
- Used to section a small portion of a drawing
- Do not modify the rest of the view
- Do not show the cutting plane in the view



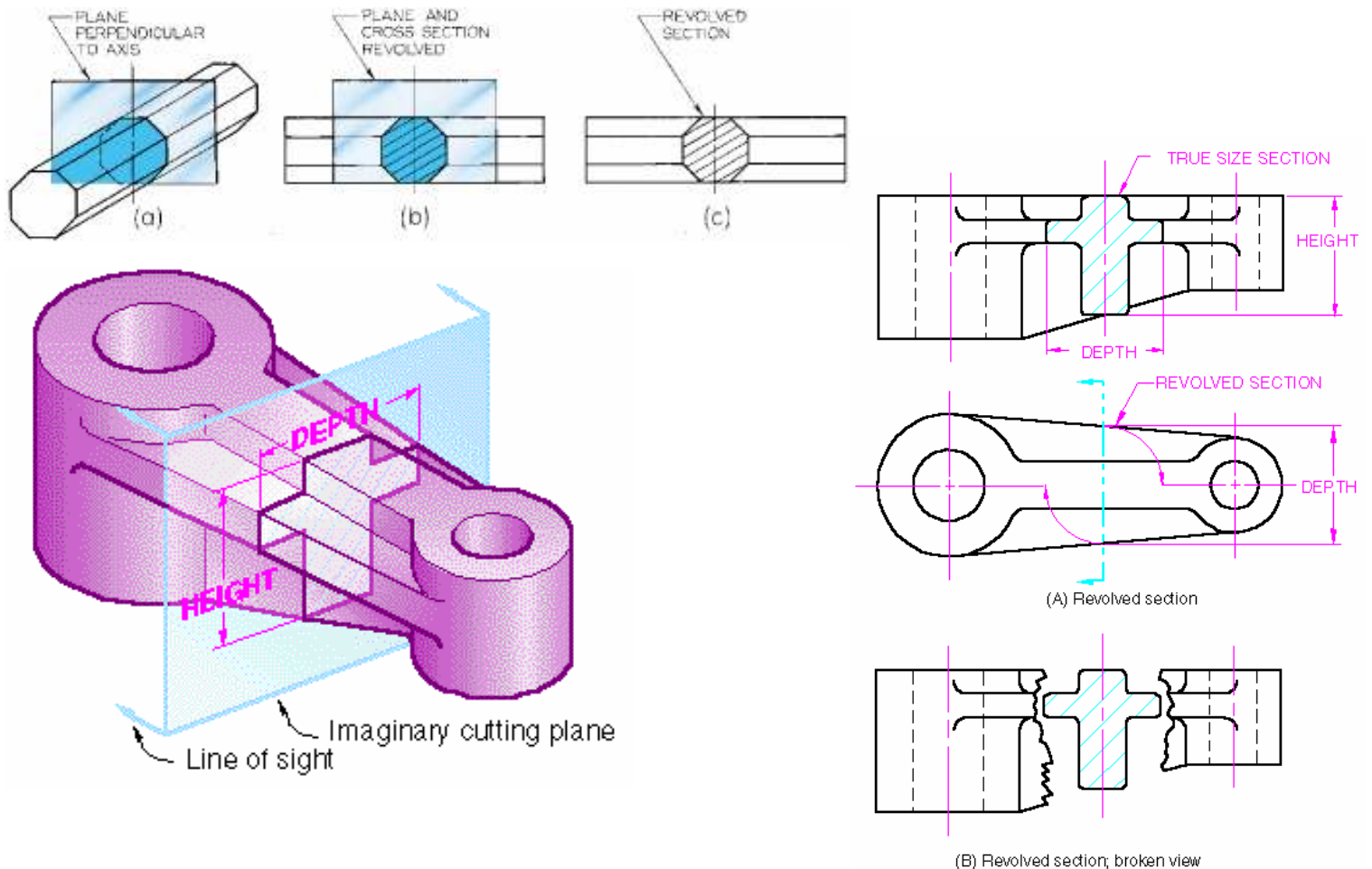
(A) Broken-out section

(B) Multiview

(C) Broken-out section view

5.7.5 Revolved Sections

- A Revolved section is created by passing a cutting plane through the object, then revolving the cross section 90°
- Revolved sections are used to show the cross-sectional shape of a bar, spoke, or arm in a single view. The cross-section is taken perpendicular to the view and then revolved 90 degrees around the center axis.

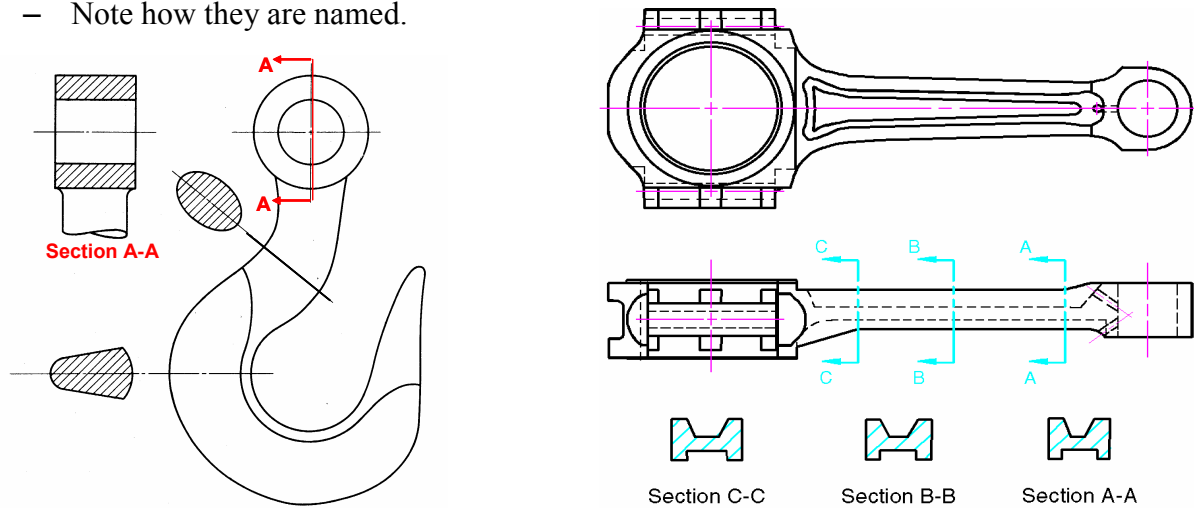


(A) Revolved section

(B) Revolved section; broken view

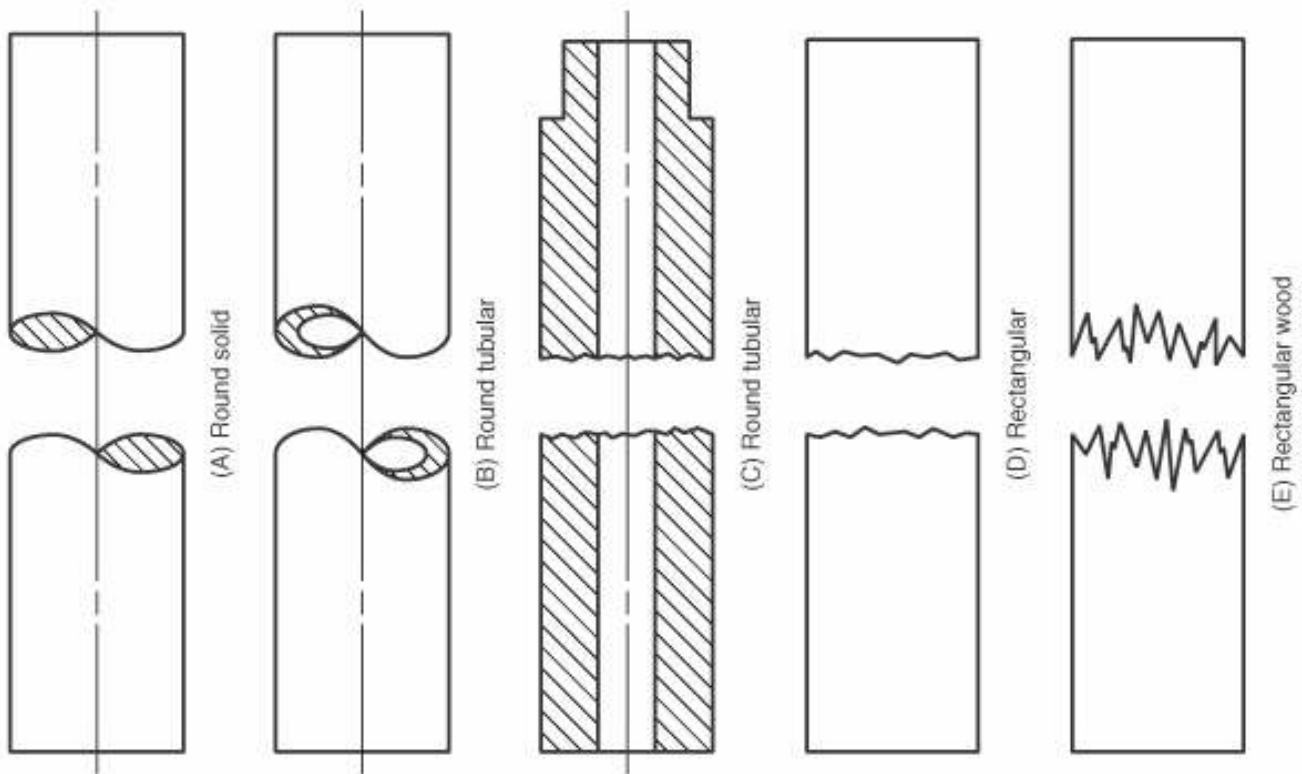
5.7.6 Removed Sections

- A removed section view is created by making a cross section, then moving it to an area adjacent to the view.
- Removed sections are like revolved sections but moved aside.
- Note how they are named.



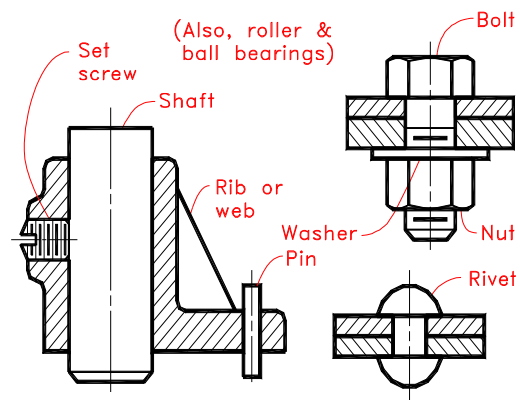
5.8 Conventional Practices

- Conventional practices are accepted drawing techniques, that violate the rules of orthographic projection
- They are designed to simplify orthographic drawing of complex features.
- Conventional breaks: Used for revolved section views or for shortening the view of an elongated part

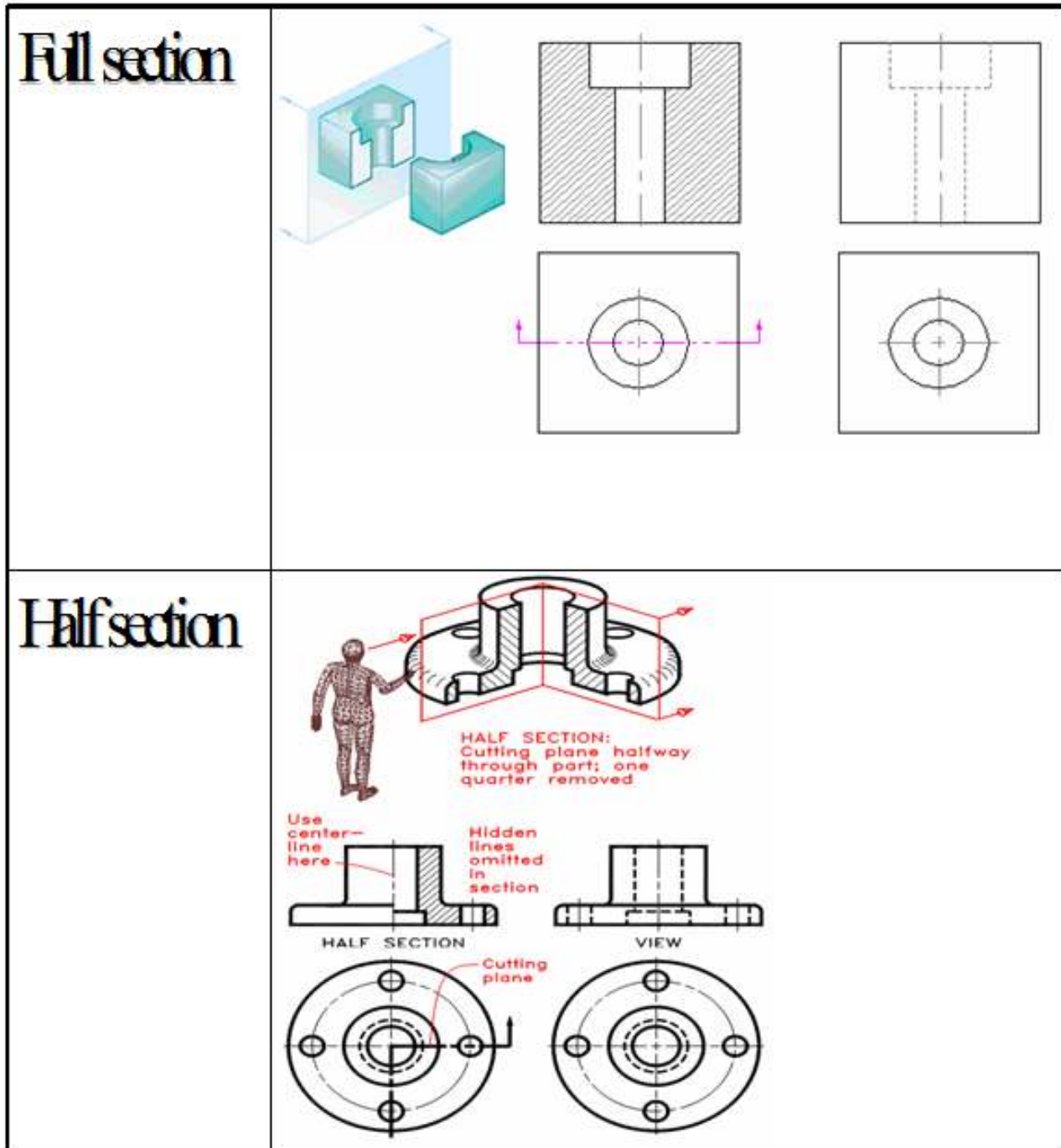


5.9 Crosshatching Practices

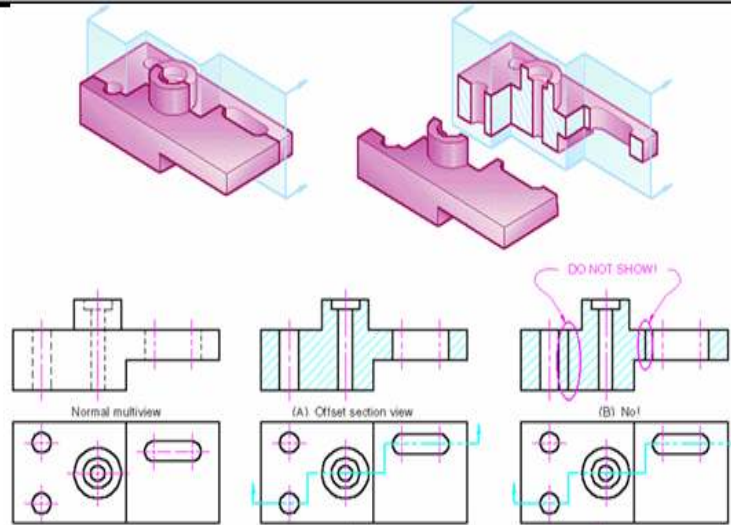
- Don't crosshatch
 - Ribs
 - Thin parts like gaskets
 - Shafts and pins
 - Ball bearings, roller bearings
 - Screws and nuts



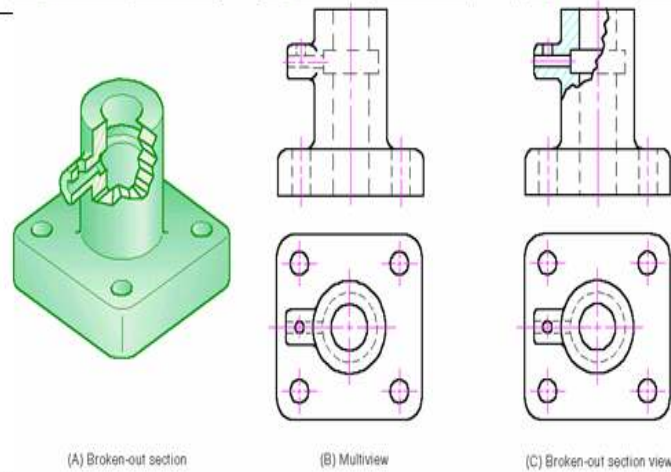
5.10 Summary of sectional view



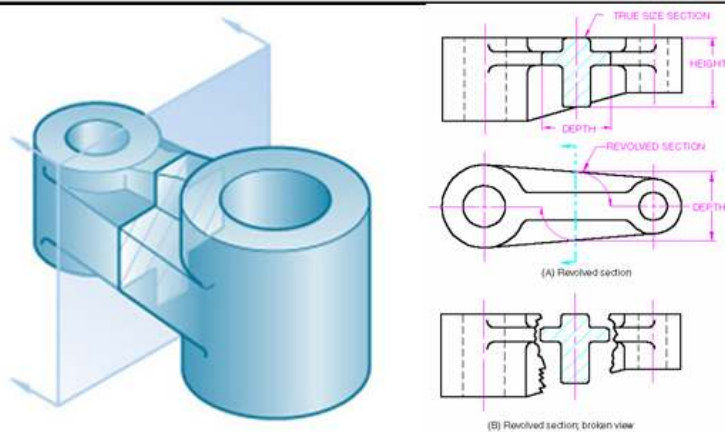
Off set section



Broken-out section



Revolved section



Removed section

