



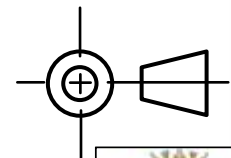
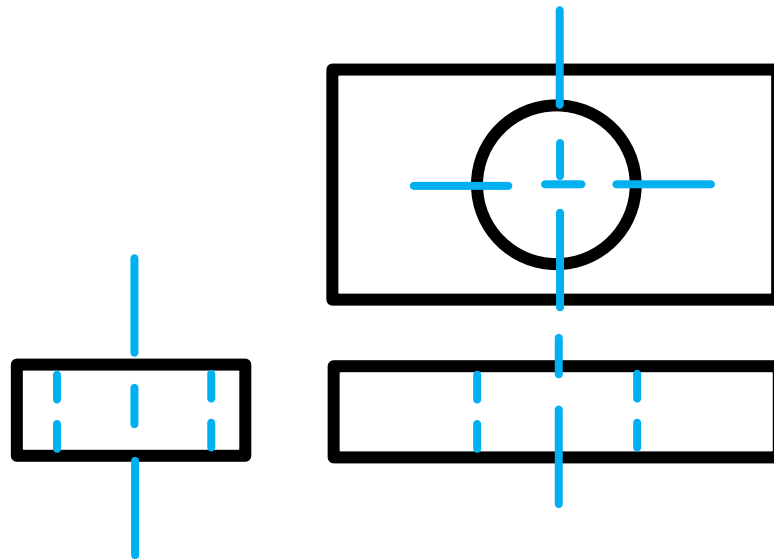
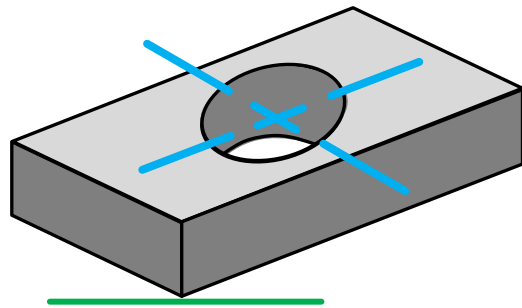
# Principles of Mechanical Drawings – SECTIONING

## Grade 10, 11 & 12

Developed by: PC Viljoen  
Senior Educational Specialist for  
Engineering Graphics and Design  
Free State Province

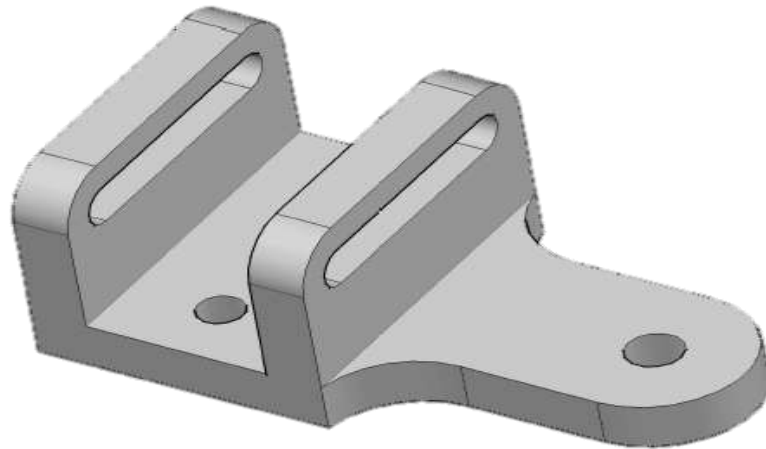
# Mechanical Drawings

- Mechanical illustrations can be a simple **isometric drawing** to be drawn in **Third Angle Orthographic Projection (T.A.O.P.)** or the other way round.



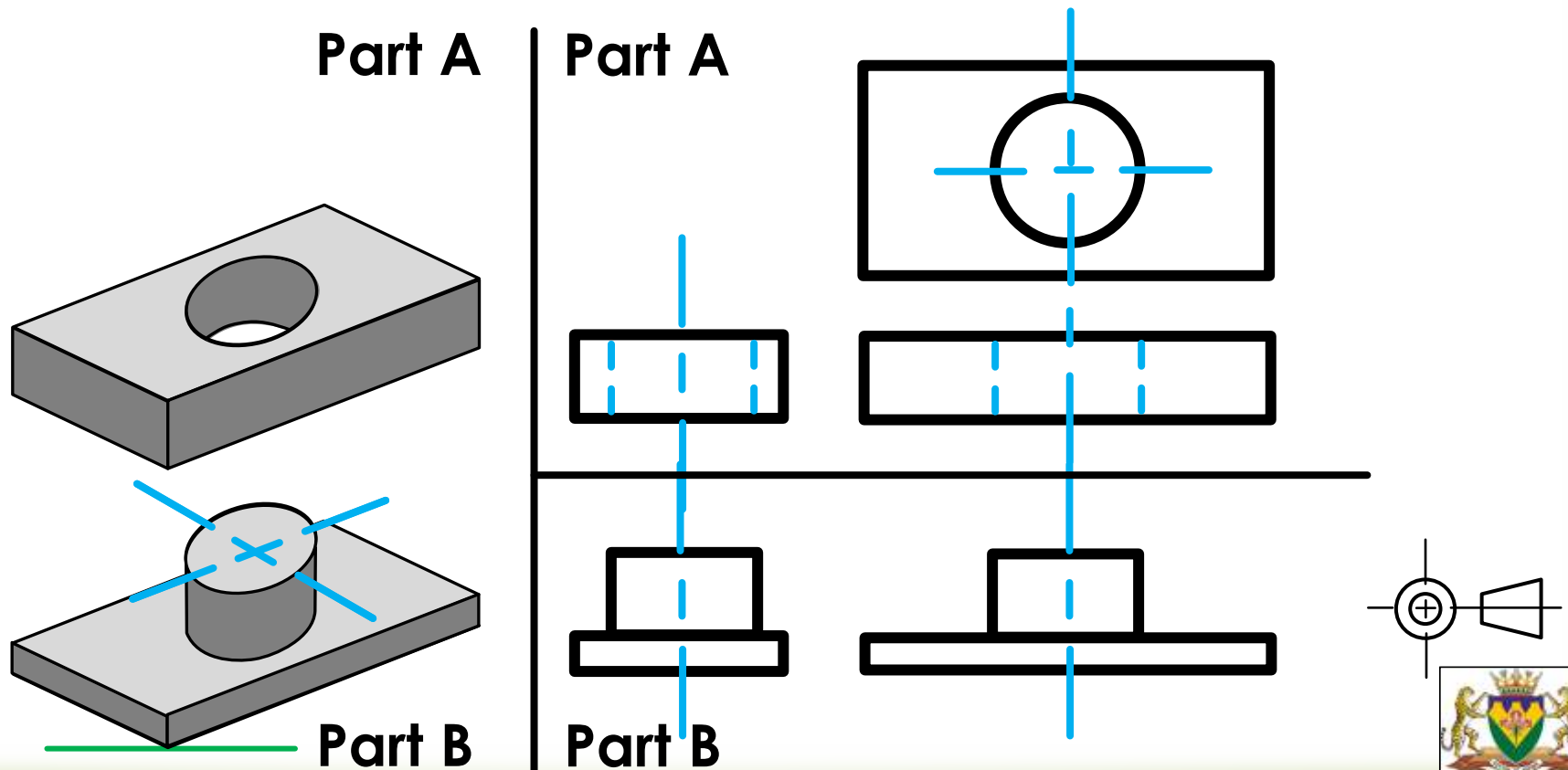
# Mechanical Drawings

- **Mechanical drawings** usually shows castings, parts or portions of mechanical components used in industry.



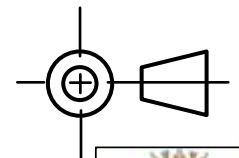
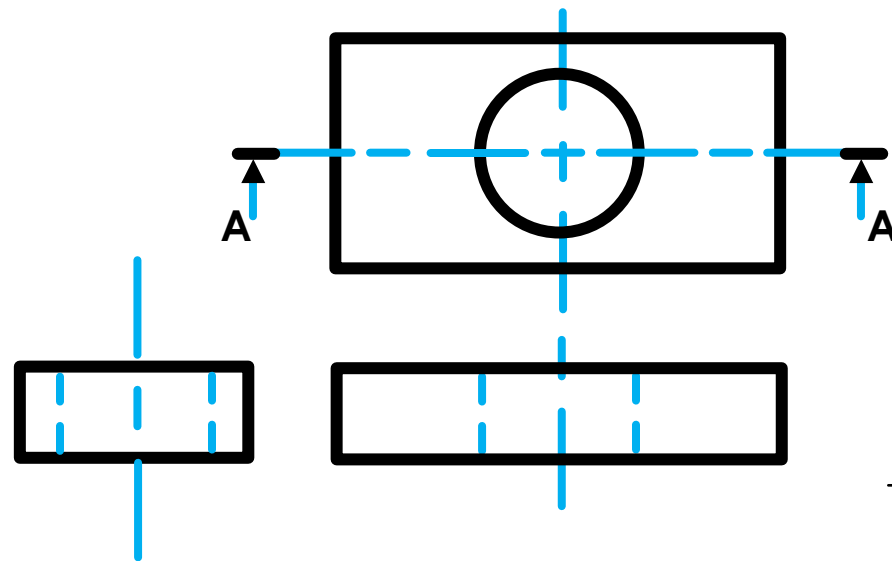
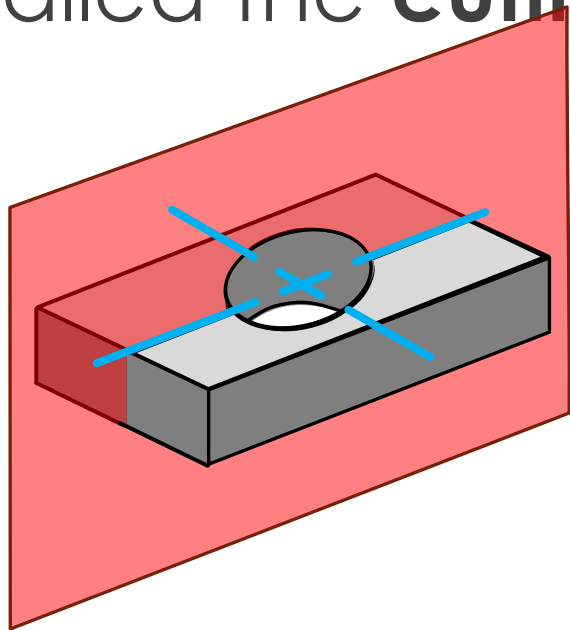
# Mechanical Drawings (assembled drawings)

- **Assembled drawings** is when mechanical components consisting of different machine parts are assembled as a unit.



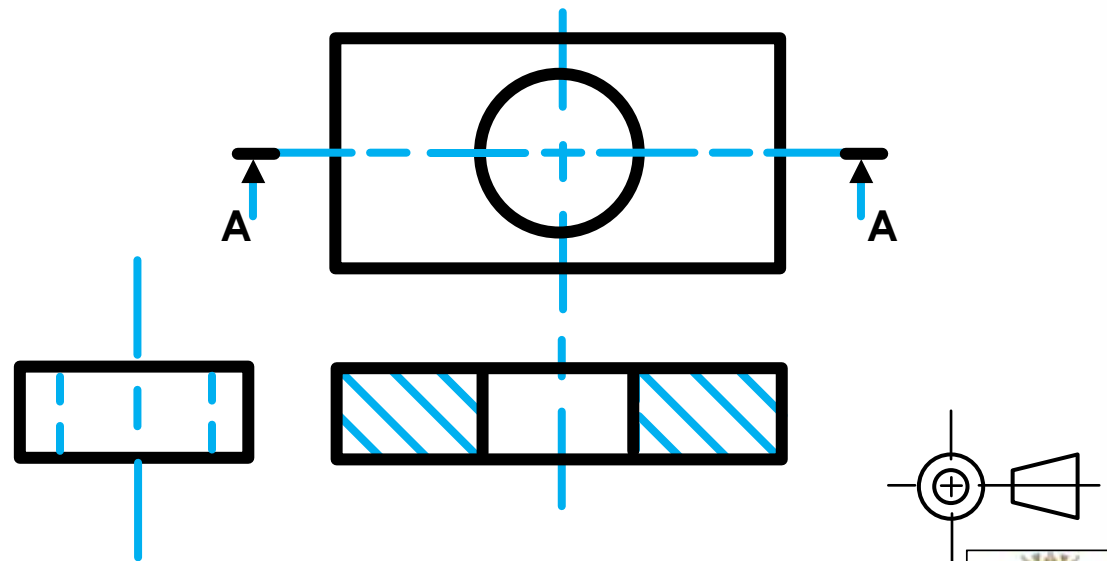
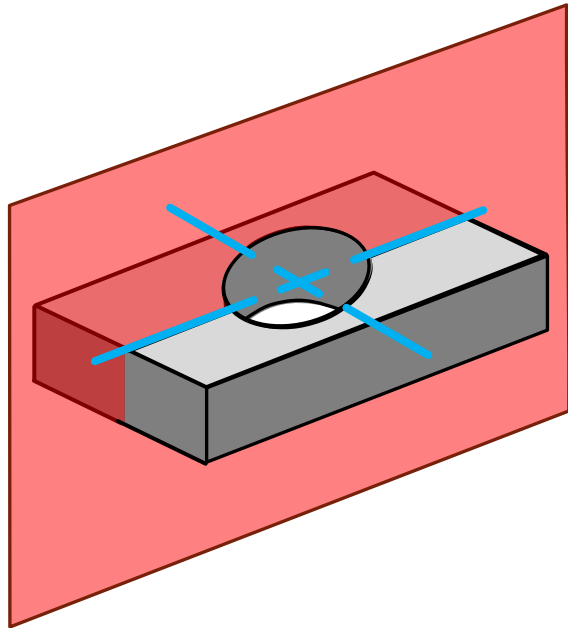
# Mechanical Drawings (sectioning)

- **Section drawings** is when mechanical components is cut to show the **inner detail**. The line indicating the point of sectioning is called the **cutting plane**.



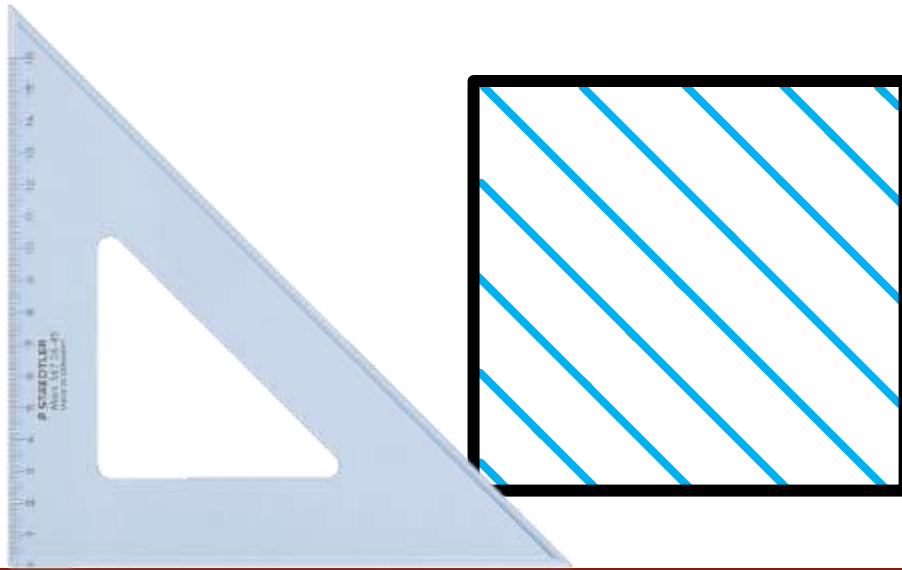
# Mechanical Drawings (sectioning)

- All solid components that are cut by a cutting plane must be **hatched** with B-type lines (medium line).



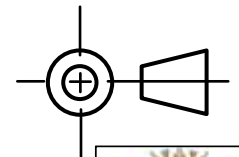
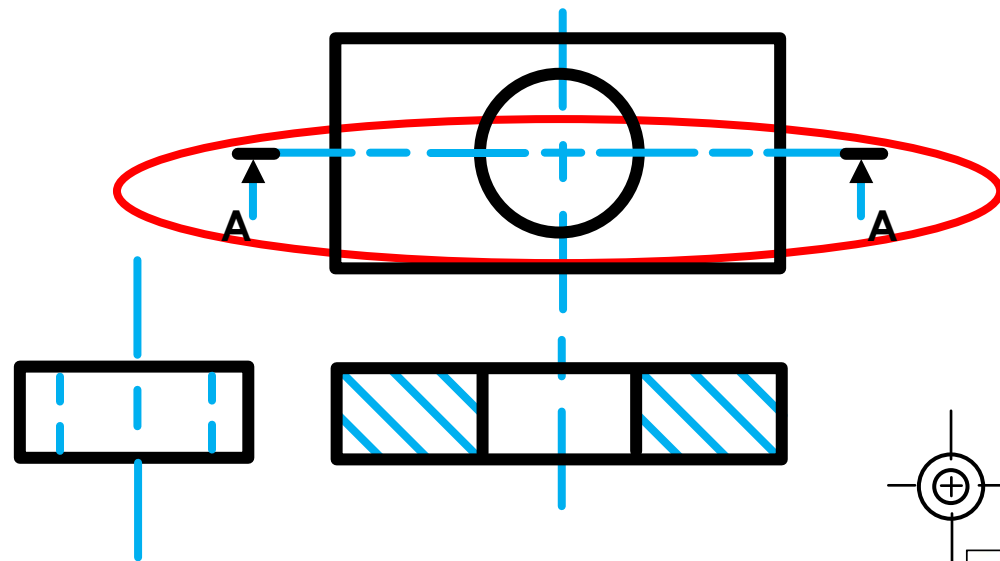
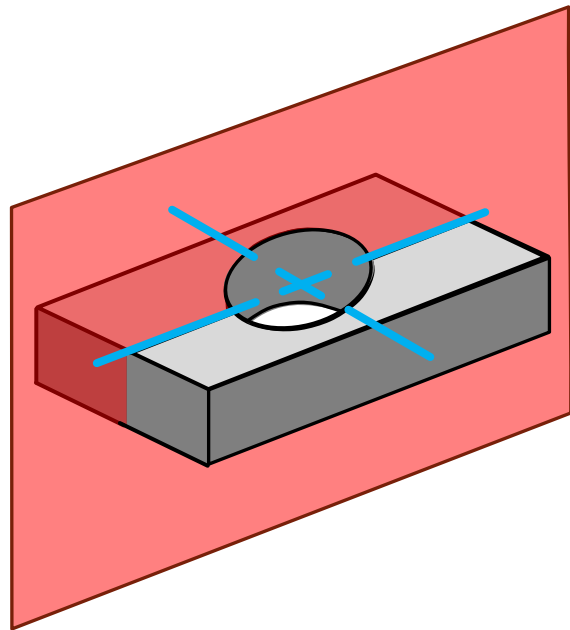
# Mechanical Drawings (sectioning)

- ➔ **Hatching** will always be with **Type-B lines (medium line)** which appear  $\pm 5$  mm apart from each other drawn on  $45^\circ$ .



# Mechanical Drawings (sectioning)

- The **cutting plane** must be clearly shown on all sectioned drawings.



# Mechanical Drawings (sectioning)

- ➔ In T.A.O.P. the **cutting plane** is shown in **medium chain-lines** (B-type) of  $\pm 20$  mm line,  $\pm 4$  mm gap and  $\pm 4$  mm line.

T.A.O.P. = Third-  
Angle Orthographic  
Projection



# Mechanical Drawings (sectioning)

- ➔ Medium chain lines will always **start & end** with a **long line**.

T.A.O.P. = Third-  
Angle Orthographic  
Projection



# Mechanical Drawings (sectioning)

- ➔ The cutting plane line must be **emphasised** at both **ends**.

T.A.O.P. = Third-  
Angle Orthographic  
Projection



# Mechanical Drawings (sectioning)

- ➔ The **arrows** of the cutting plane is larger than dimension arrows.

T.A.O.P. = Third-  
Angle Orthographic  
Projection



# Mechanical Drawings (sectioning)

- ➔ The **tail** part of the arrows must be B type line quality.

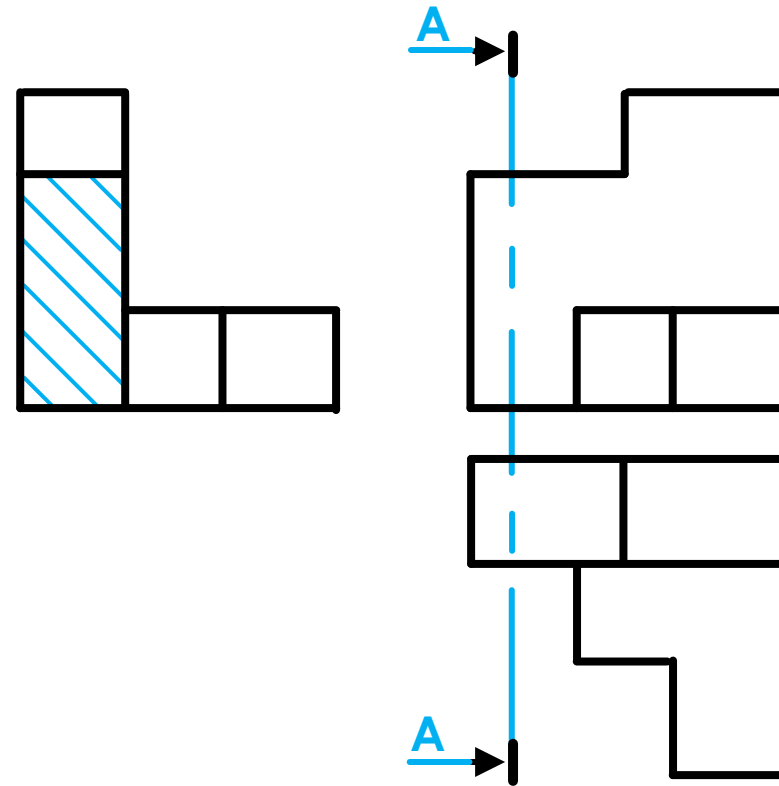
T.A.O.P. = Third-  
Angle Orthographic  
Projection



# Mechanical Drawings (sectioning)

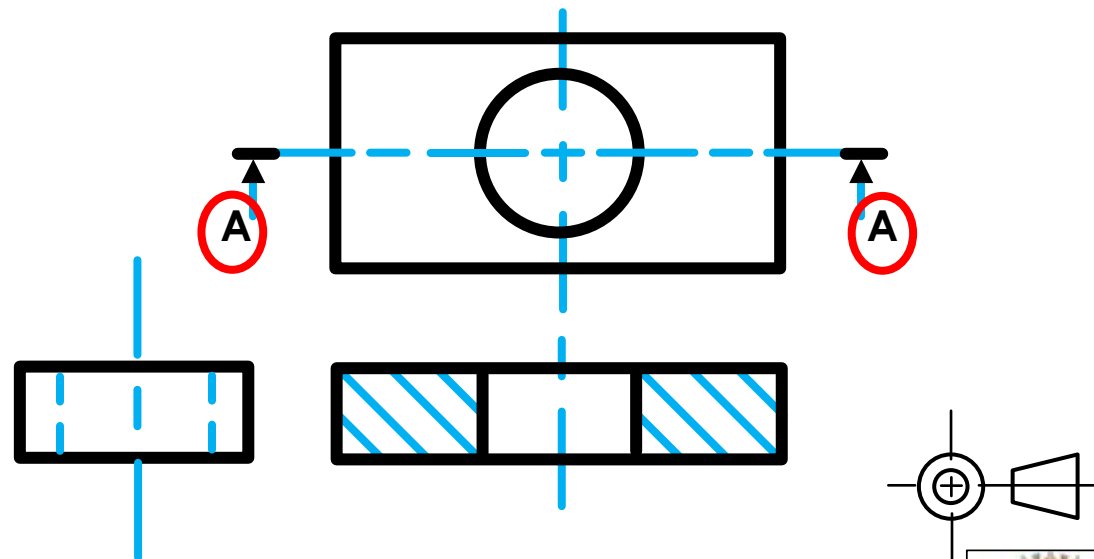
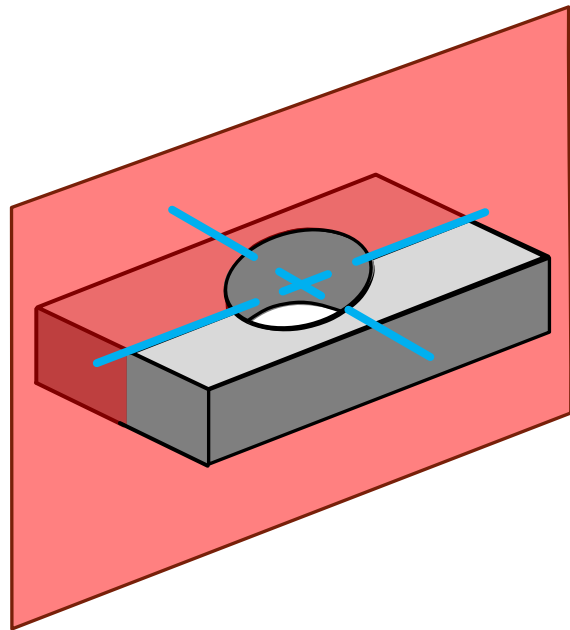
- ➔ The **arrows** on the cutting plane will **point** towards the **remaining portion** of the object.

T.A.O.P. = Third-  
Angle Orthographic  
Projection



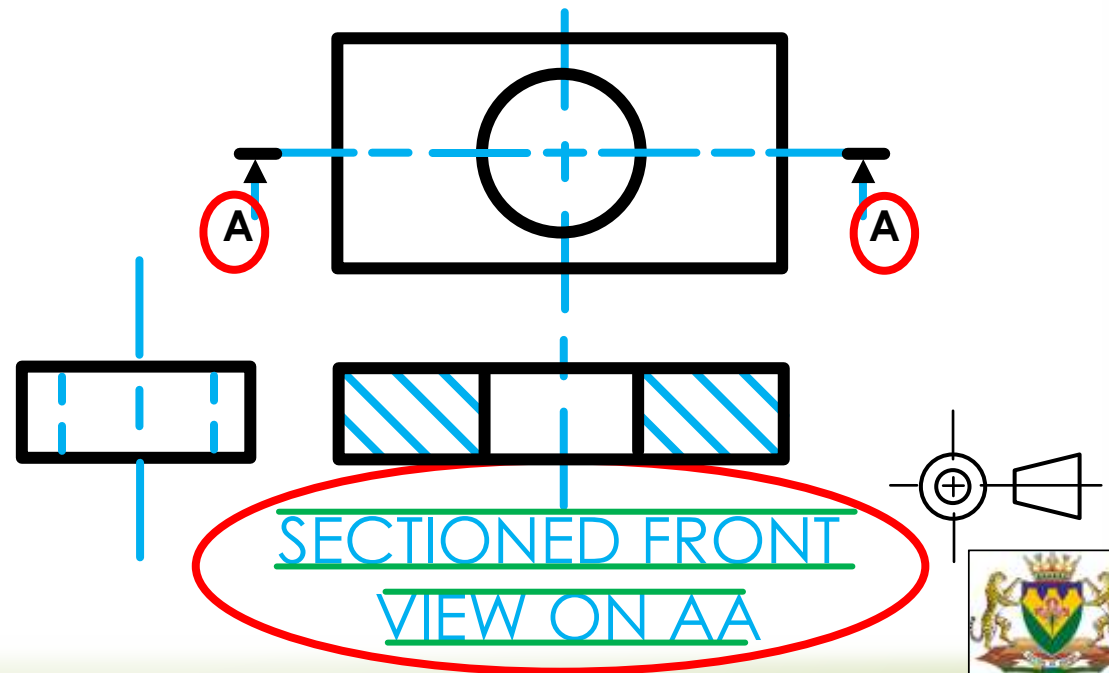
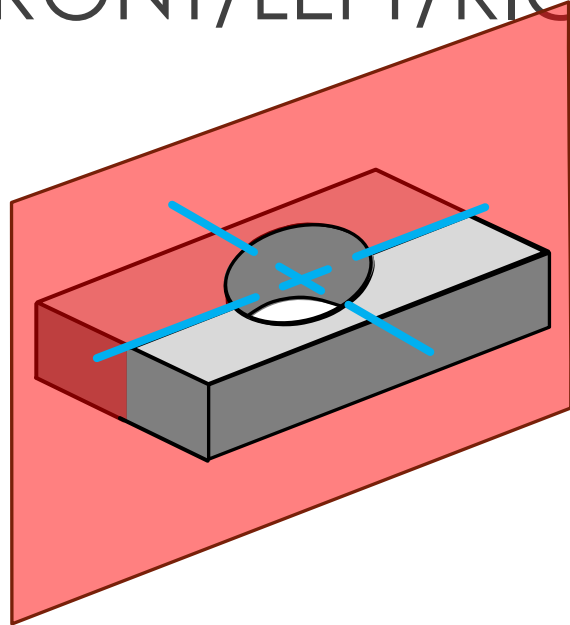
# Mechanical Drawings (sectioning)

- ➔ The cutting plane will normally be **named** after letters of the alphabet (e.g. AA).



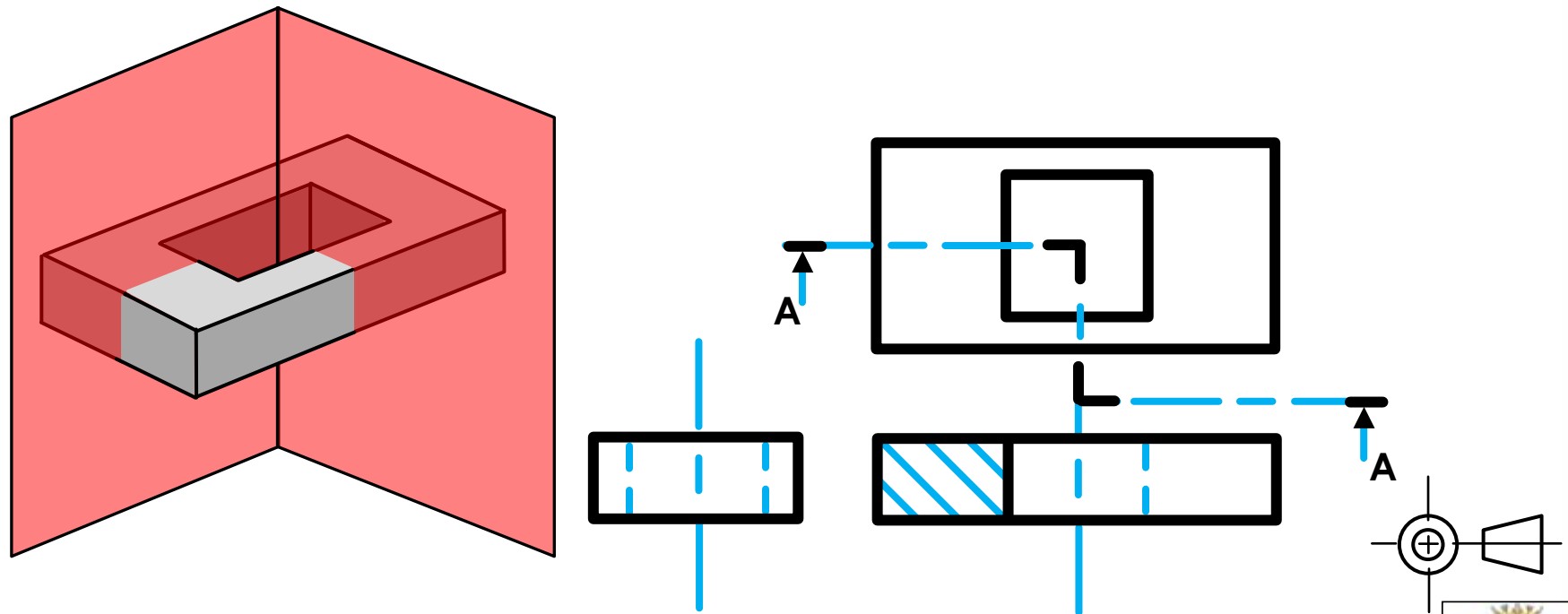
# Mechanical Drawings (sectioning)

- ➔ The view which is cut (sectioned) because of the cutting plane (e.g. AA) will be named after the cutting plane: e.g. **SECTIONED FRONT VIEW ON AA**



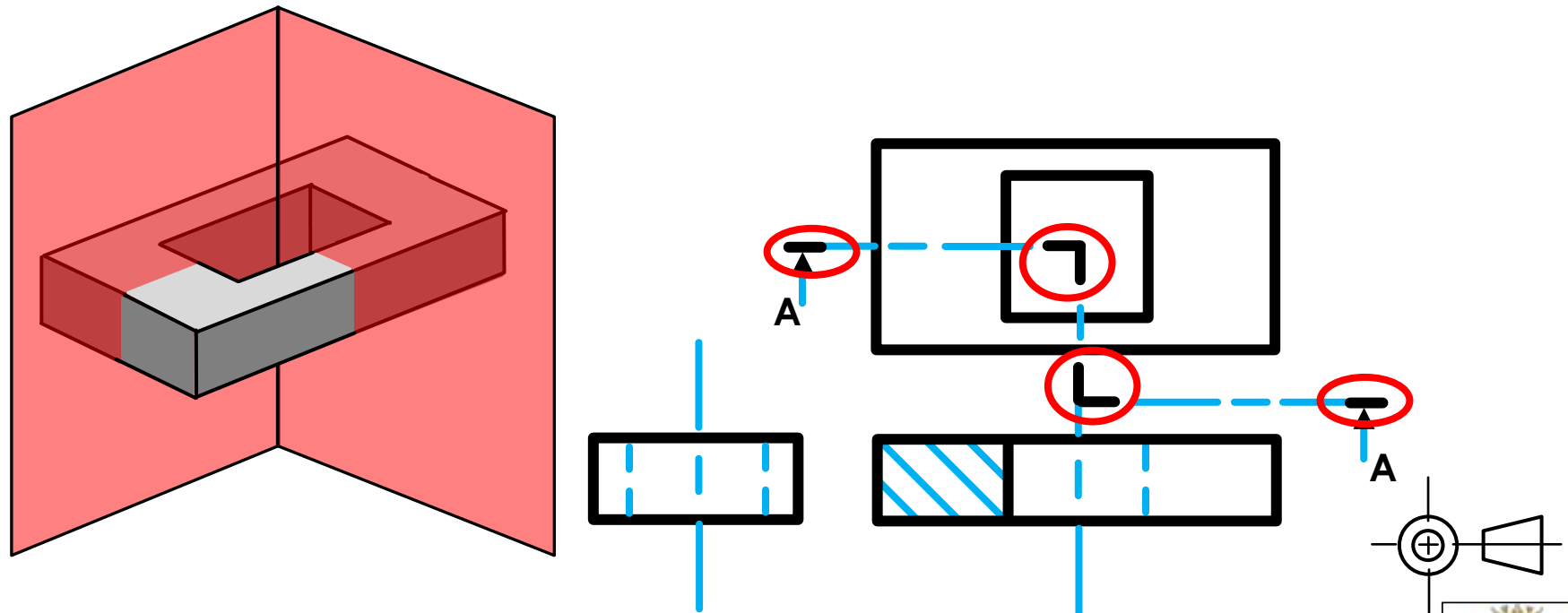
# Mechanical Drawings (sectioning)

- ➔ The **cutting plane** can also **bend** to show a half sectioned area. It is called an **offset sectioning** (*afwykende snit*).



# Mechanical Drawings (sectioning)

- ➔ The **cutting plane** must be **emphasised** at all **bends and ends**. It is called an **offset sectioning** (*afwykende snit*).



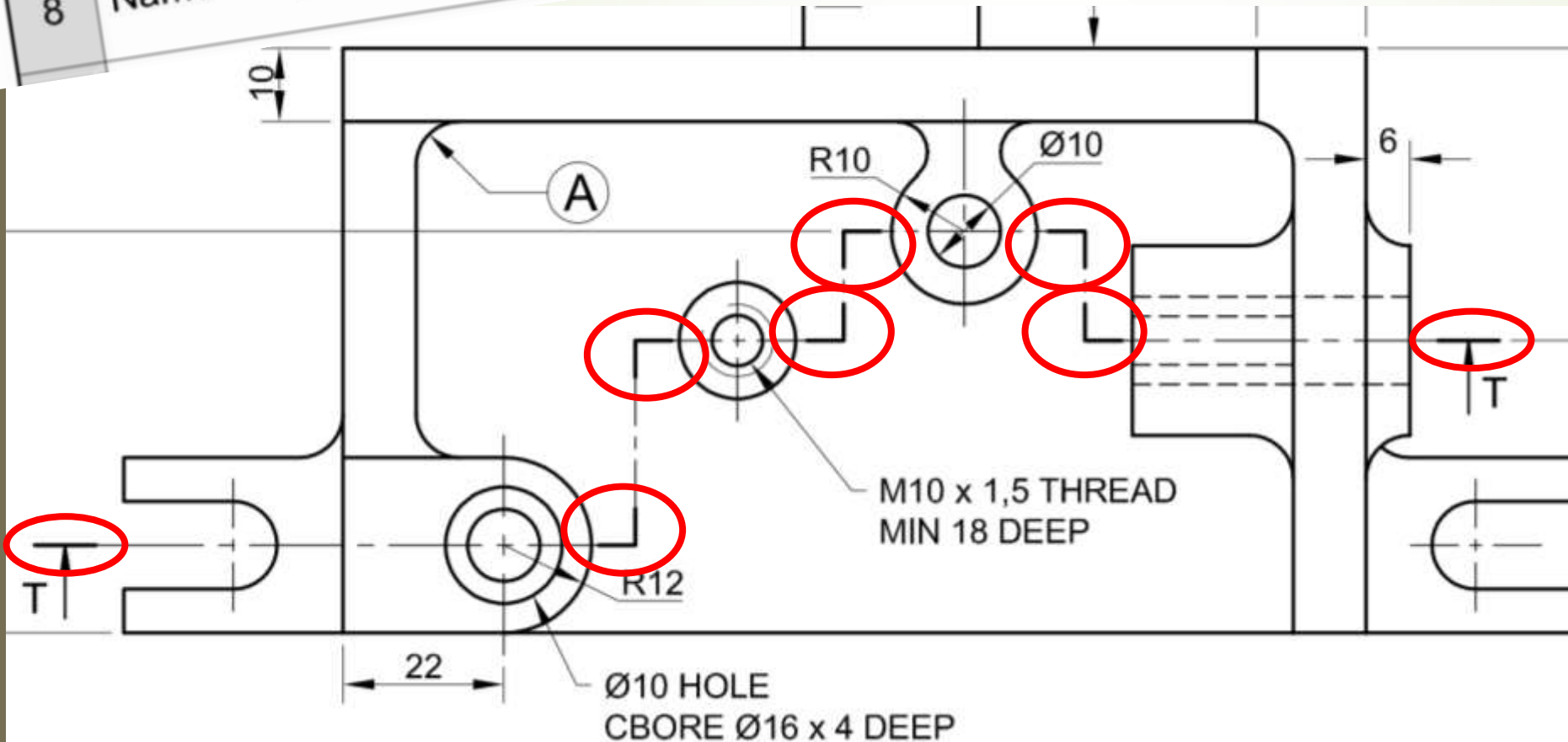
# Mechanical Drawings (sectioning)

8

Name the type of section produced by cutting plane T-T.

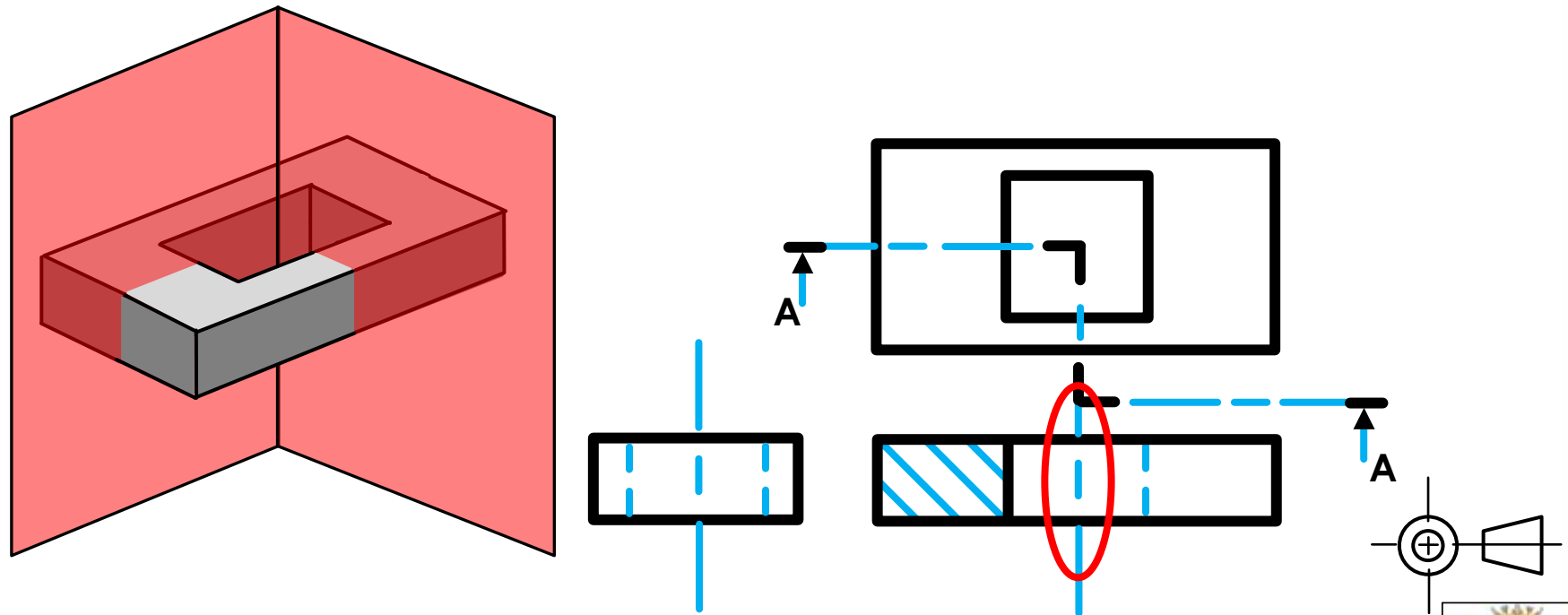
➔ Asked as question:

➔ 2019



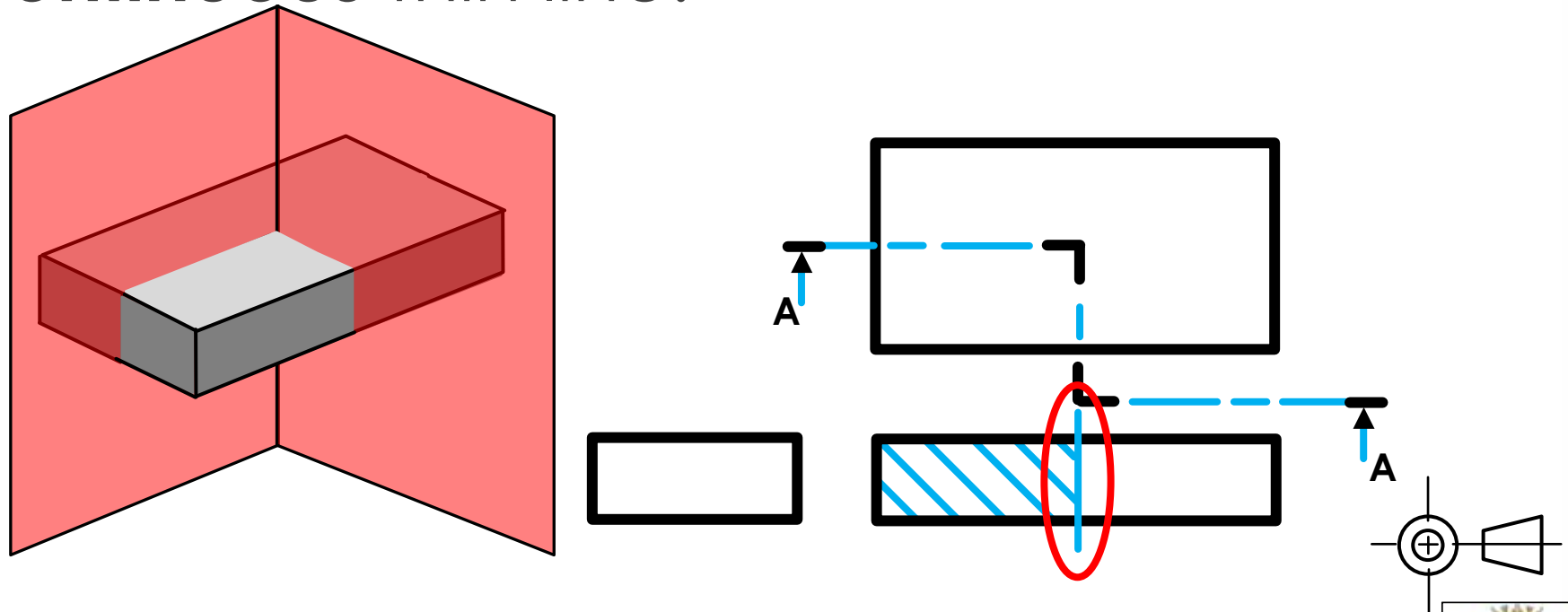
# Mechanical Drawings (sectioning)

- When the sectioned half of the view contains a **hollow area** towards the centre point, a **centre line** should be indicated.



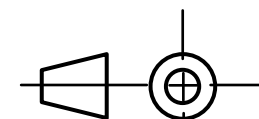
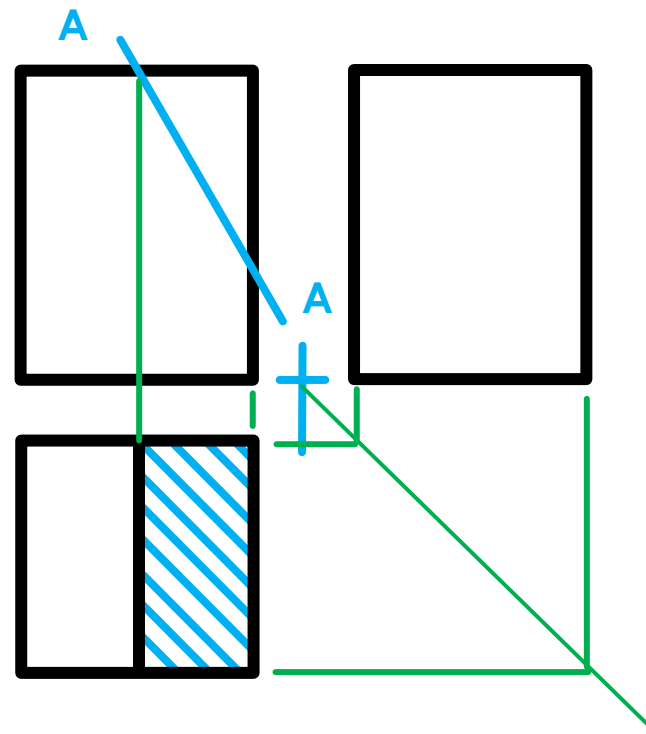
# Mechanical Drawings (sectioning)

- When the sectioned half of the view contains a **solid area** towards the centre point, the centre line should be **changed to a continuous thin line**.



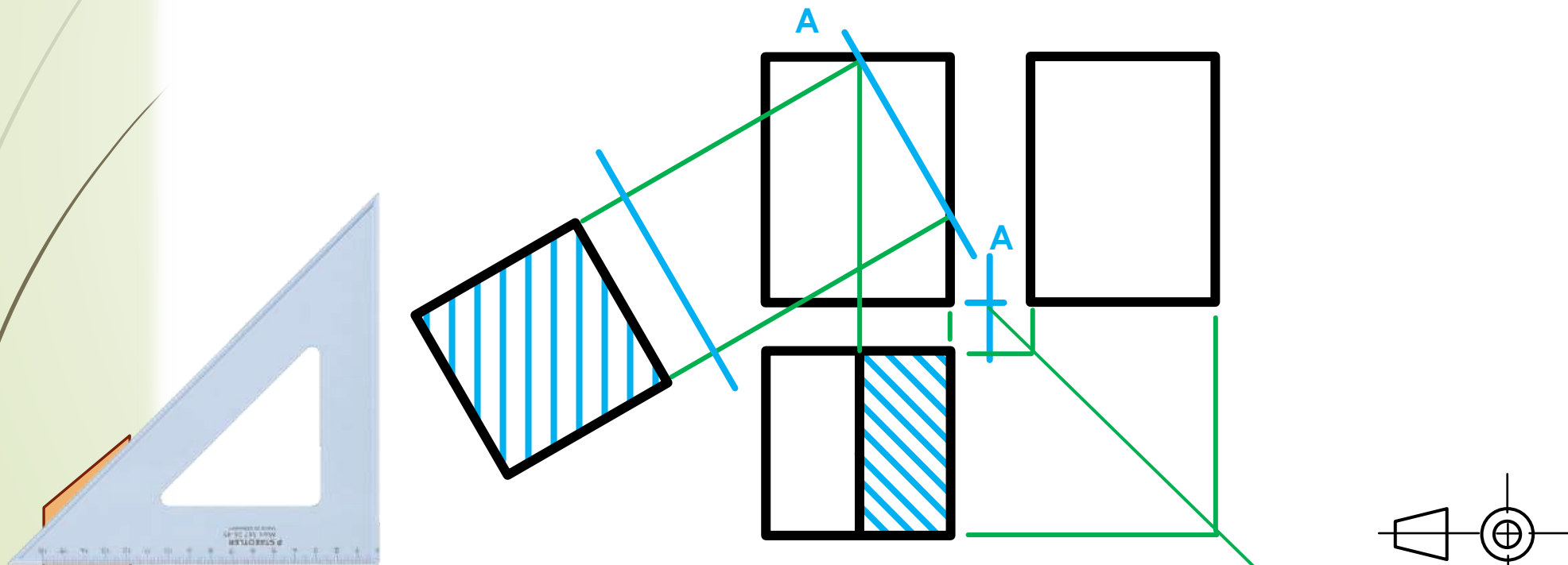
# Direction of Sectioning

- If the **sectioned object appear predominantly vertical**, all hatching lines will be diagonal in  $45^\circ$  B-type lines (medium line).



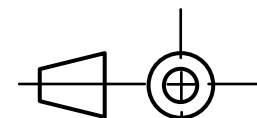
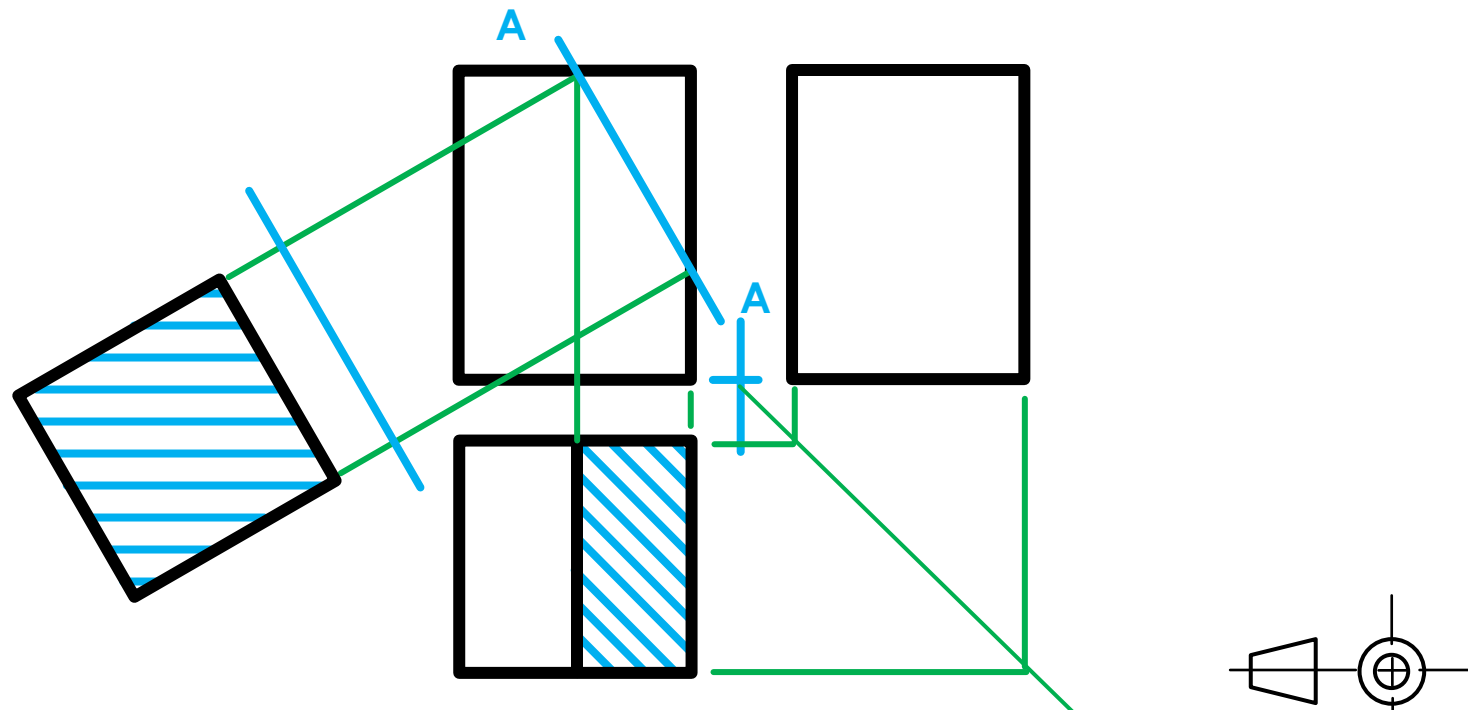
# Direction of Sectioning

- ➔ Should a **sectioned object appear predominantly diagonal**, all hatching lines will be either horizontal ( $0^\circ$ ) or vertical ( $90^\circ$ ).



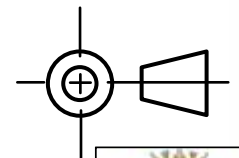
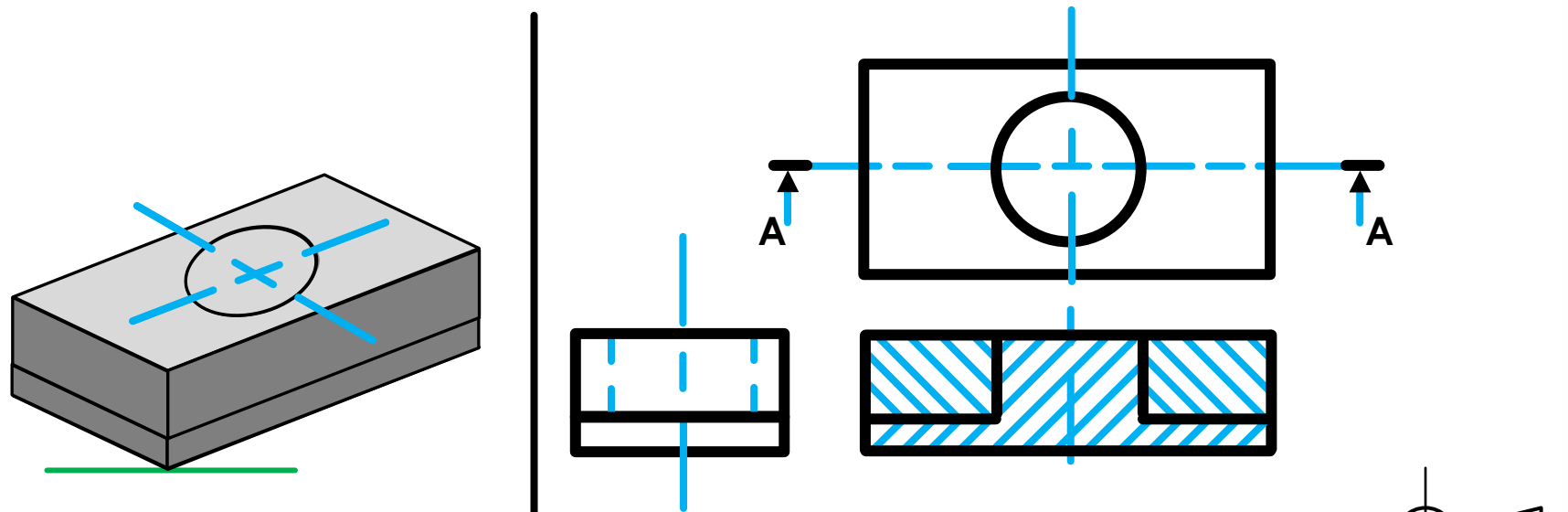
# Direction of Sectioning

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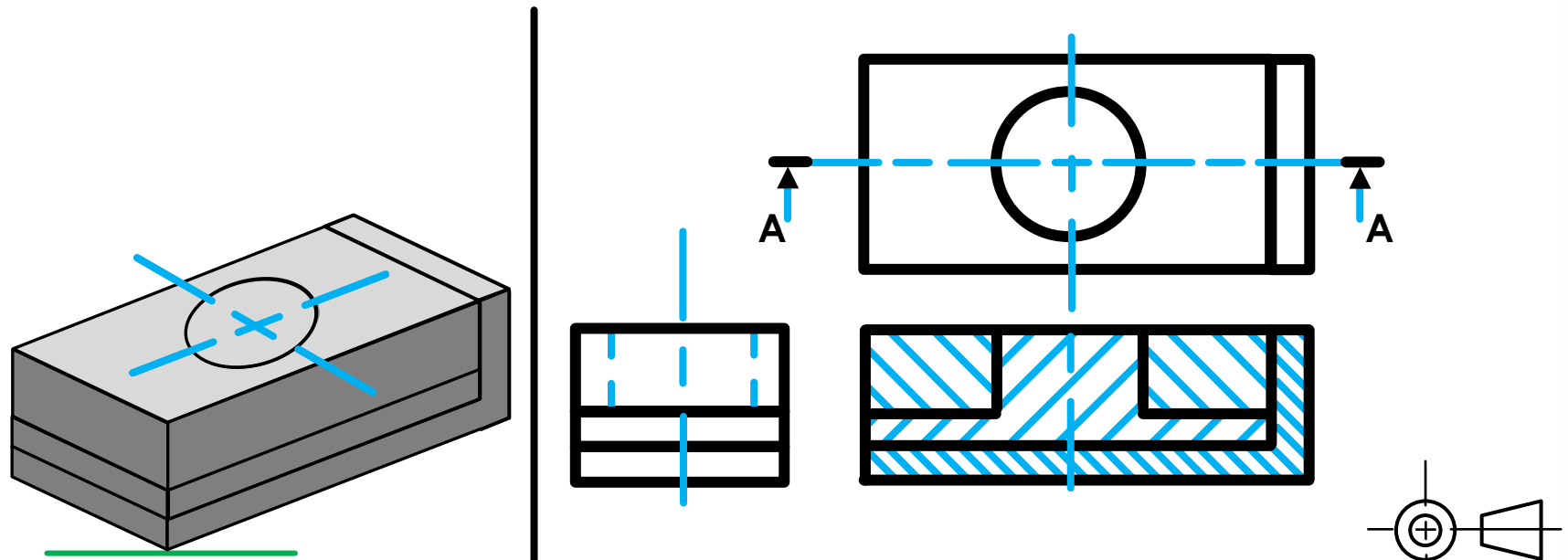
# Sectioning of two adjacent parts

- ▶ **Hatch lines of two components** next to each other must alternate in direction to indicate the difference in components.



# Sectioning of three adjacent parts

- ➔ **Hatch lines of three components** next to each other must alternate in direction while the hatch lines of the smallest component can be drawn to a smaller distance apart from each other.



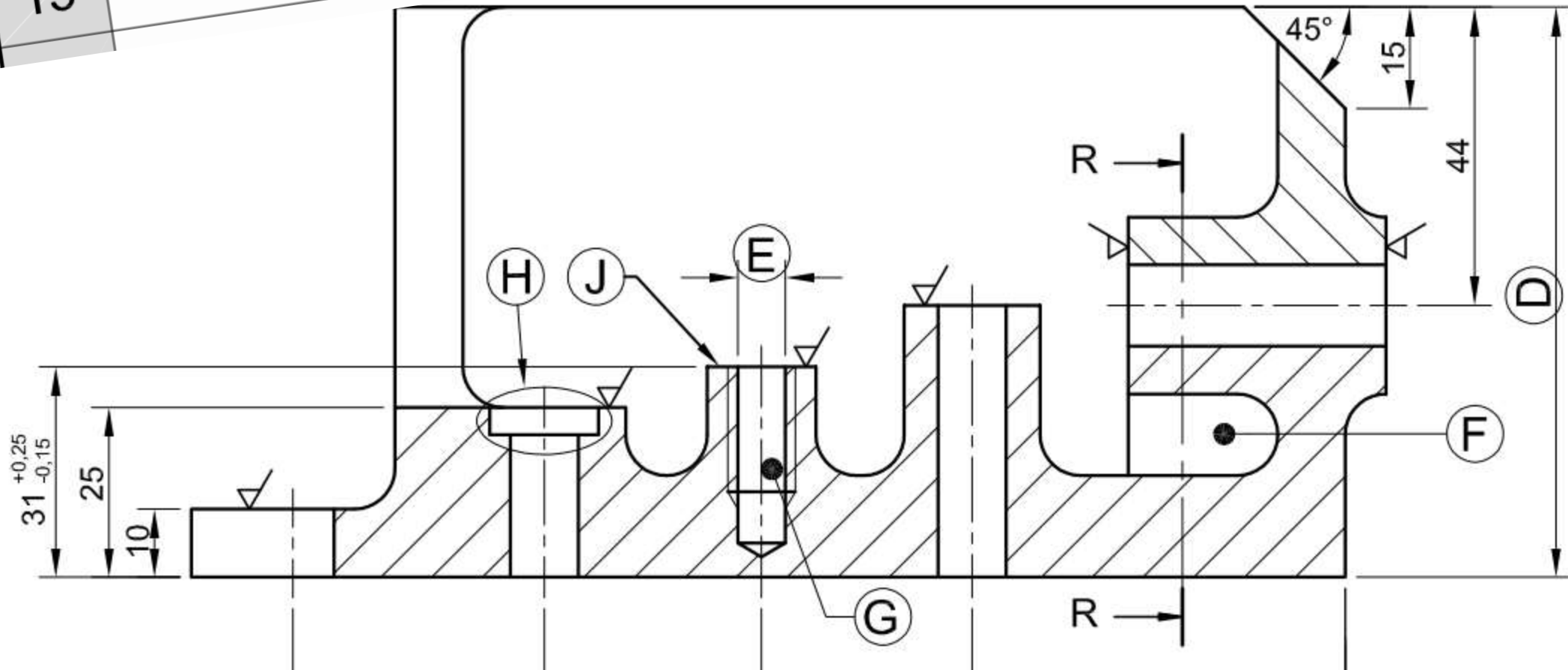
# Mechanical Drawings (sectioning)

15

Describe the hatching mistake on VIEW 1.

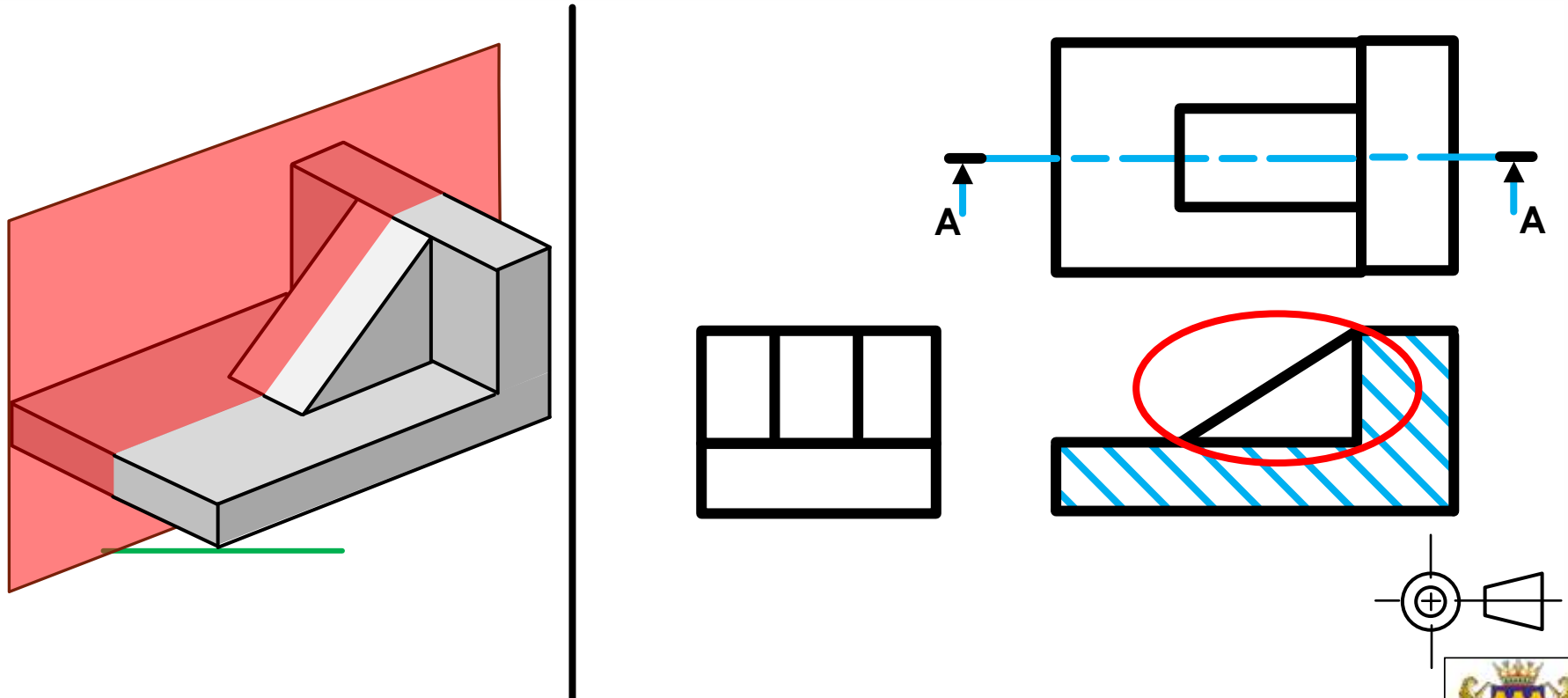
➤ Asked as question:

➤ 2019



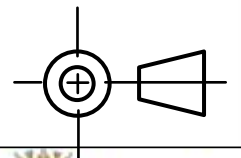
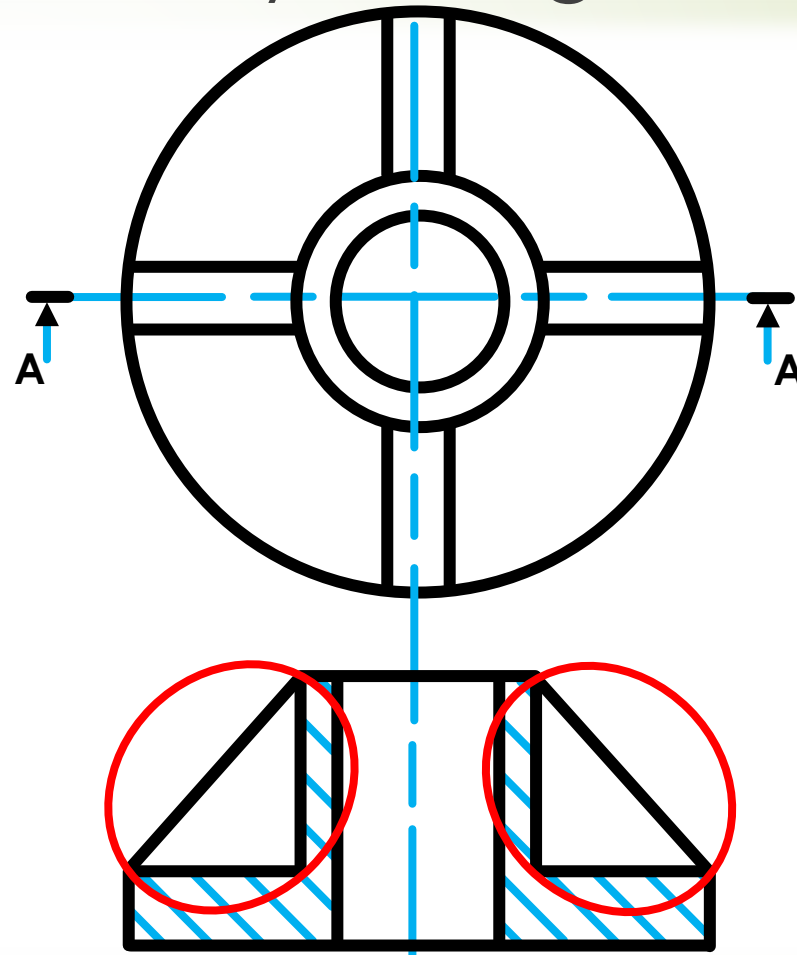
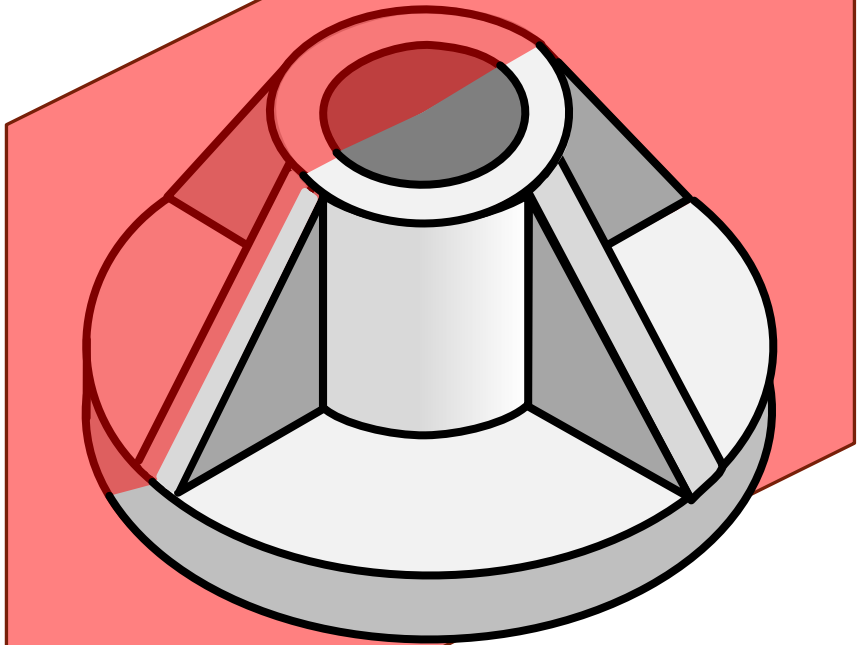
# Mechanical Drawings (sectioning)

- ➔ A **reinforced web** may be sectioned, but **NO** hatching must be shown when the cutting plane passes longitudinally through it.



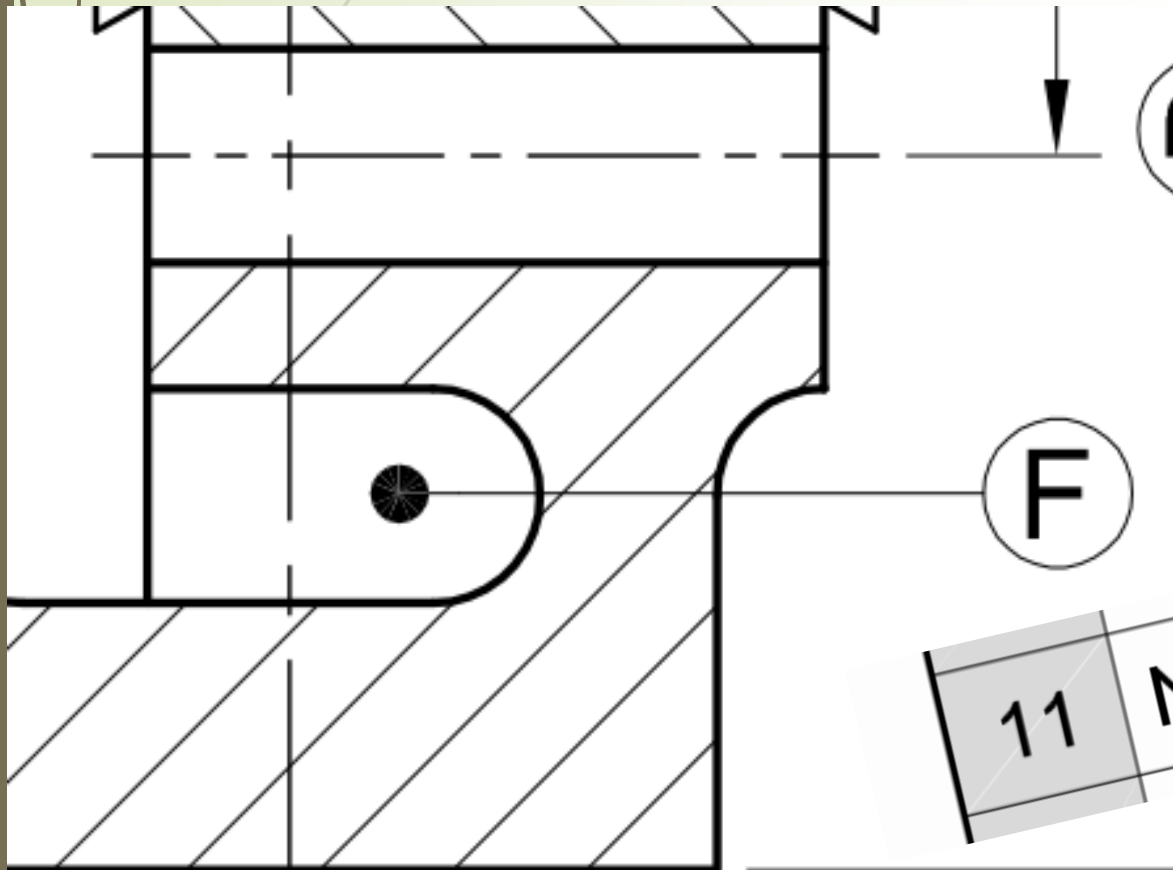
# Mechanical Drawings (sectioning)

- **Webs** may **not** be sectioned when the cutting plane passes longitudinally through them.



# Mechanical Drawings (sectioning)

- ▶ Asked as question:
  - ▶ 2019

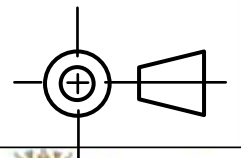
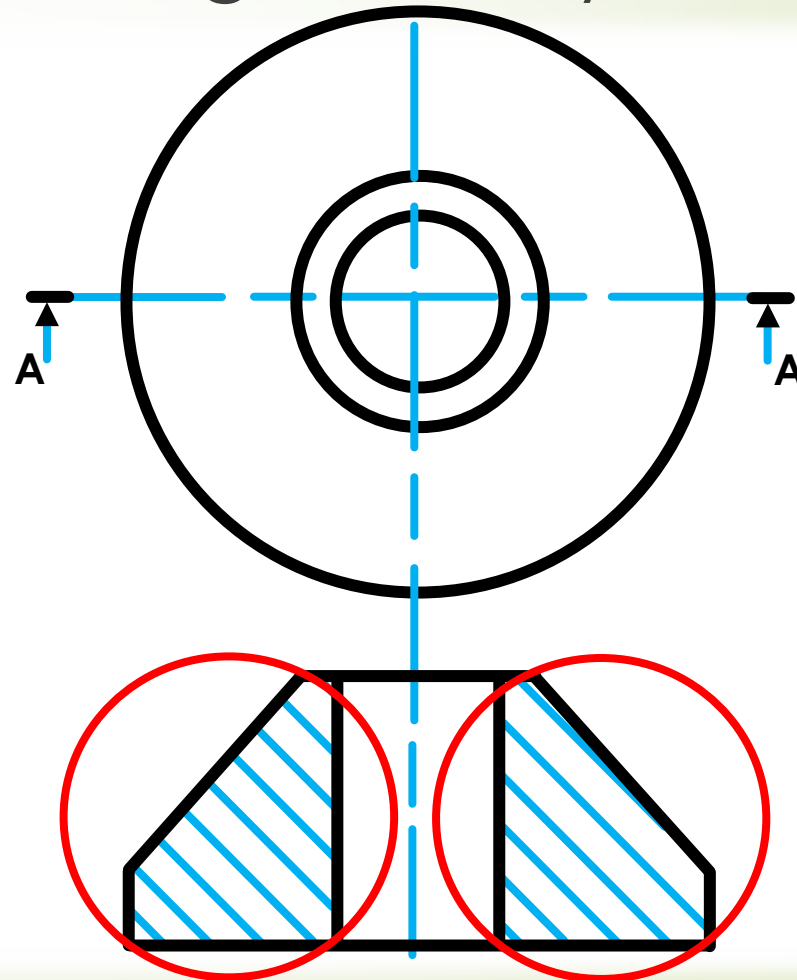
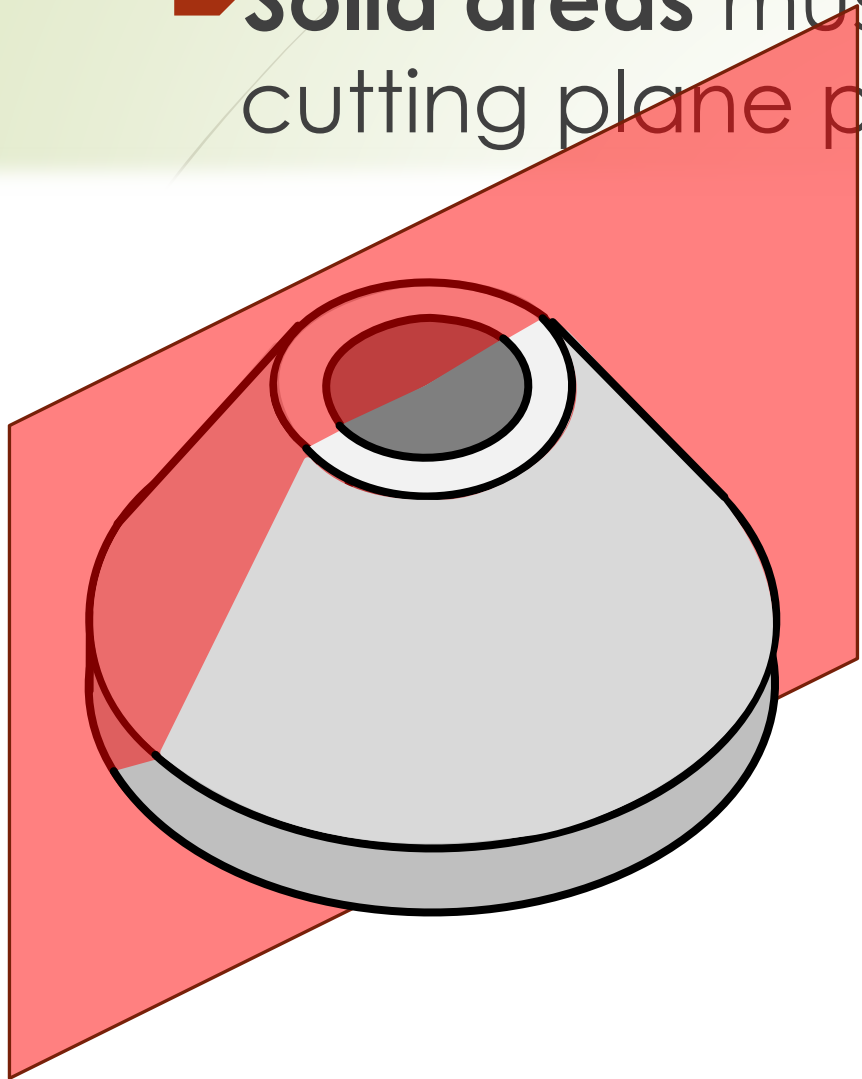


11

Name the feature at F.

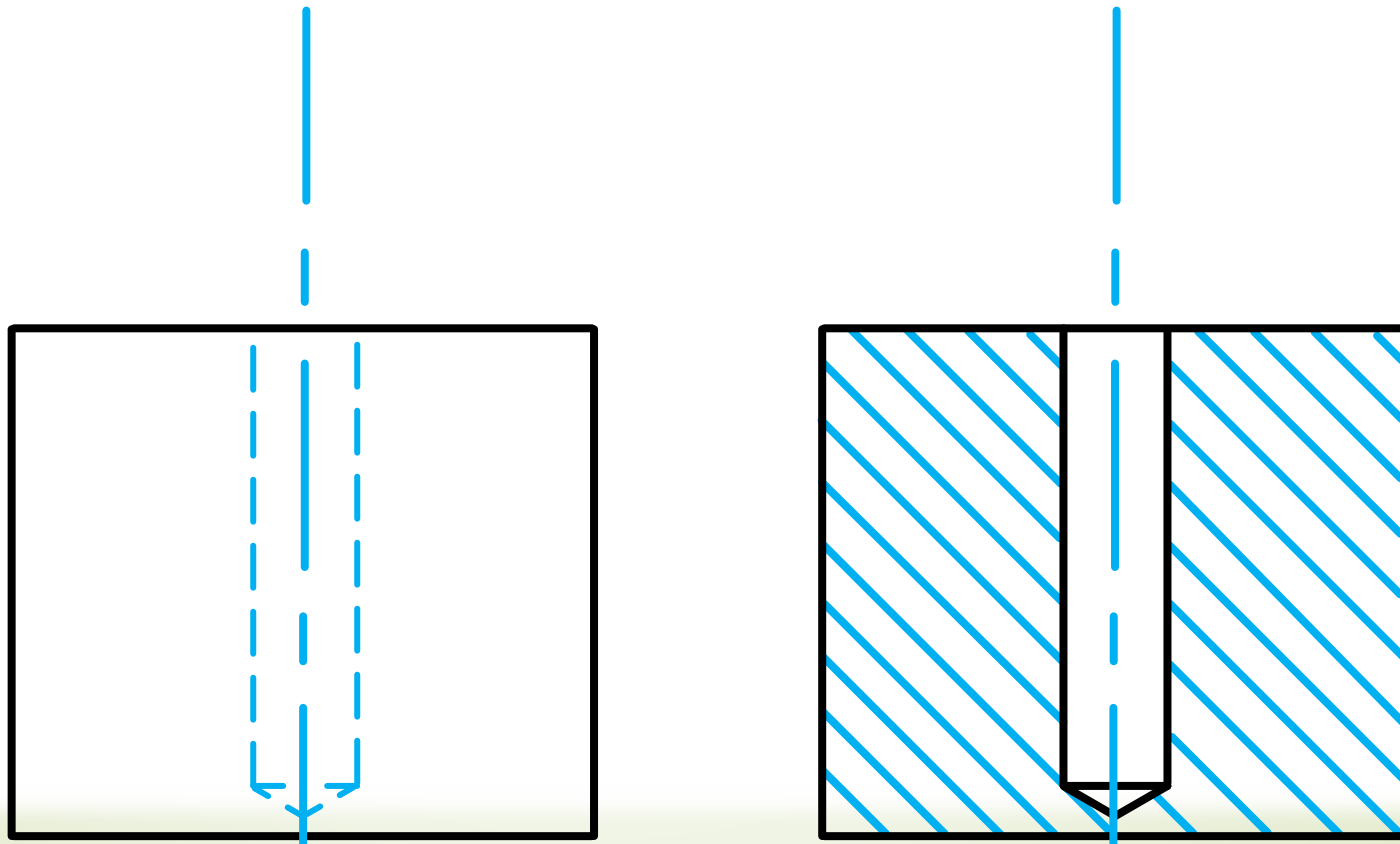
# Mechanical Drawings (sectioning)

- **Solid areas** must be sectioned when the cutting plane passes longitudinally through it.



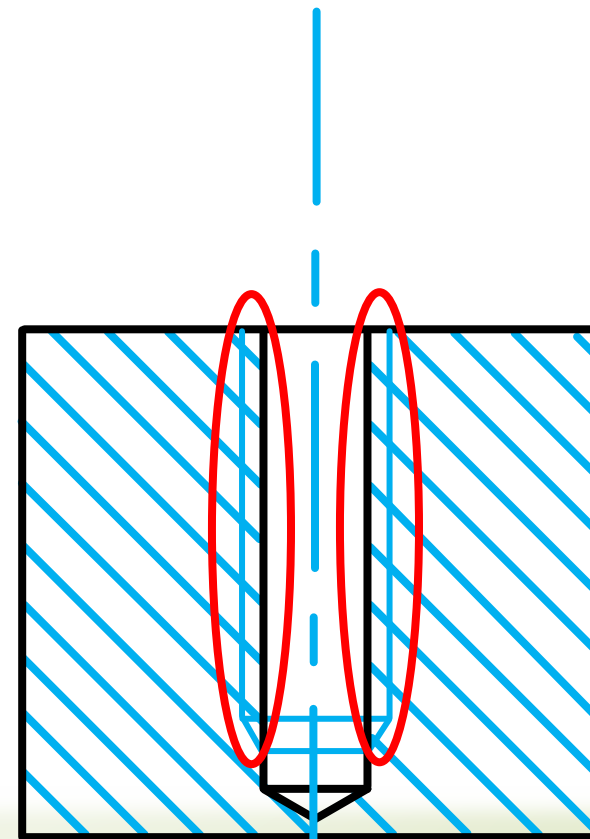
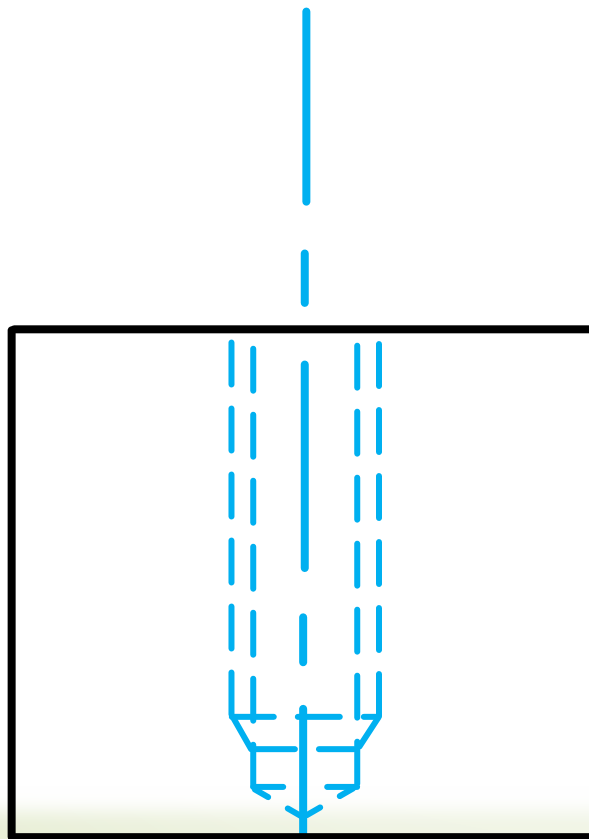
# Mechanical Drawings (sectioning)

- Hatching of an internal hole.



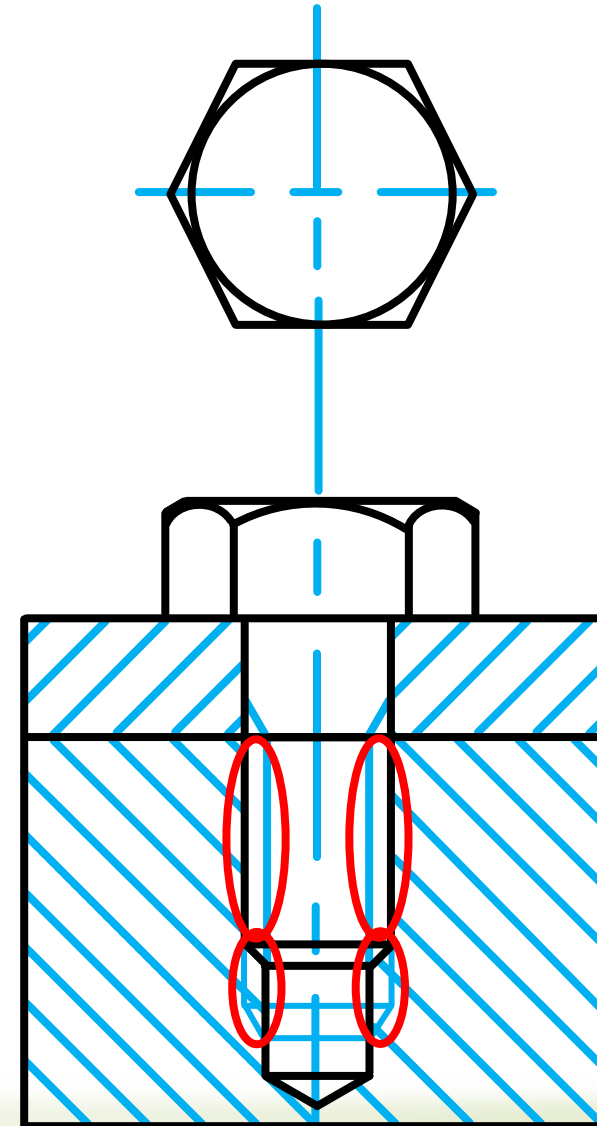
# Mechanical Drawings (sectioning)

- Hatching of an internal hole with thread.



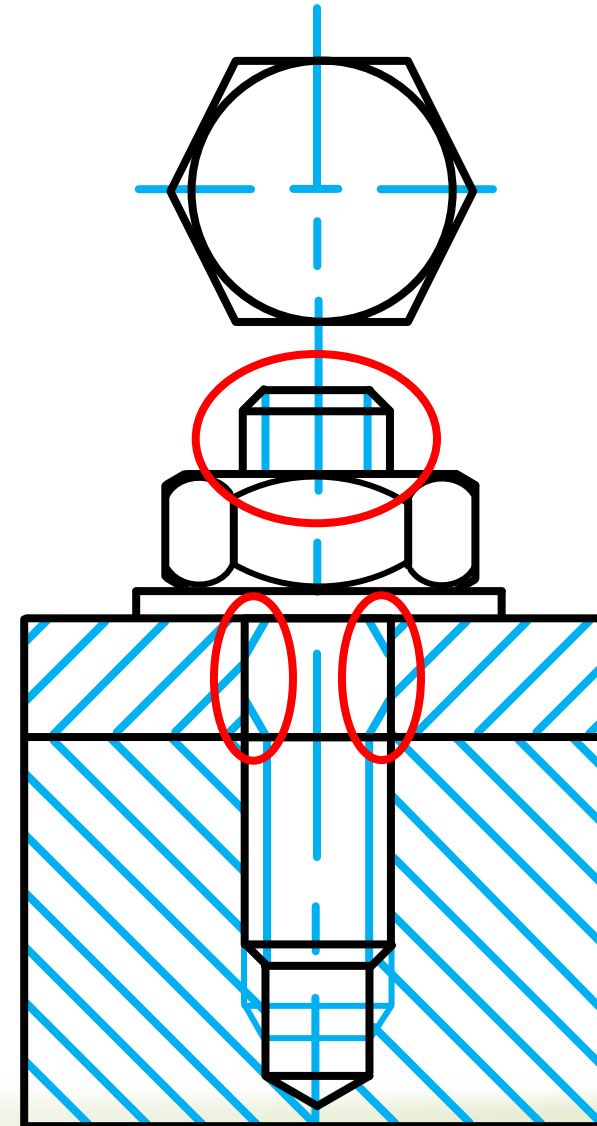
# Mechanical Drawings (sectioning)

- ▶ Hatching of an internal hole including a thread and a bolt.



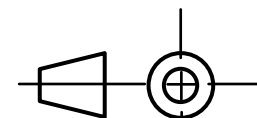
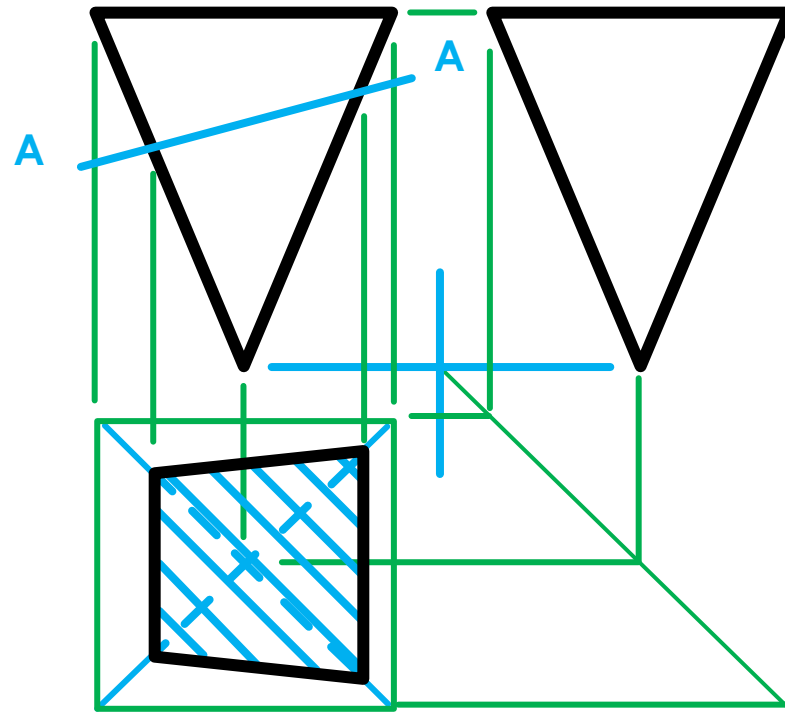
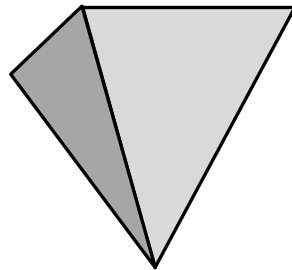
# Mechanical Drawings (sectioning)

- ▶ Hatching an internal hole including a thread, washer, nut and a stud.

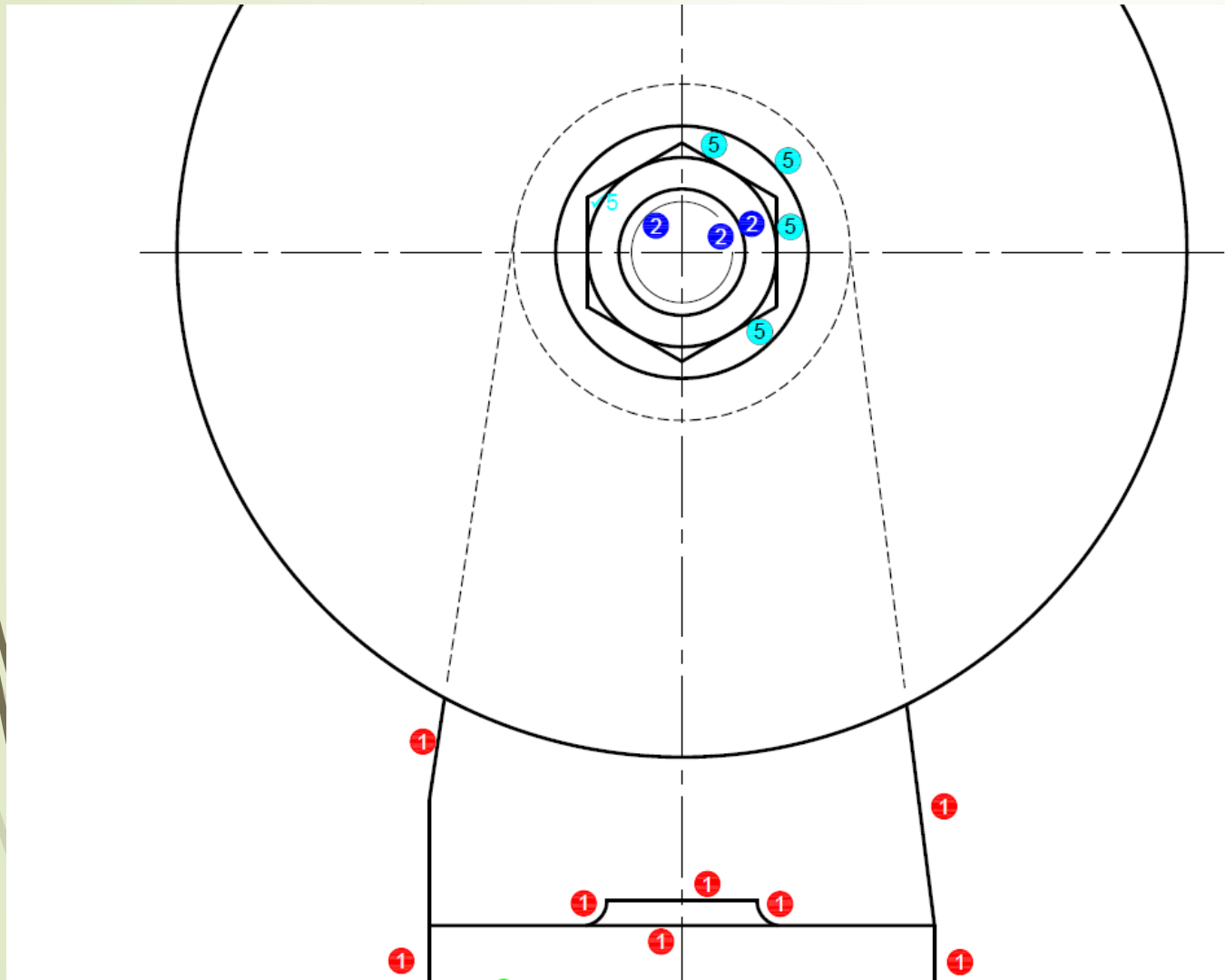


# Sectioning and hidden detail

- ➔ **Hidden detail** should also be shown **behind hatching** when **necessary for clarity**.



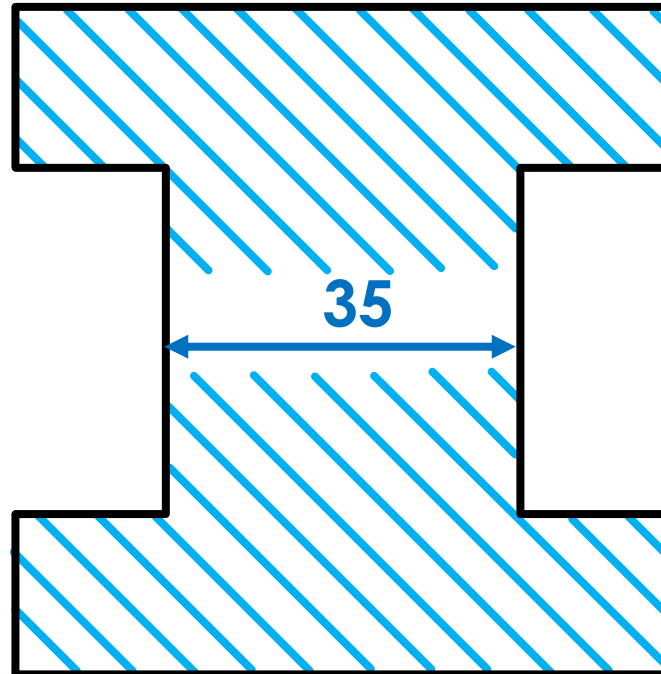
# Hidden detail are sometime required



- Asked as question:
  - 2017

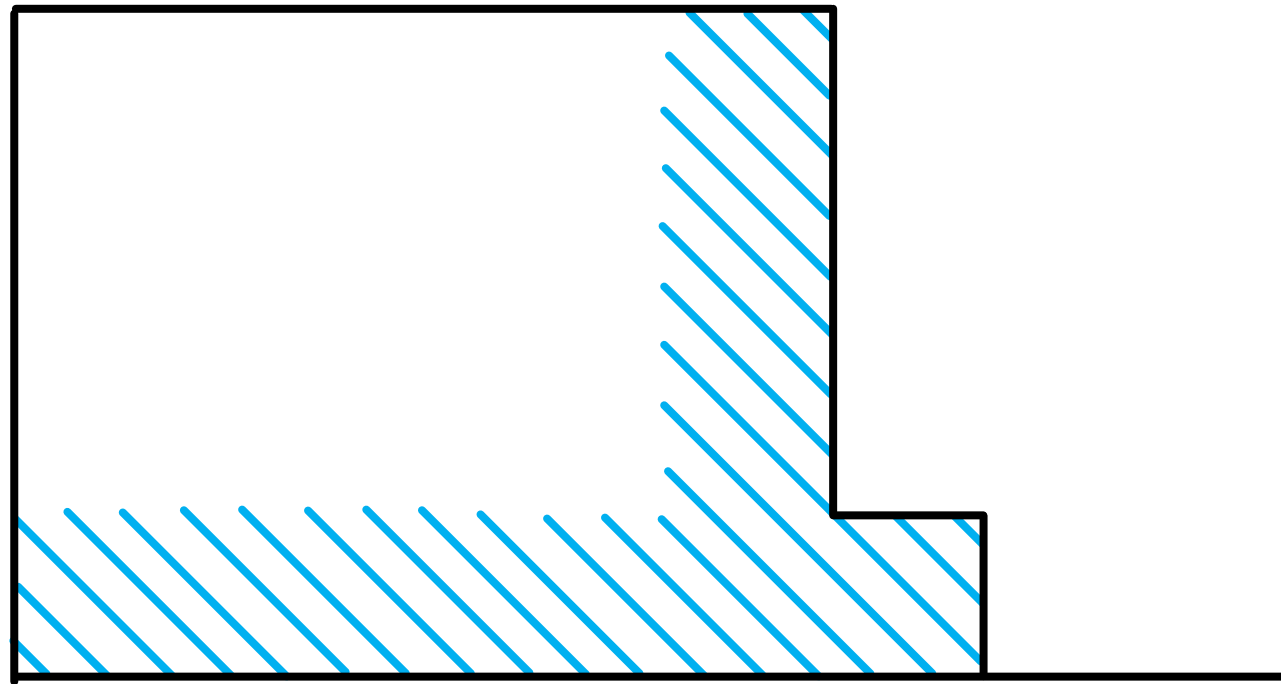
# Mechanical Drawings (sectioning)

- ▶ Hatching may be interrupted for dimensions and lettering.



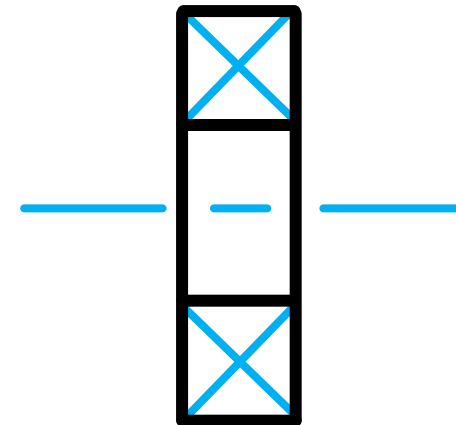
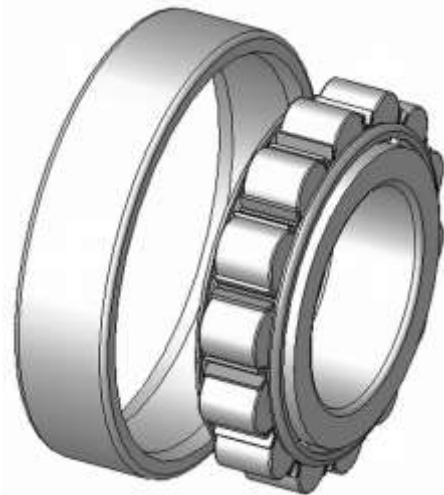
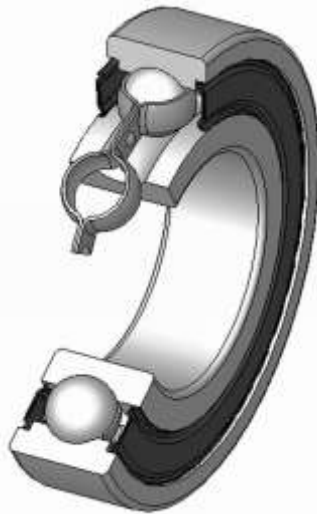
# Mechanical Drawings (sectioning)

- ➔ In the case of a large area, the hatching may be limited to a zone following the outline of the area



# Mechanical Drawings (sectioning)

- Indication of a bearing.



# Mechanical Drawings (sectioning)

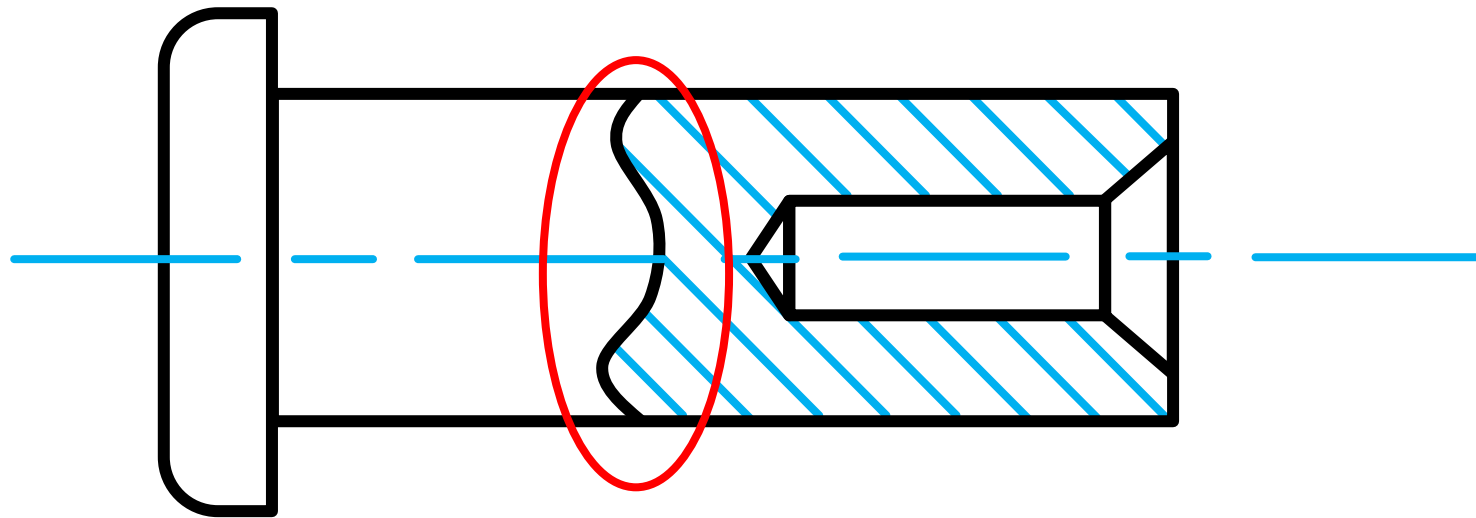
- ▶ Asked as question:
  - ▶ **2017**

|    |   |              |           |
|----|---|--------------|-----------|
| 22 | In the space below (ANSWER 22), draw, in neat freehand, the conventional representation of a bearing on a section of a shaft. | 5            |           |
|    |   | <b>TOTAL</b> | <b>28</b> |

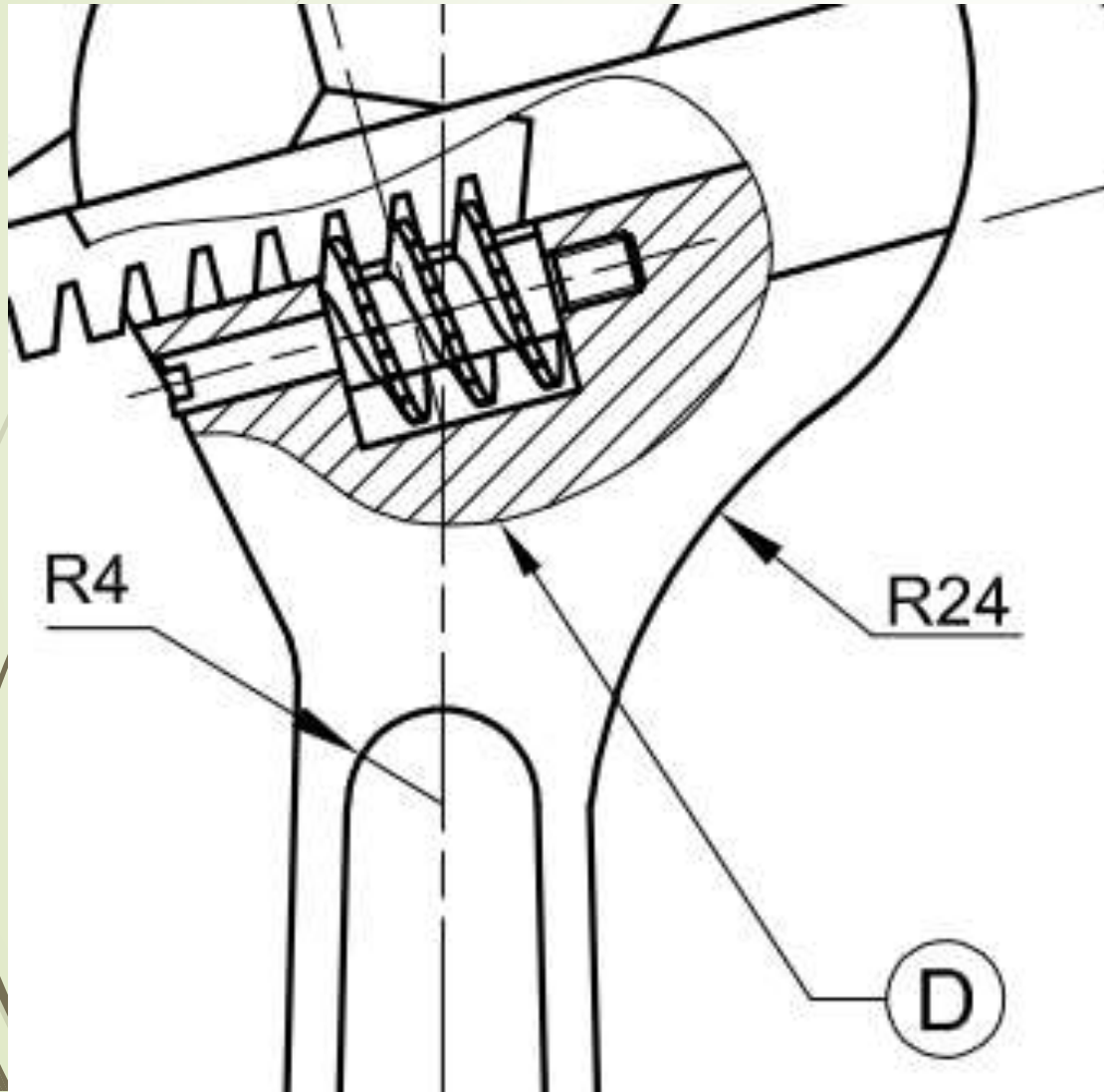
**ANSWER 22:** Conventional representation of a bearing on a section of a shaft

# Mechanical Drawings (sectioning)

- ➔ A view may be drawn in **part section** (*gedeeltelike snit*) to show detail that would otherwise be hidden



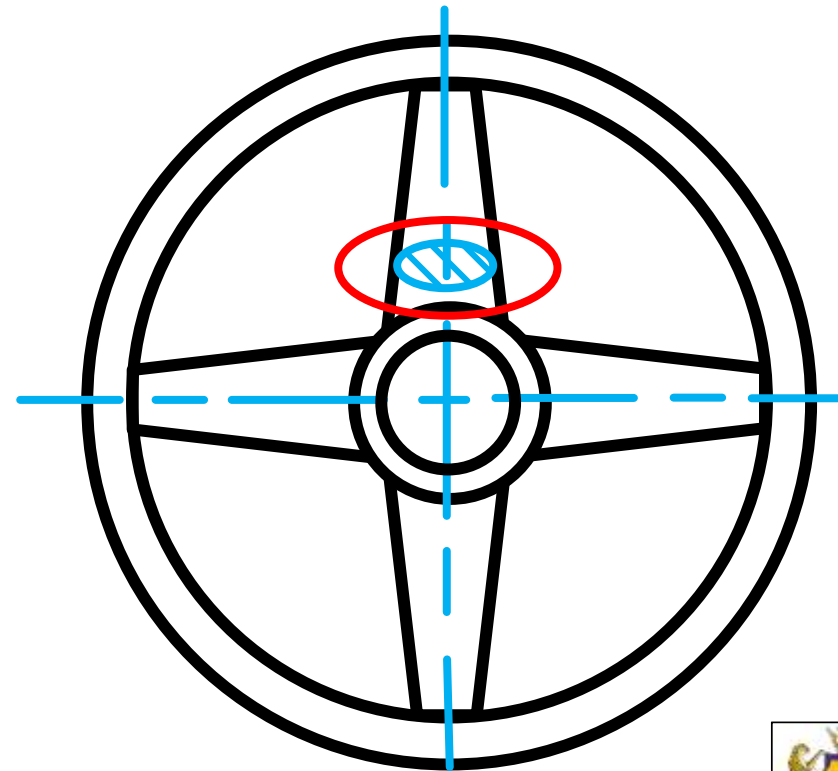
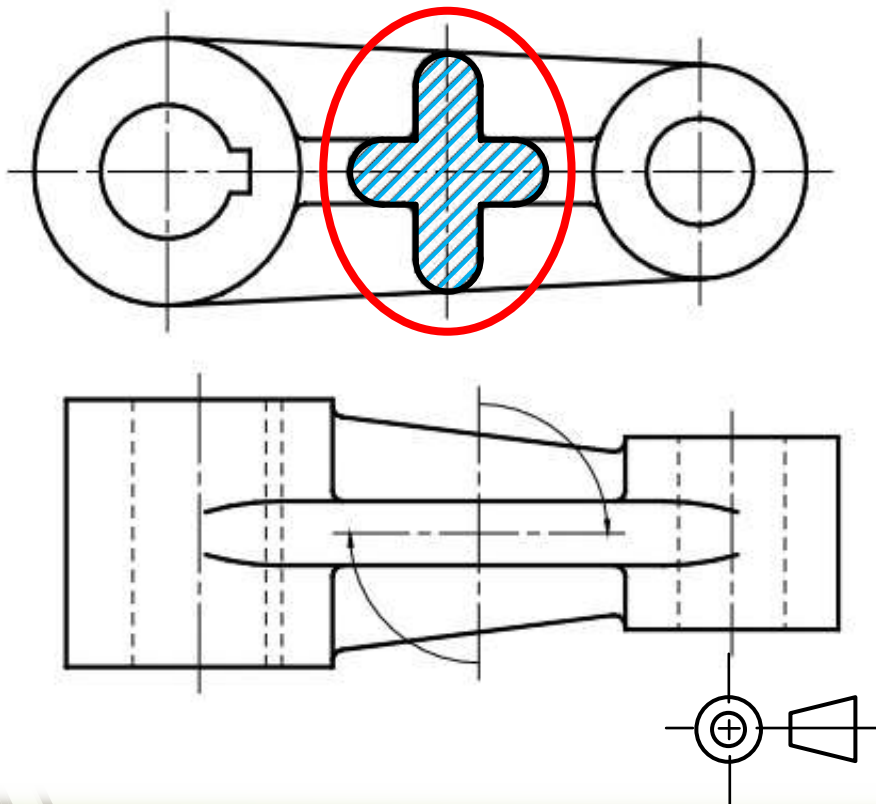
# Mechanical Drawings (sectioning)



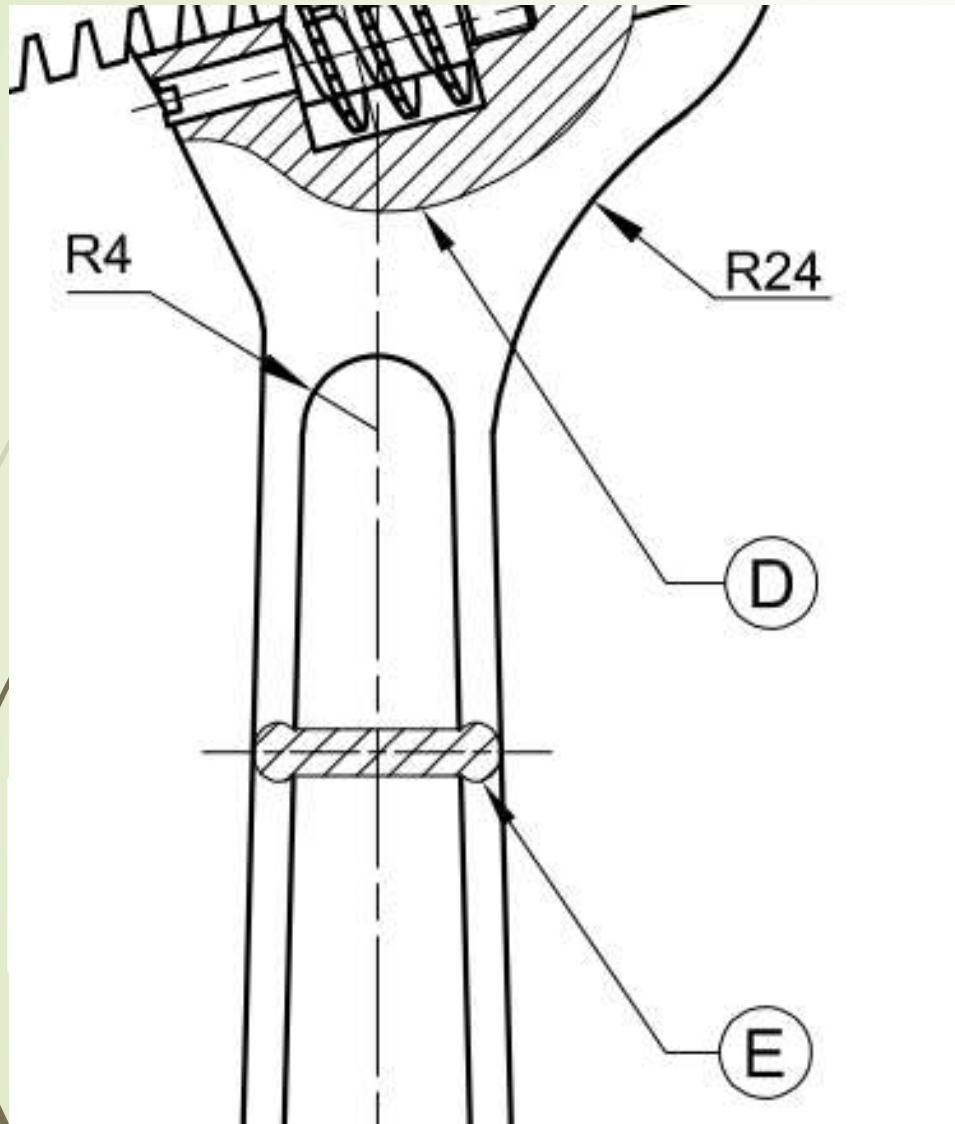
- ▶ Asked as question:
  - ▶ 2017

# Mechanical Drawings (sectioning)

- A **revolved section** (*wentelsnit*) is used to show the **shape** of a cross-section by revolving the cutting plane in position.



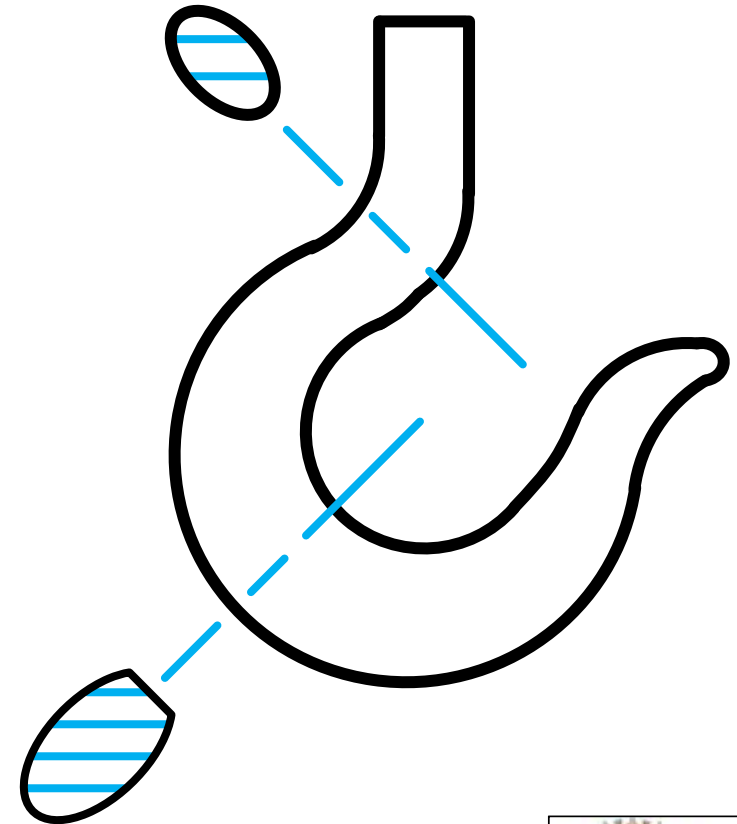
# Mechanical Drawings (sectioning)



- Asked as question:
  - **2017**

# Mechanical Drawings (sectioning)

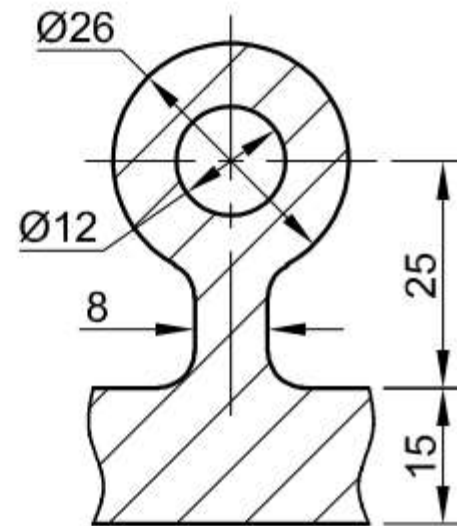
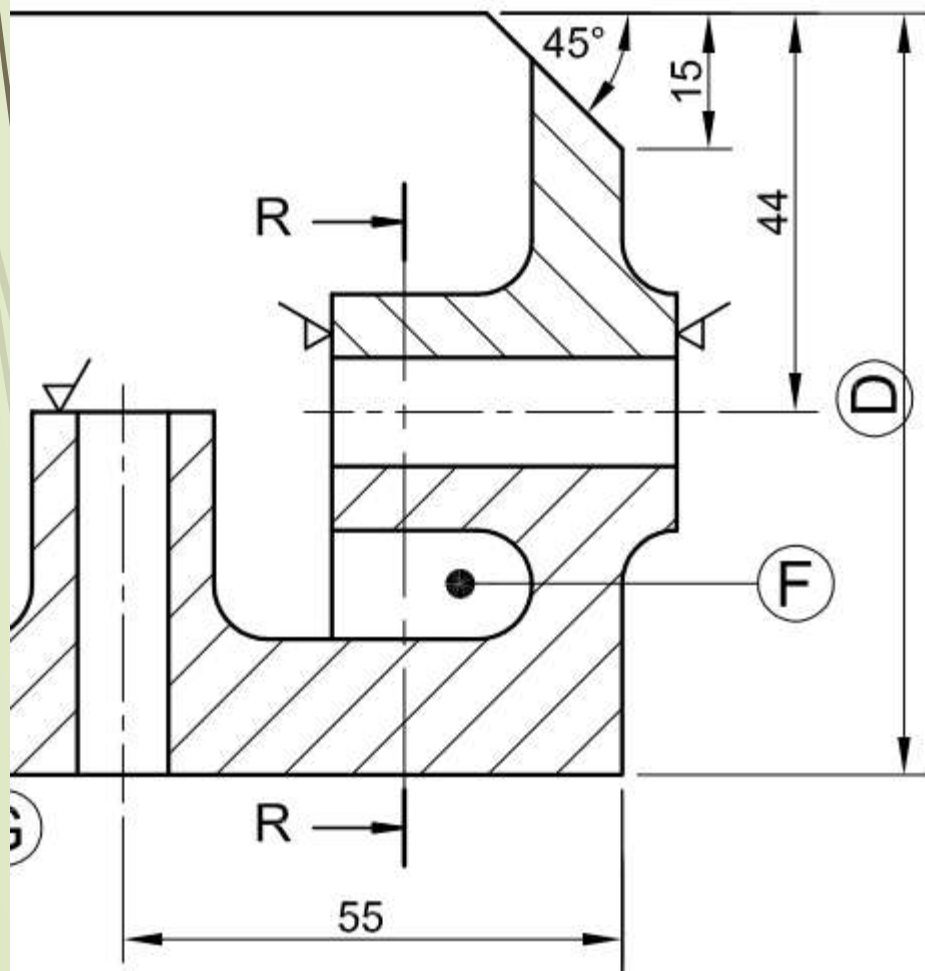
- A removed section (*verwyderde snit*) show the **shape** of the cross-section placed near the view and, if applicable, connected with the view by its line of symmetry (thin chain line) through the cutting plane.



# Mechanical Drawings (sectioning)

► Asked as question:

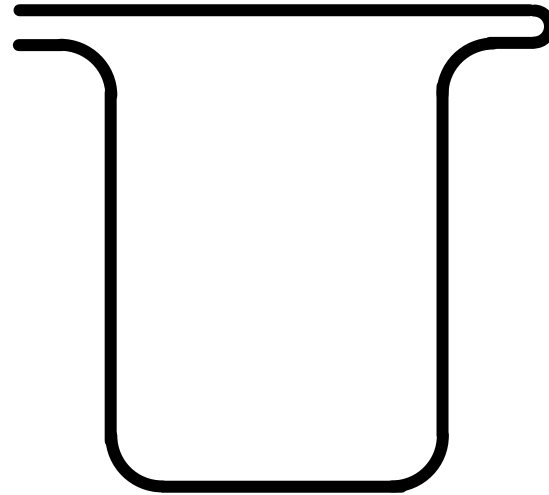
► 2019



VIEW R-R

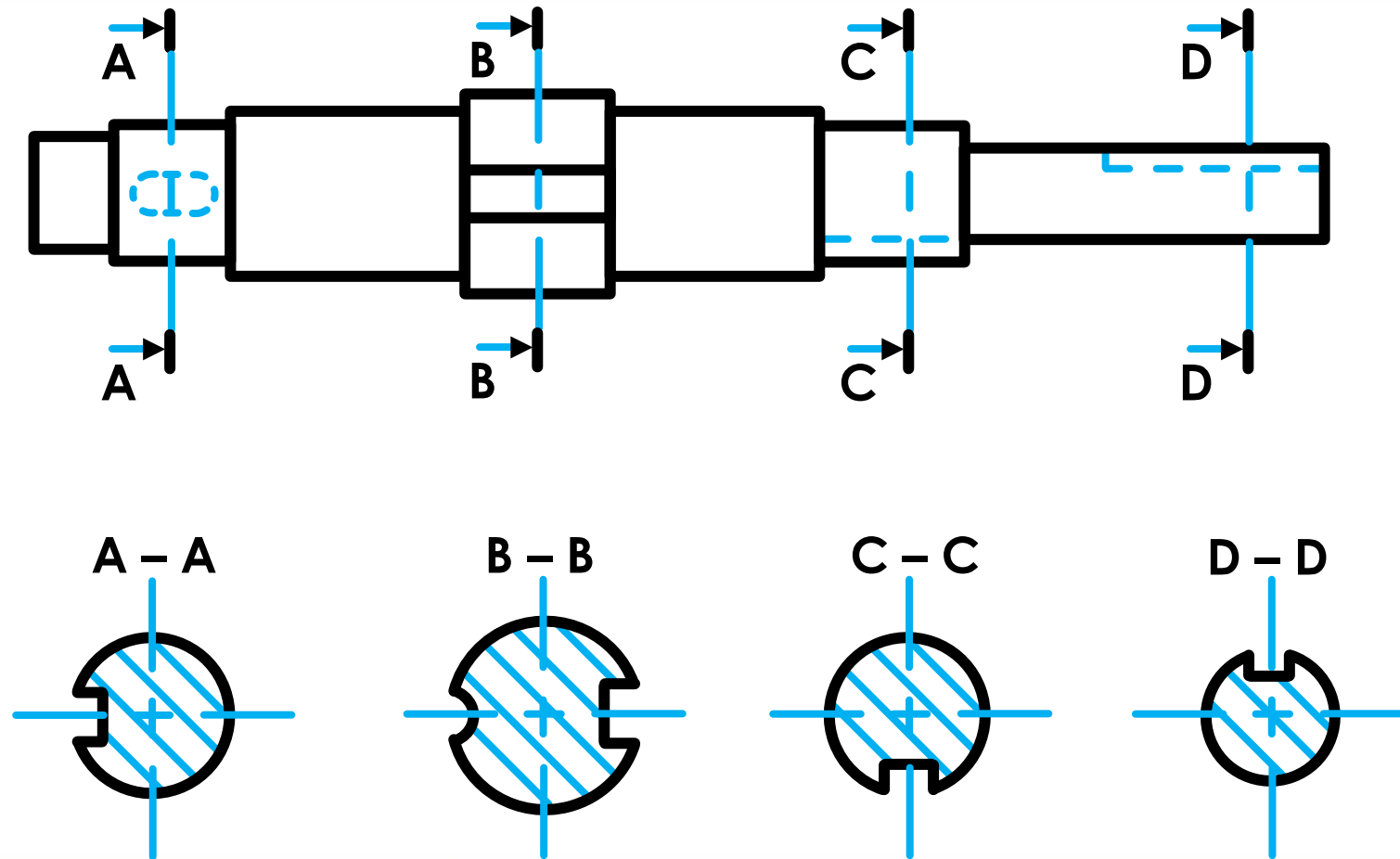
# Mechanical Drawings (sectioning)

- Sections of components that are **too thin** for hatching may be blackened (i.e. filled in solid), and a space left between adjacent components.

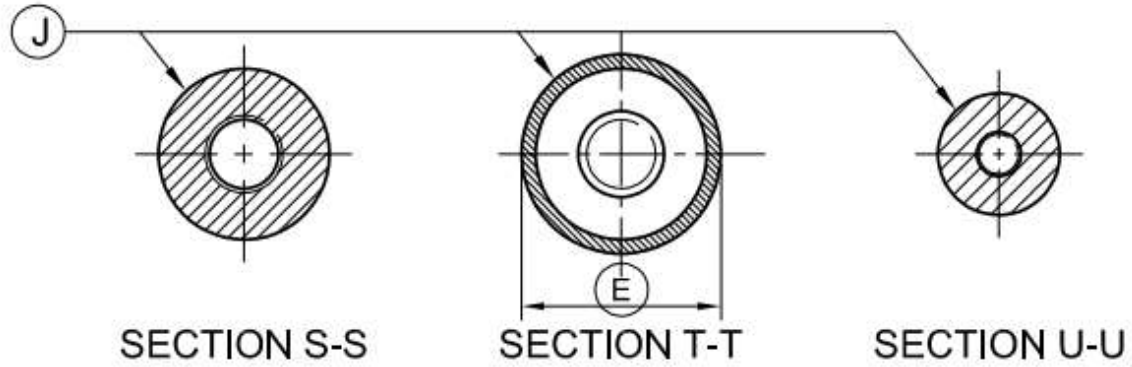


# Mechanical Drawings (sectioning)

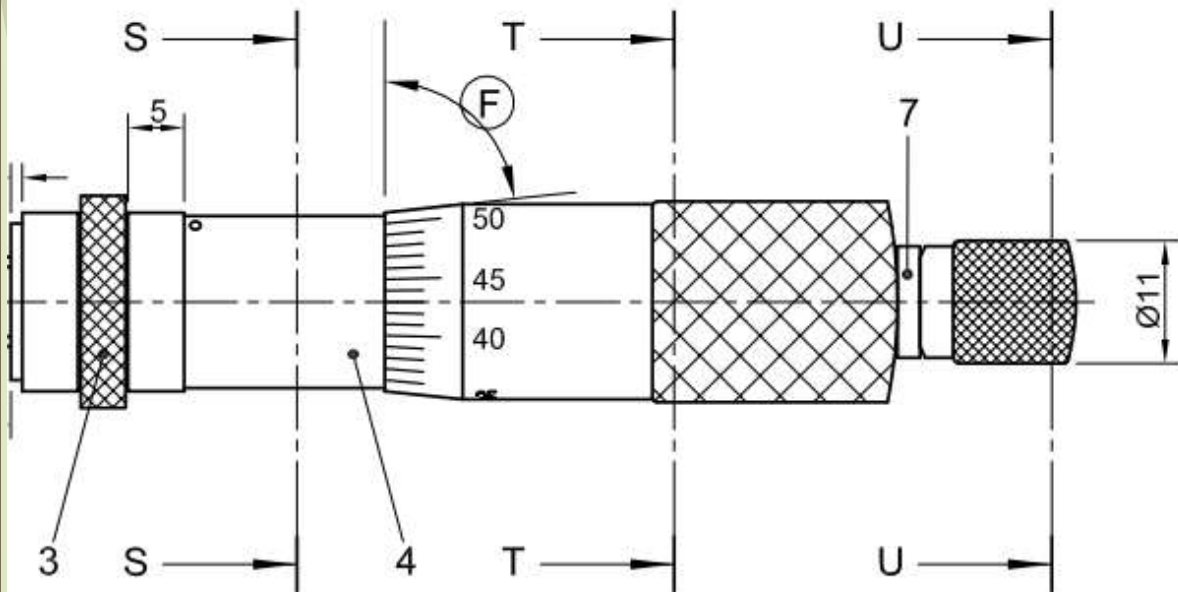
## Successive sections (opeenvolgende snit)



# Mechanical Drawings (sectioning)

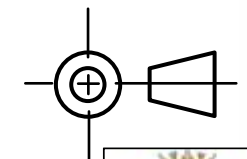
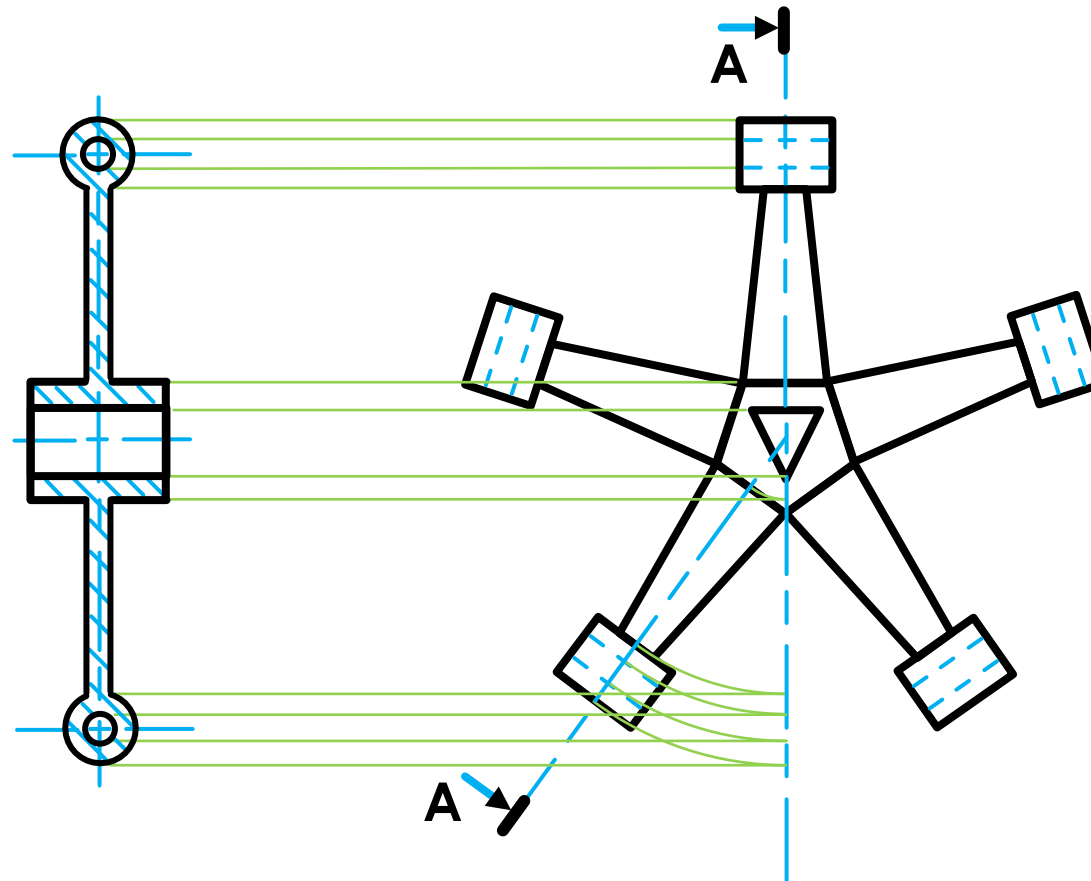


➤ Asked as question:  
➤ 2018



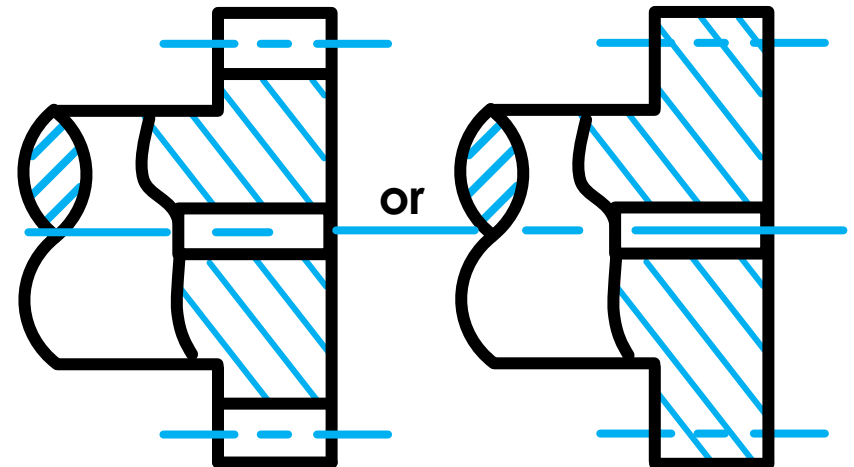
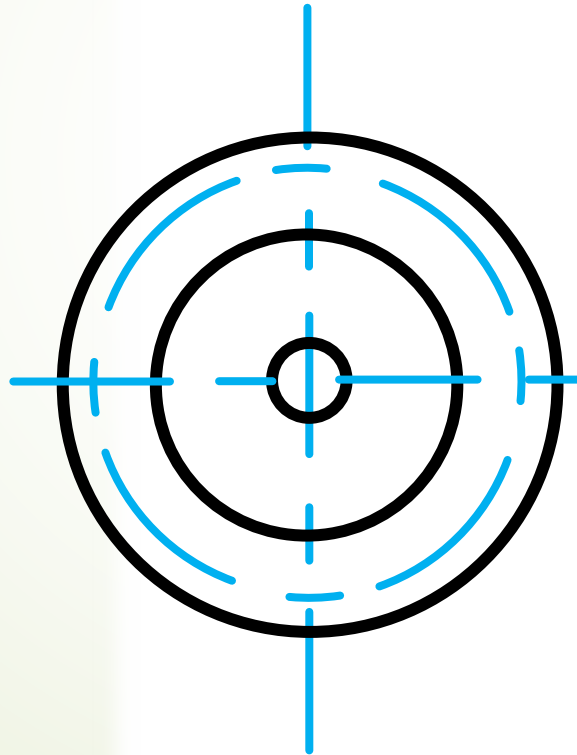
# Mechanical Drawings (sectioning)

## ➤ Aligned sections (*stelsnit*)



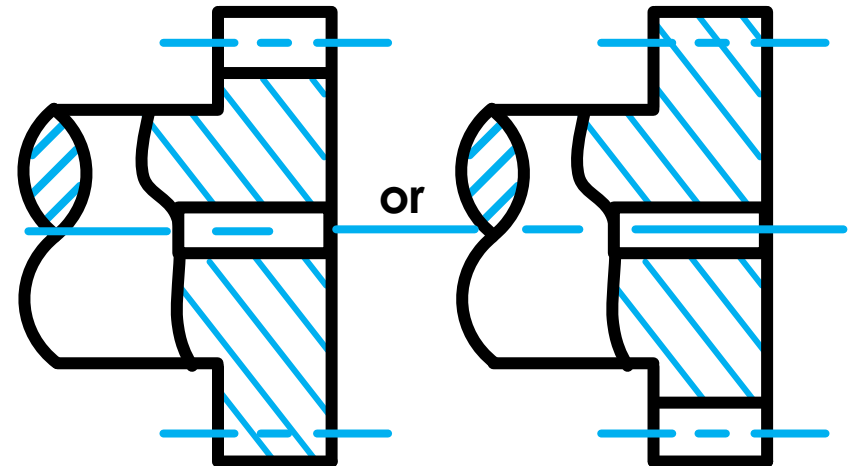
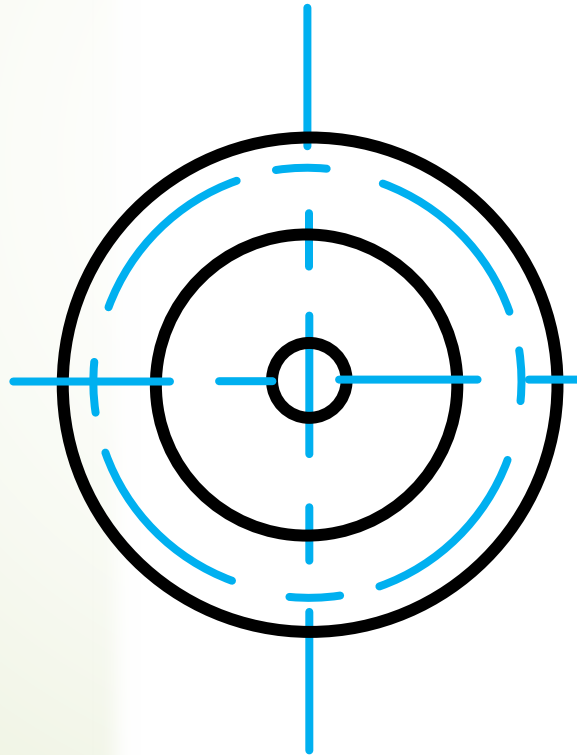
# PRESENTATION OF COMMON FEATURES

- The conventional representation of a gear.
  - Equal number of teeth.



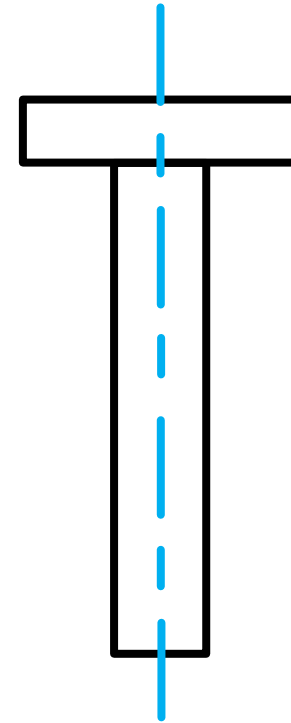
# PRESENTATION OF COMMON FEATURES

- The conventional representation of a gear.
  - Unequal number of teeth.



# Mechanical Drawings (sectioning)

- **Rivets** may **not** be sectioned when the cutting plane passes longitudinally through them.



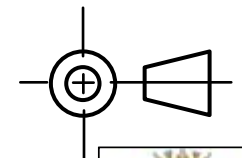
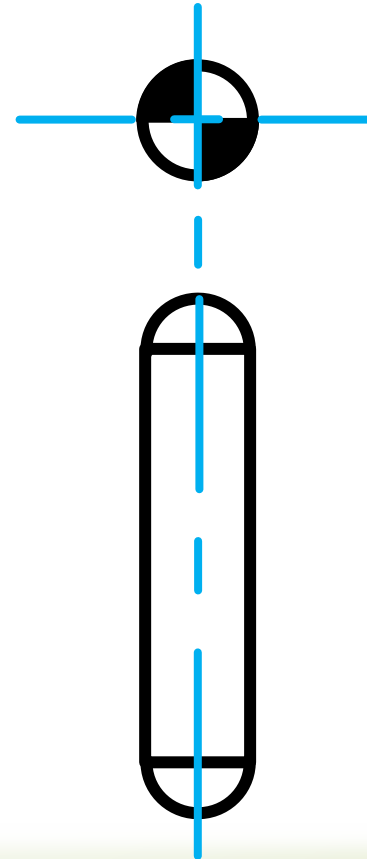
# Mechanical Drawings (sectioning)

- ➔ **Rods (Stang)** of any kind may **not** be sectioned when the cutting plane passes longitudinally through them.



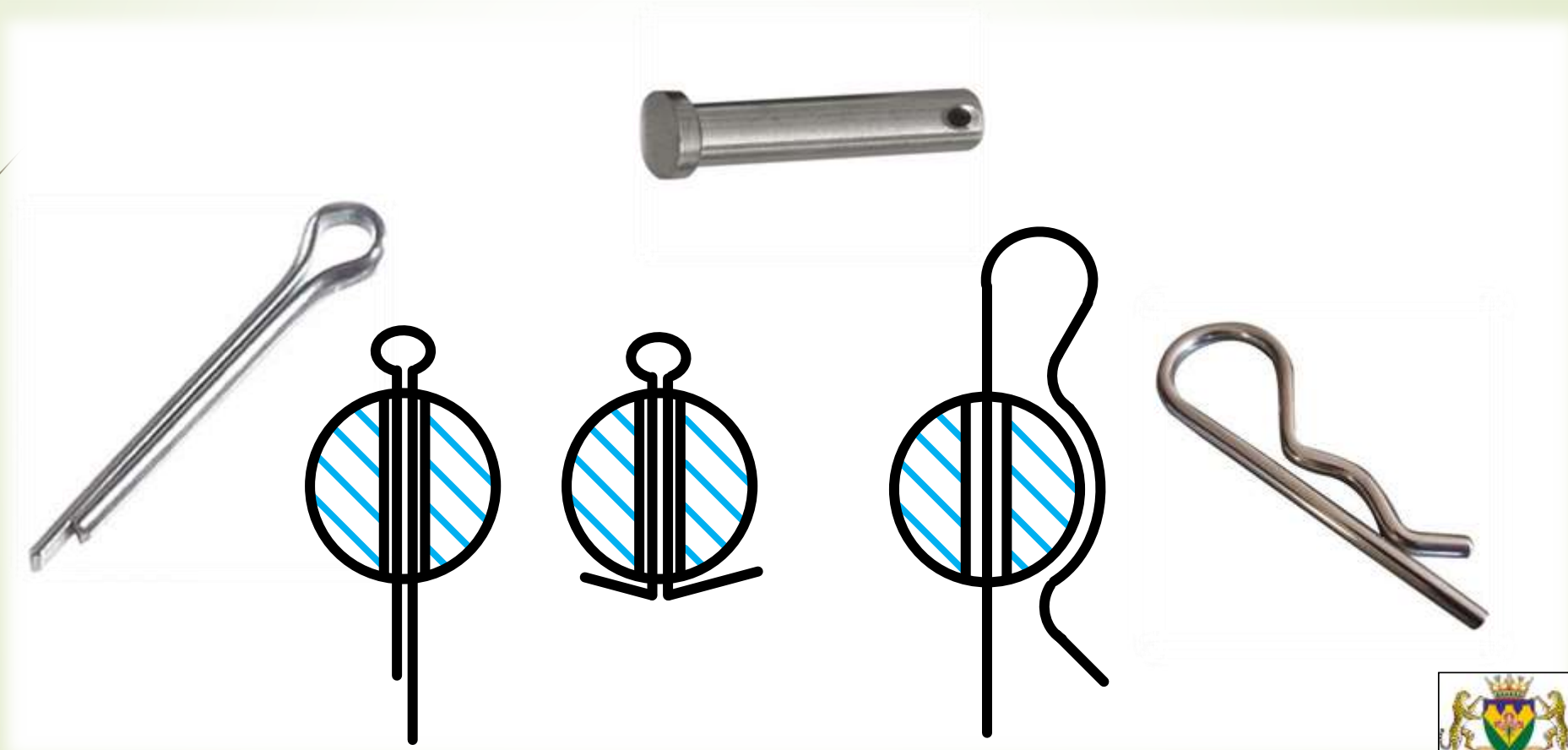
# Mechanical Drawings (sectioning)

- **Dowels** may **not** be sectioned when the cutting plane passes longitudinally through them.



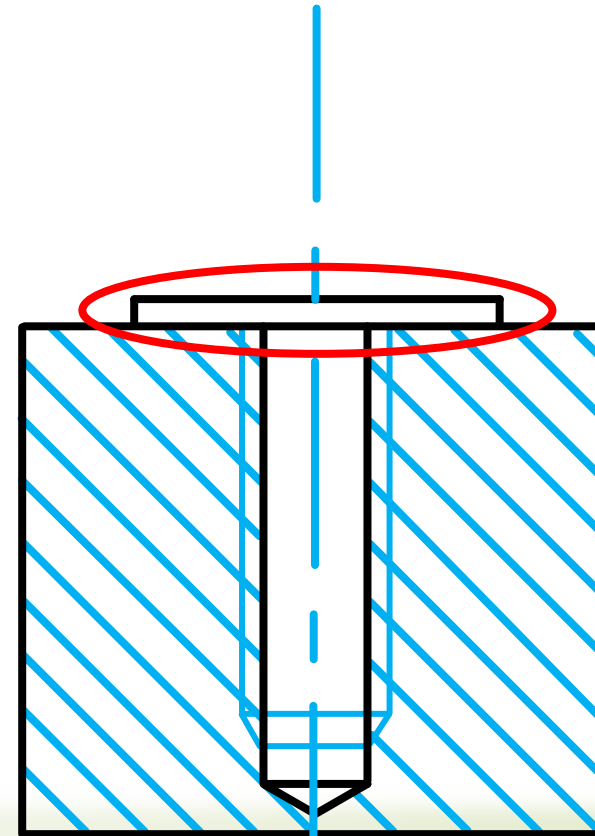
# Mechanical Drawings (sectioning)

- Pins may **not** be sectioned when the cutting plane passes longitudinally through them.



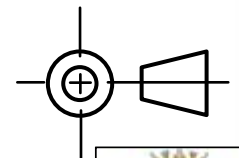
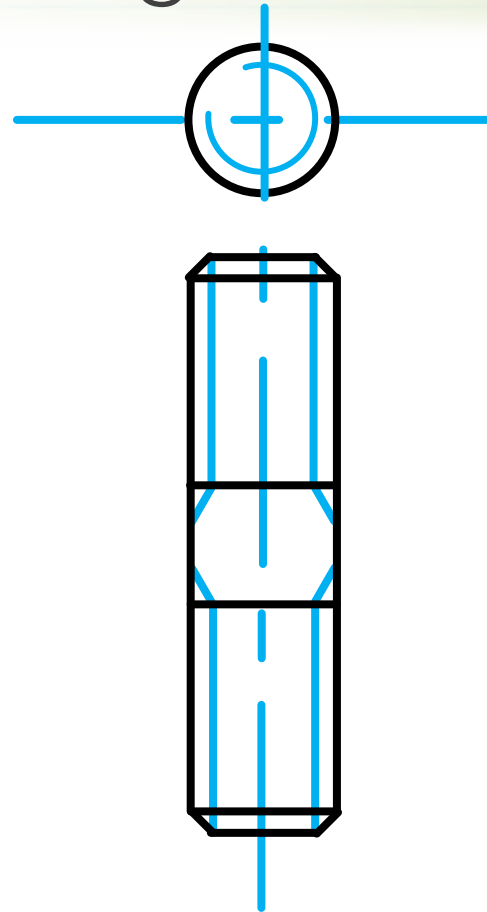
# Mechanical Drawings (sectioning)

- Washers may **not** be sectioned.



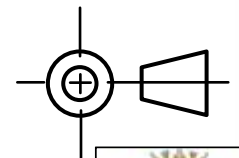
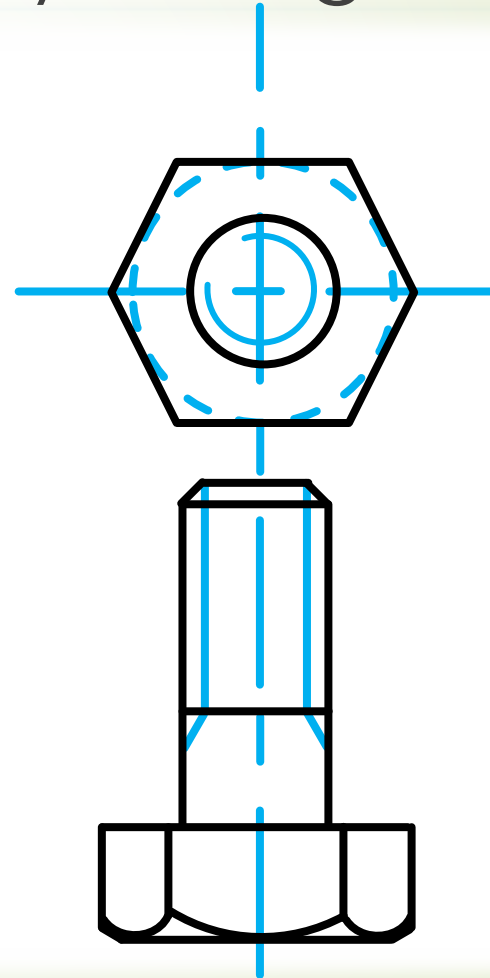
# Mechanical Drawings (sectioning)

- **Studs (tapend)** may **not** be sectioned when the cutting plane passes longitudinally through them.



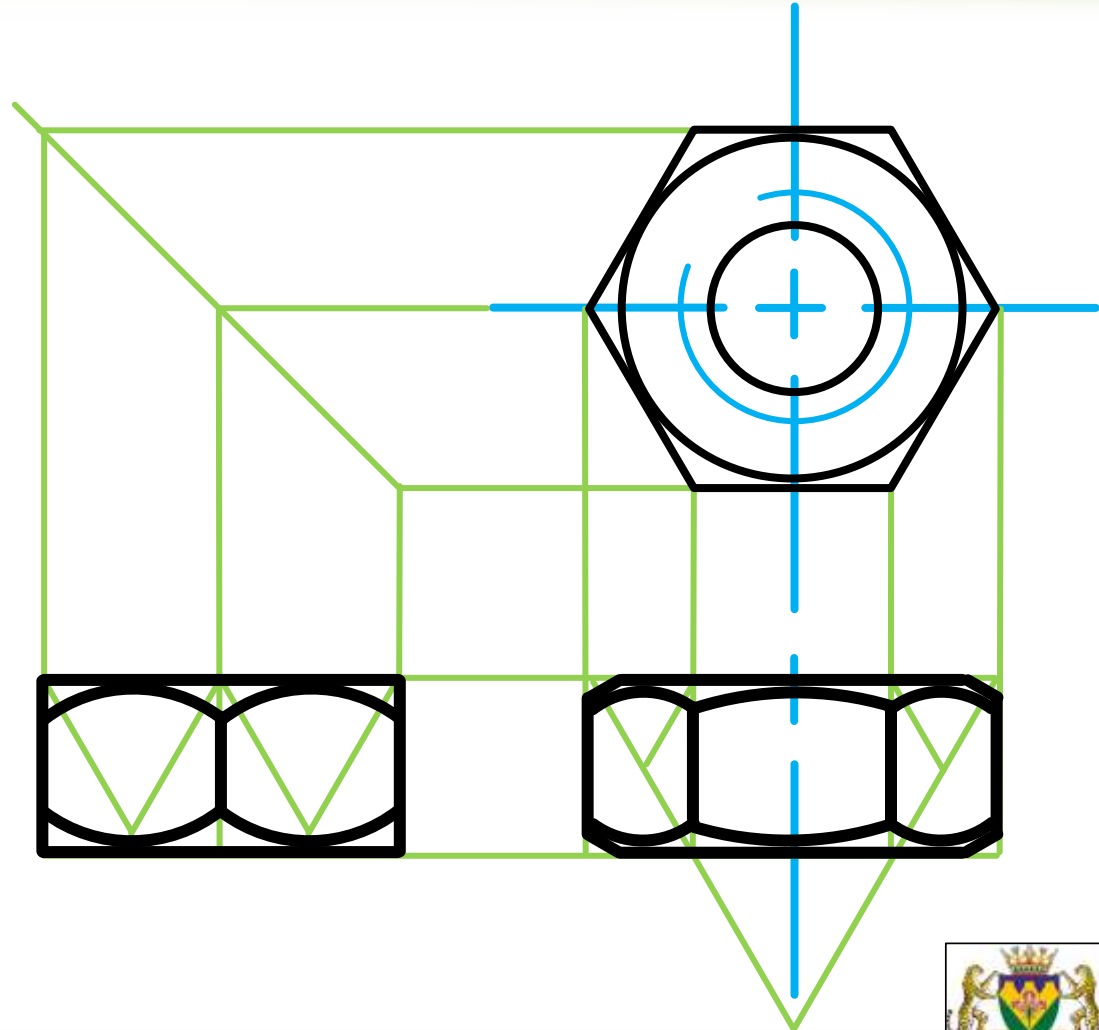
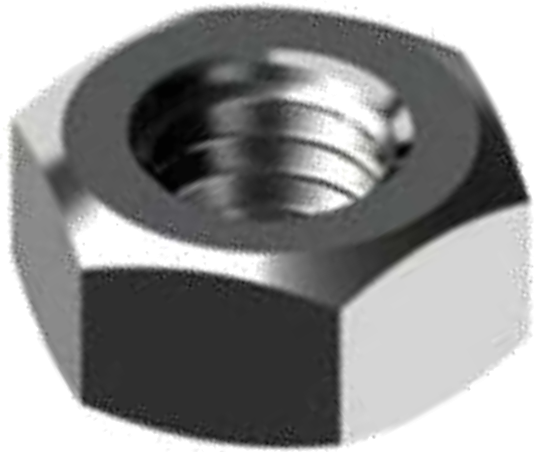
# Mechanical Drawings (sectioning)

- ➔ **Bolts** may **not** be sectioned when the cutting plane passes longitudinally through them.



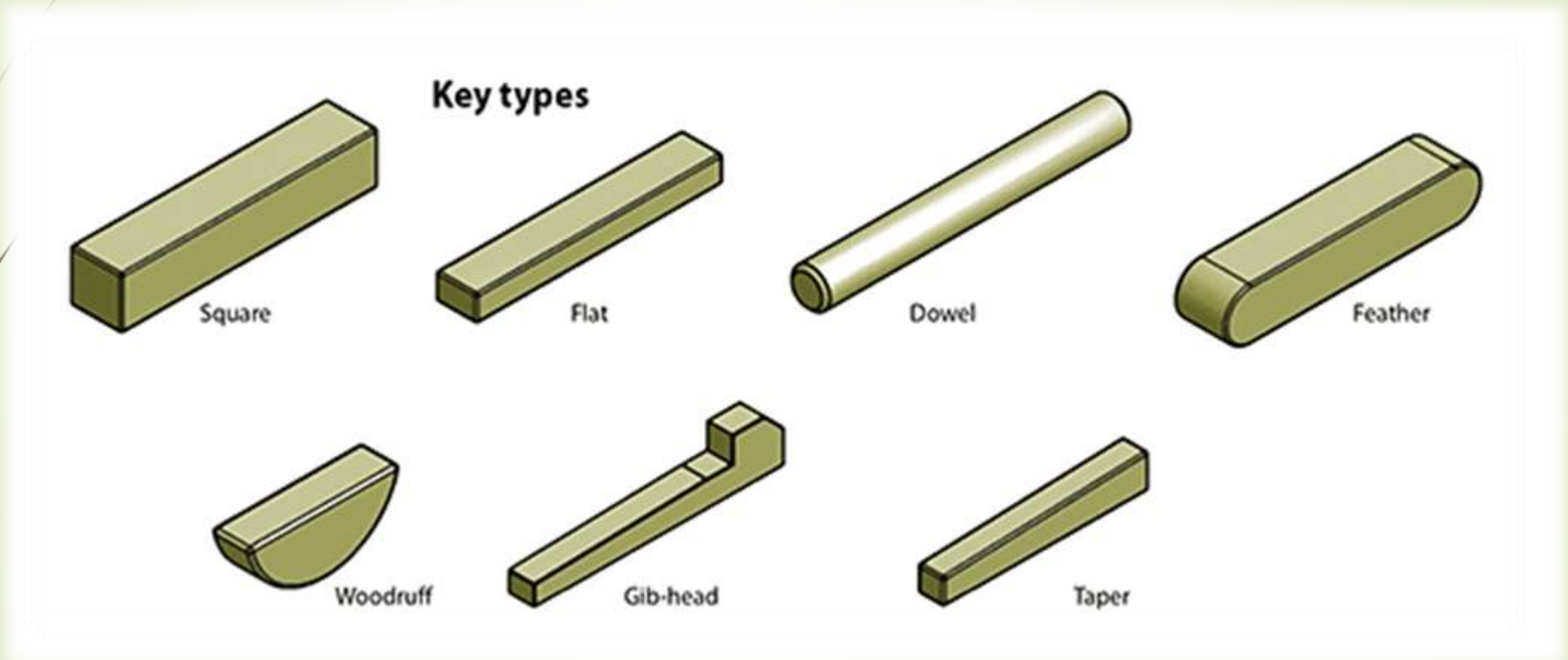
# PRESENTATION OF COMMON FEATURES

- ➔ Nuts may **not** be sectioned.



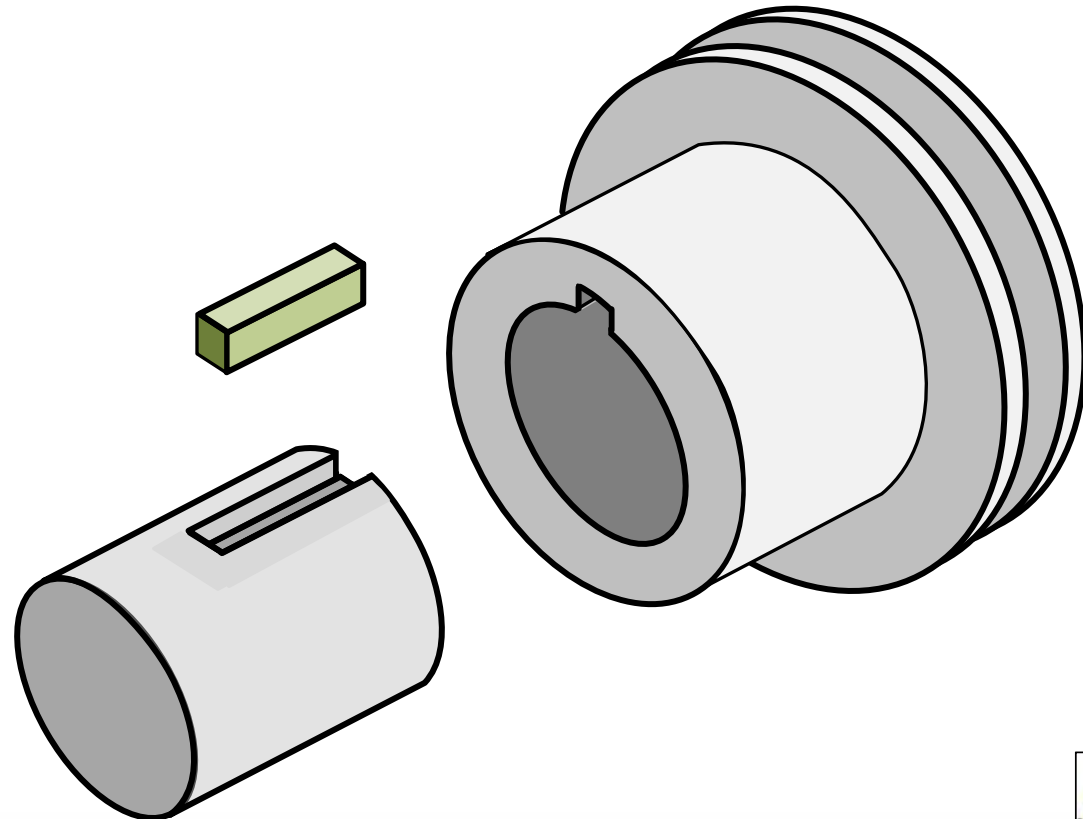
# Mechanical Drawings (sectioning)

- Keys may **not** be sectioned when the cutting plane passes longitudinally through them.



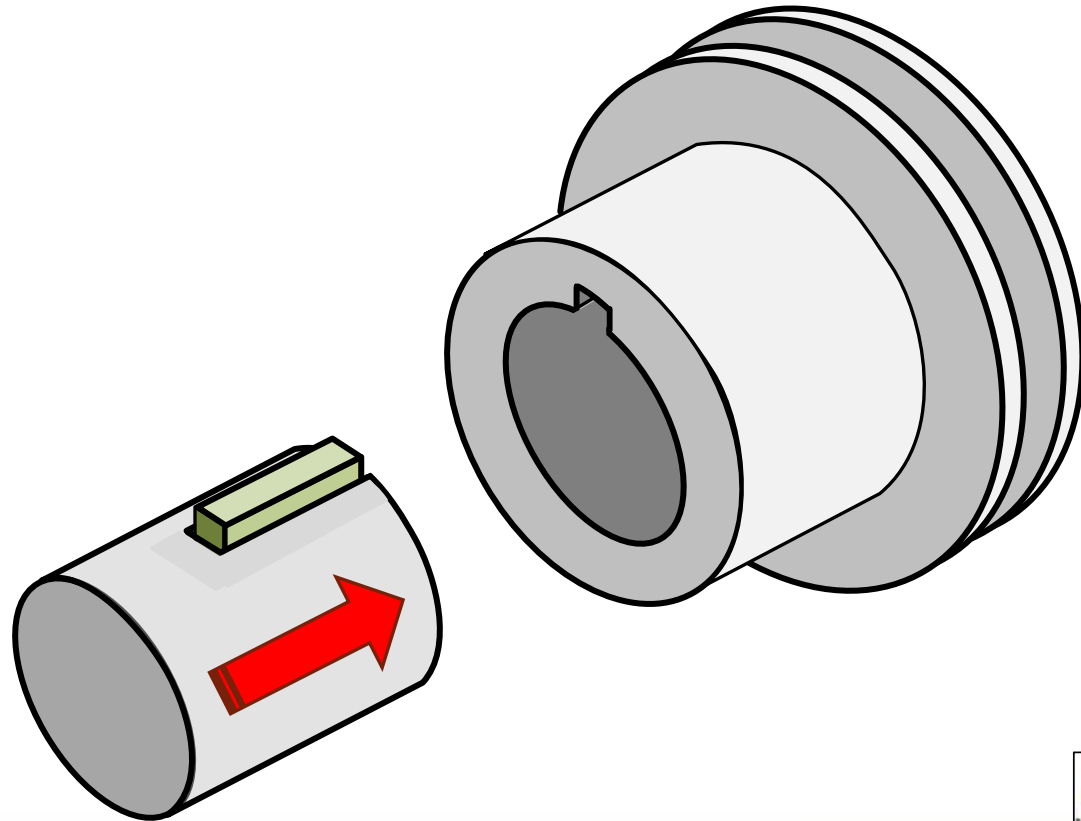
# Mechanical Drawings (sectioning)

- **Keys** may **not** be sectioned when the cutting plane passes longitudinally through them.



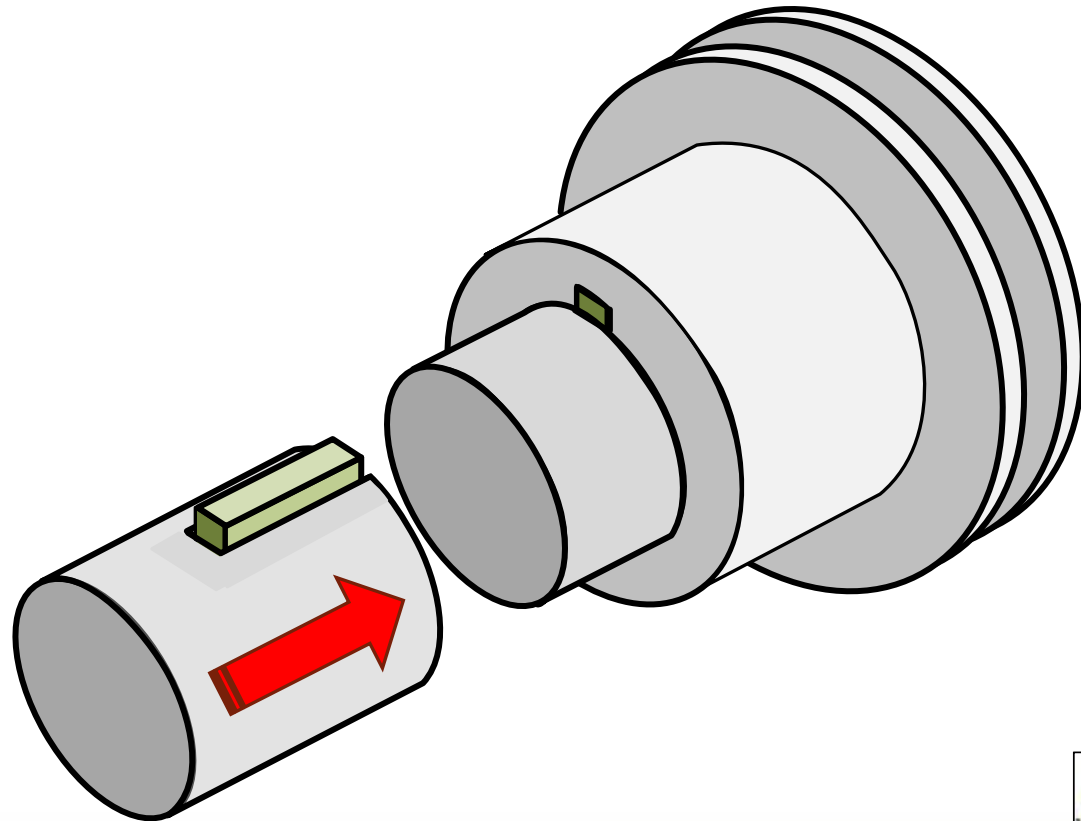
# Mechanical Drawings (sectioning)

- **Keys** may **not** be sectioned when the cutting plane passes longitudinally through them.



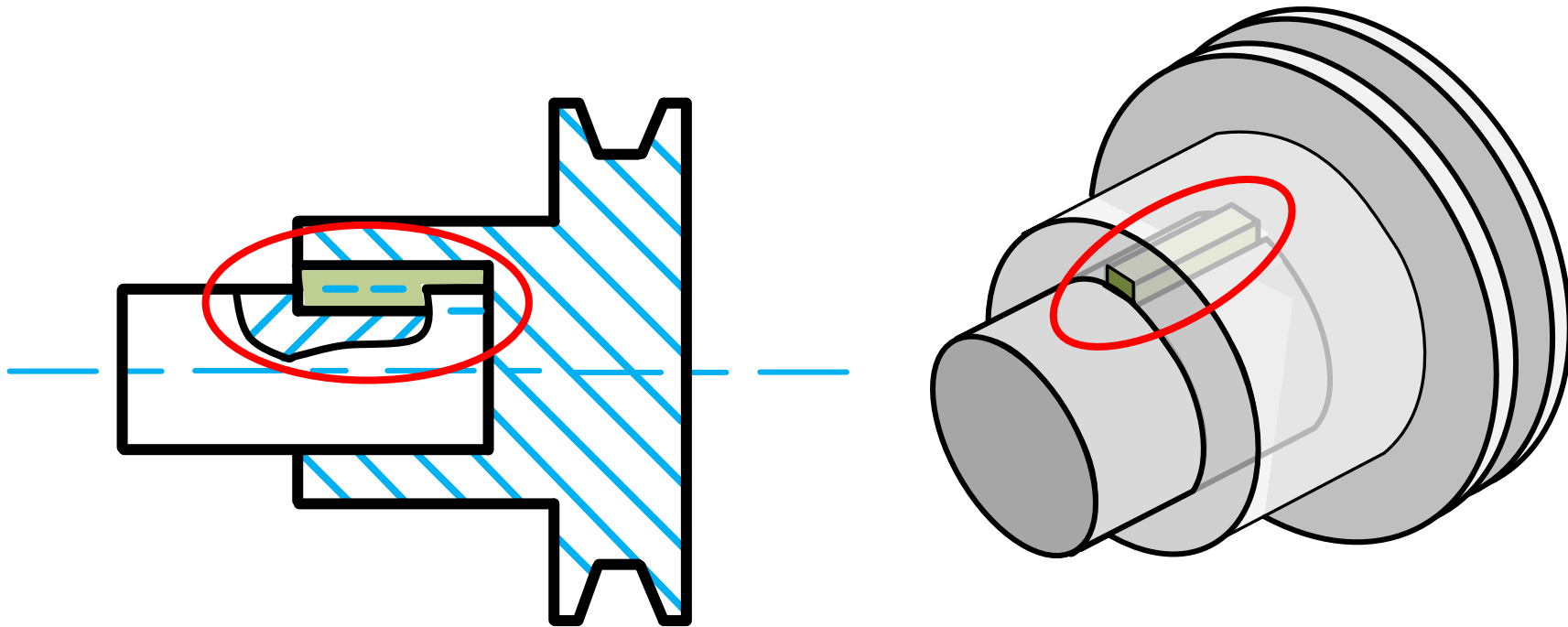
# Mechanical Drawings (sectioning)

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