Cuts and Sections

Cuts

- **The principles of representation studied in the previous chapter "Orthogonal Projections" are perfectly suited to describing and defining the shapes and external contours, even for complex objects. In the case of hollow parts, however, this is not the case, as internal shapes described using thin interrupted lines are difficult to define. To improve definition and readability, section views (cuts and sections) are used.**

Cutting :

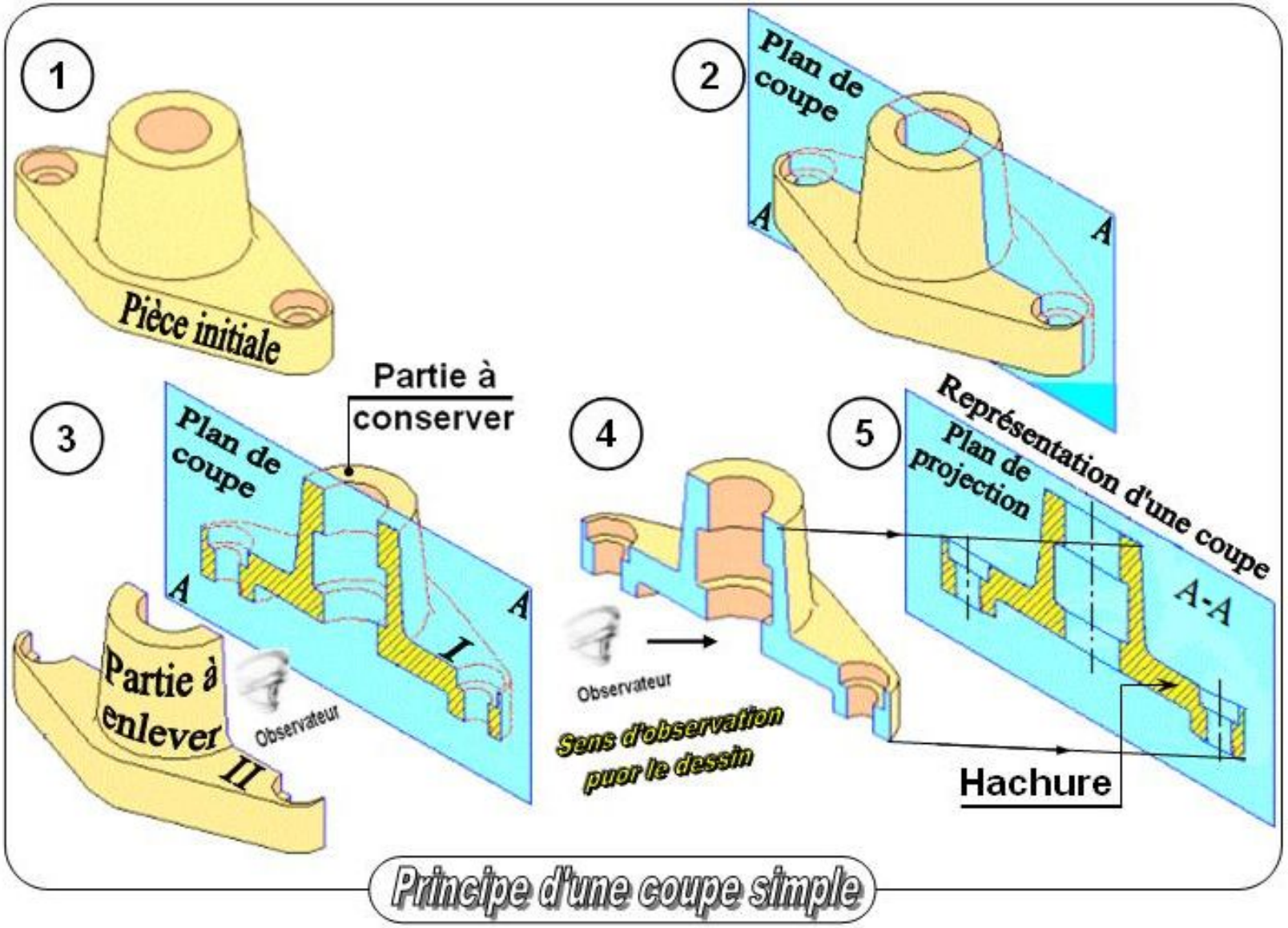
Simple Cutting (Principle):

In this mode of representation, the object is cut (analogy with a fruit cut with a knife). The pieces are separated. The most representative one is retained.

The observer, looking toward the cutting plane, draws the entire piece following the usual rules. The interior, now visible, appears clearly in bold lines.

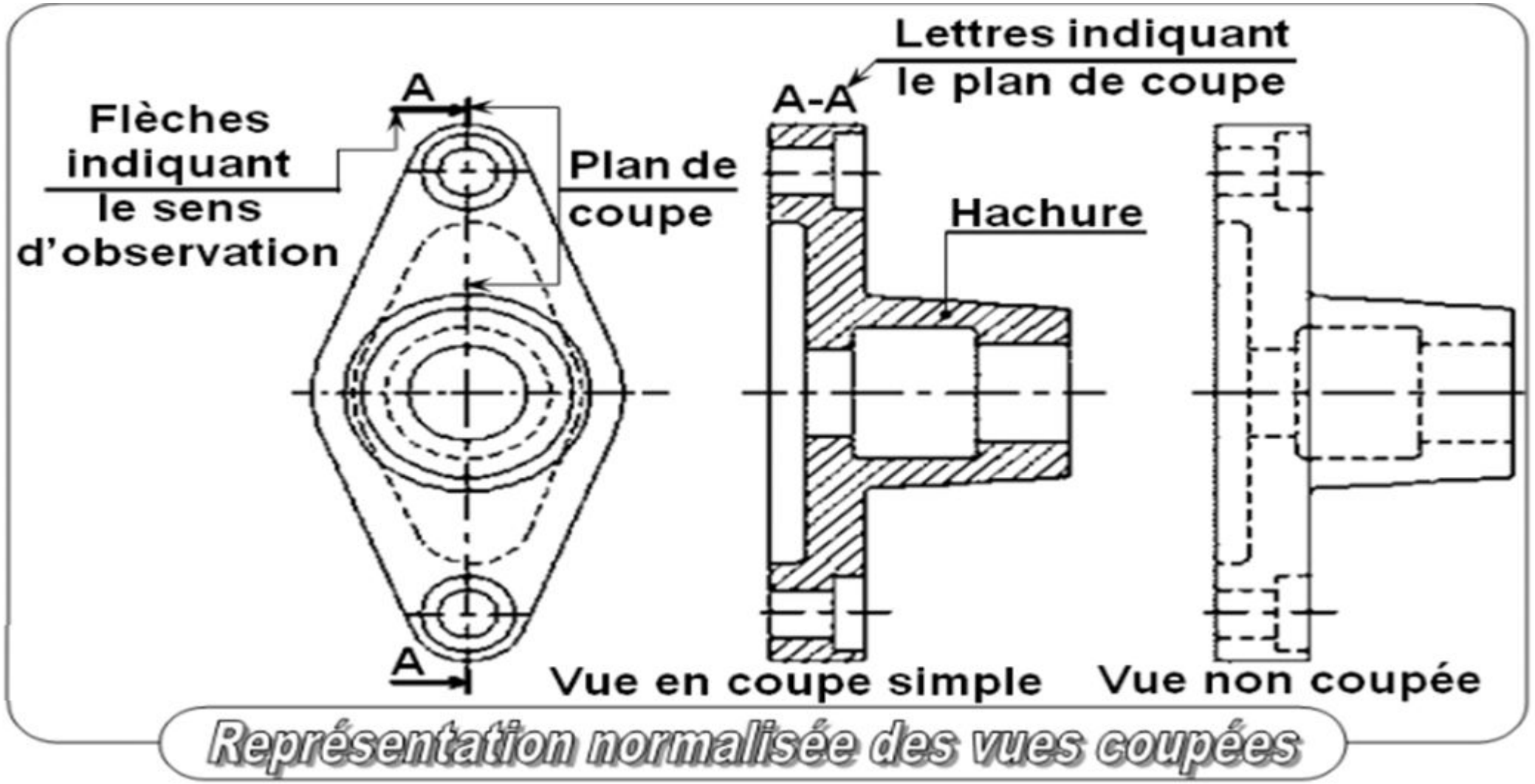
principle

1- Initial part.
2- Choose a cutting plane A-A that divides the part into two sections, smoothing its trace.
3- Separate the cut part, and position the observer between sections I and II.
4- Remove (delete) section II of the part.
5- Draw the internal details of the part (section I) using the orthogonal projection method on the projection plane and hatch the trace



Standardized Representation Rules:

Note 1:Generally, hidden outlines are not drawn in section views, unless they are essential for understanding.



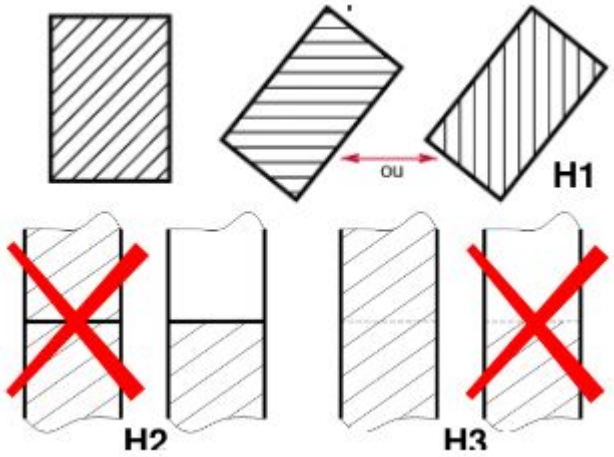
Cutting Plane:

- It is indicated in an adjacent view.
- It is materialized by a thin center line (axis line) reinforced at both ends by two thick solid lines.
- The viewing direction is indicated by two arrows (in thick solid lines) pointing toward the part to be retained. The arrow tips touch the cutting plane.
- Two capital letters (AA, BB, etc.) are used to identify both the cutting plane and the corresponding section view. These indications are particularly useful when the drawing includes multiple section views. If there is no possible ambiguity, they are sometimes omitted (neglected).

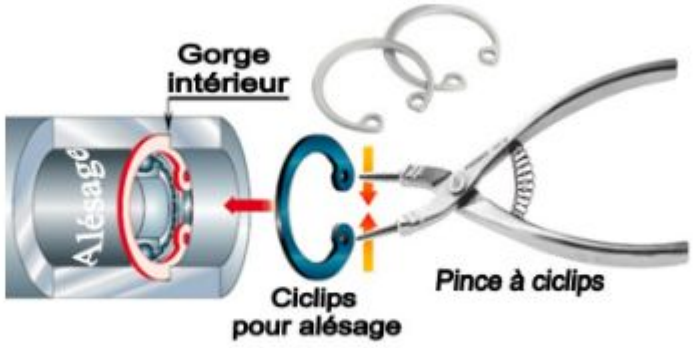
Hatching

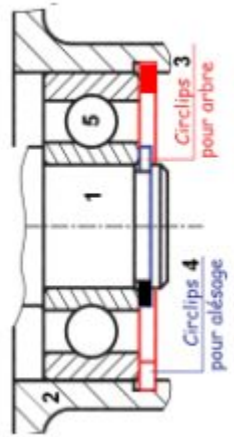
Hatching is drawn with a thin continuous line and is used to highlight cut surfaces, as well as to designate the construction materials of a part.

- Hatching appears where the material has been cut;
- It is drawn with a thin continuous line and is preferably inclined at 45° (in the case of a single cut object) relative to the general contour lines (see H1);



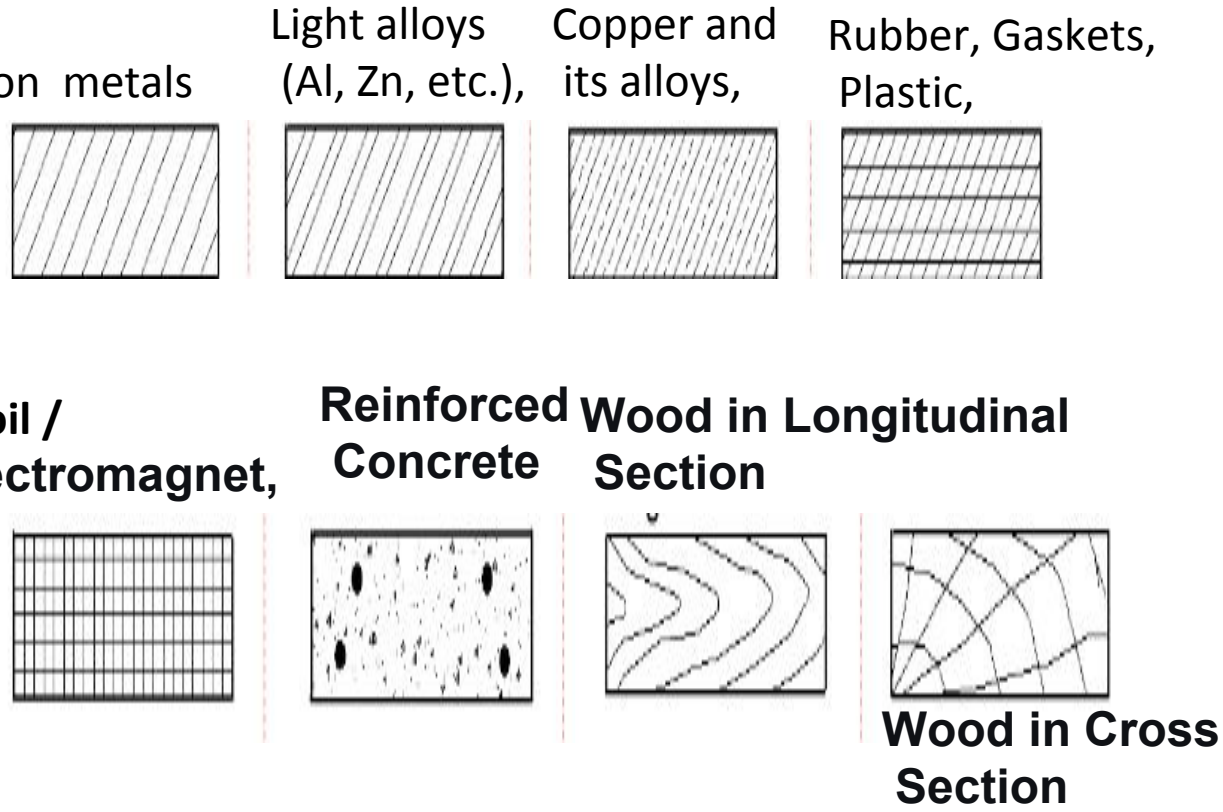
- It never crosses a thick continuous line (see H2);
- It never stops at a thin interrupted line (or hidden outline) (see H3);
- The spacing between hatching lines must be maintained;
- The different surfaces of a cut part are hatched in the same way;
- If the thickness of the part is very small, the cut surfaces will be filled in black (e.g., a circlip).





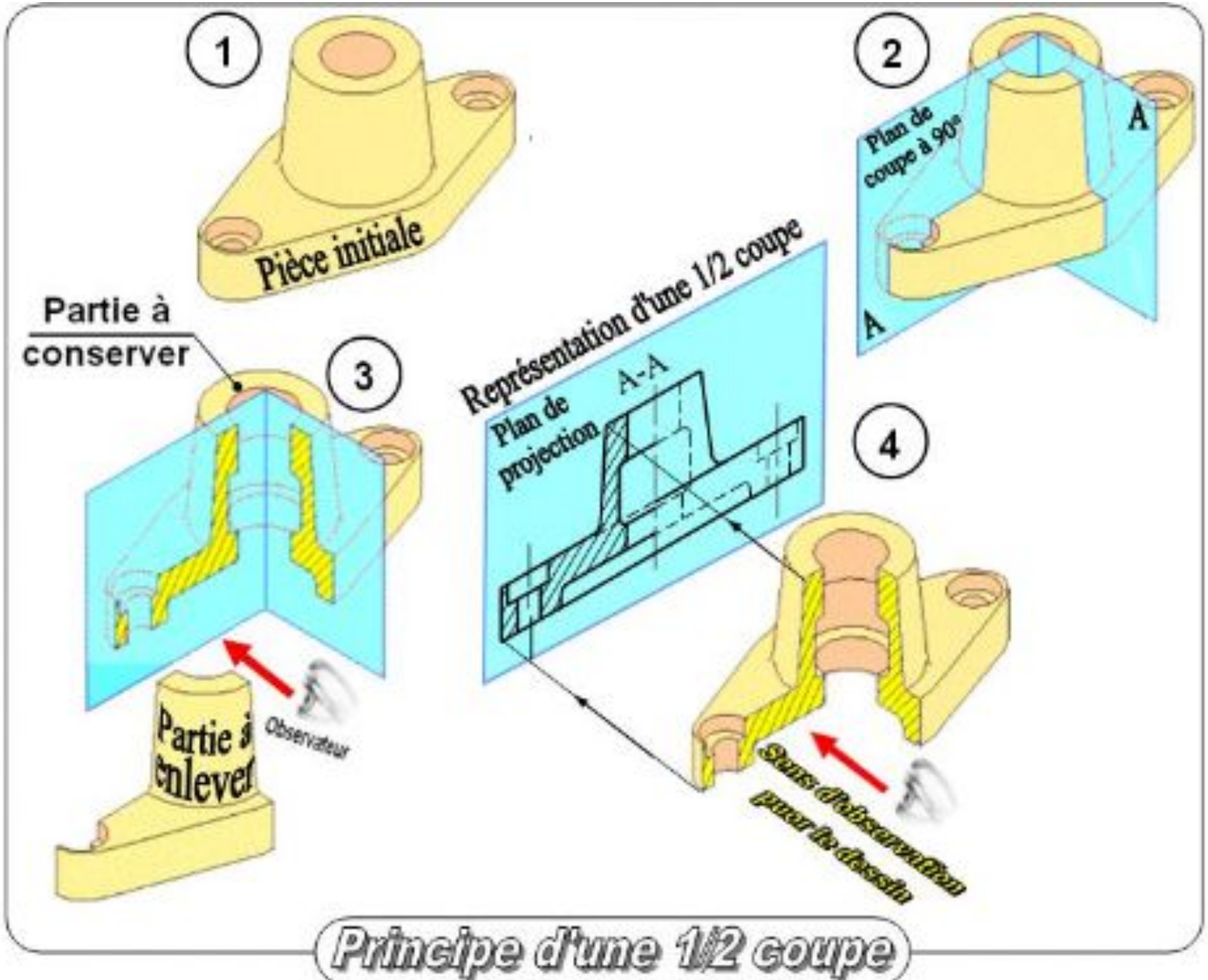
Different Hatch Patterns (see below)

On an assembly drawing, the hatching pattern allows for the identification of the type of materials of the parts. However, on a detail drawing, the general-purpose pattern is always used.



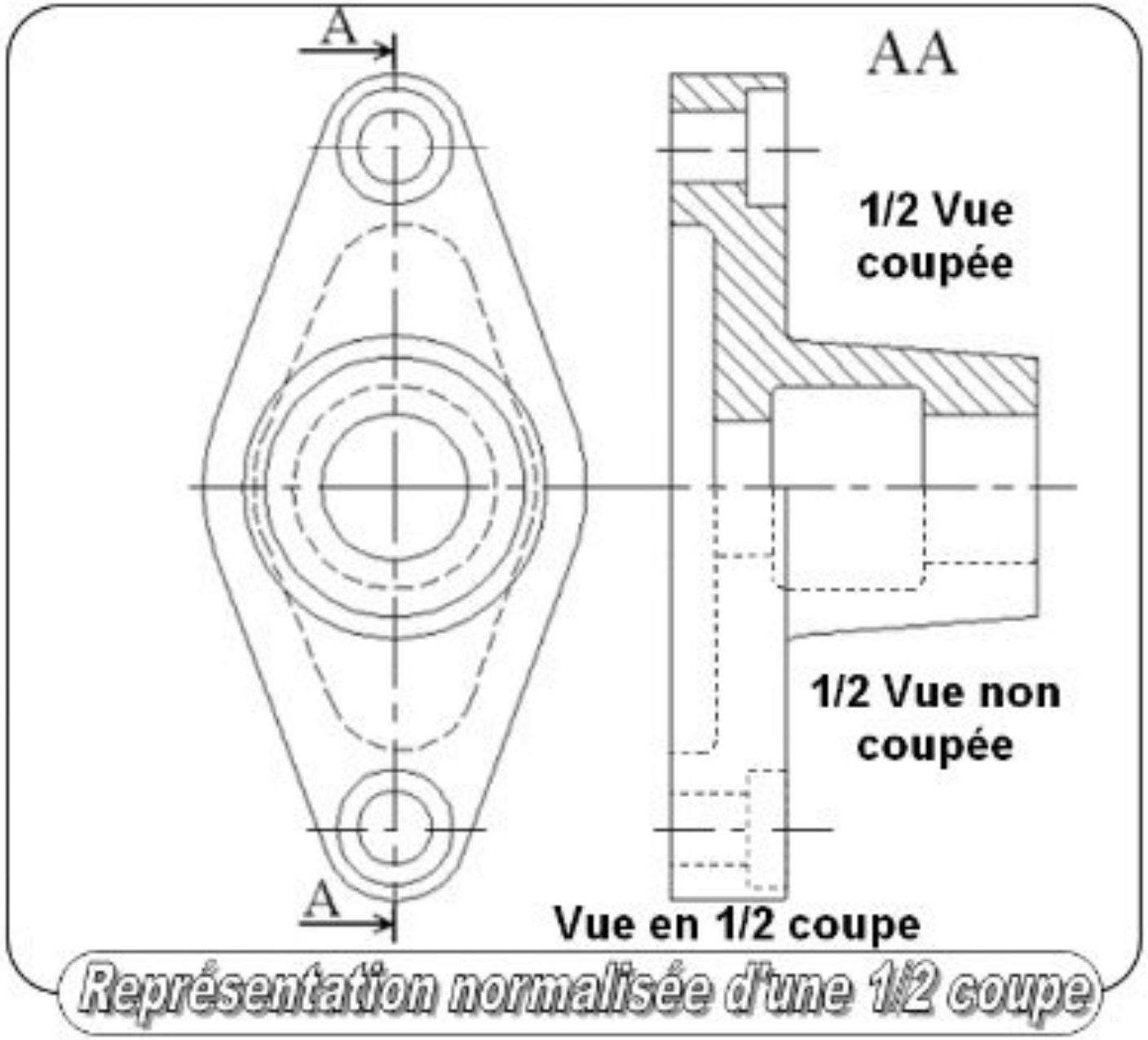
Half Cutting :

When a part has one or more planes of symmetry, a half section can be made instead of a full section.

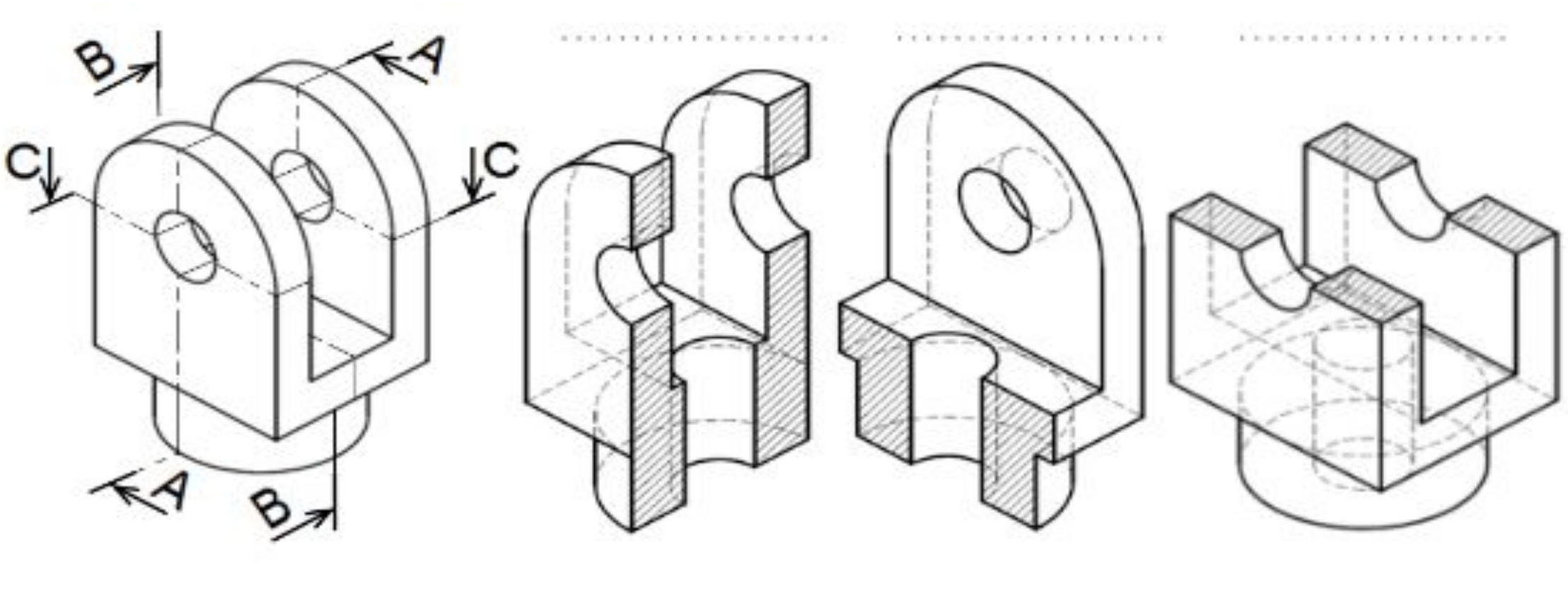


Standardized Representation Rules:

The indication of the cutting plane remains unchanged.
The two half-views are separated by a thin center line.

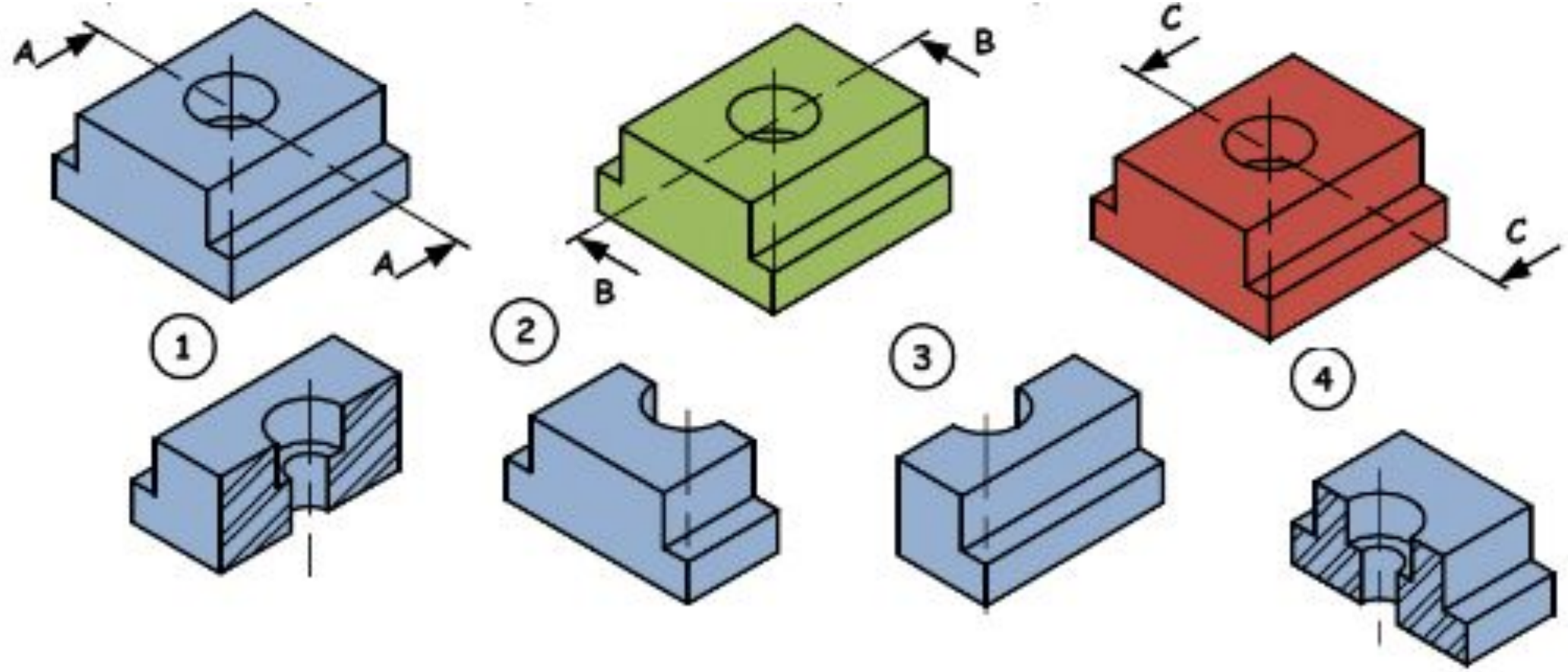


Example 1: **Name the type of section for each drawing of the clamp.**



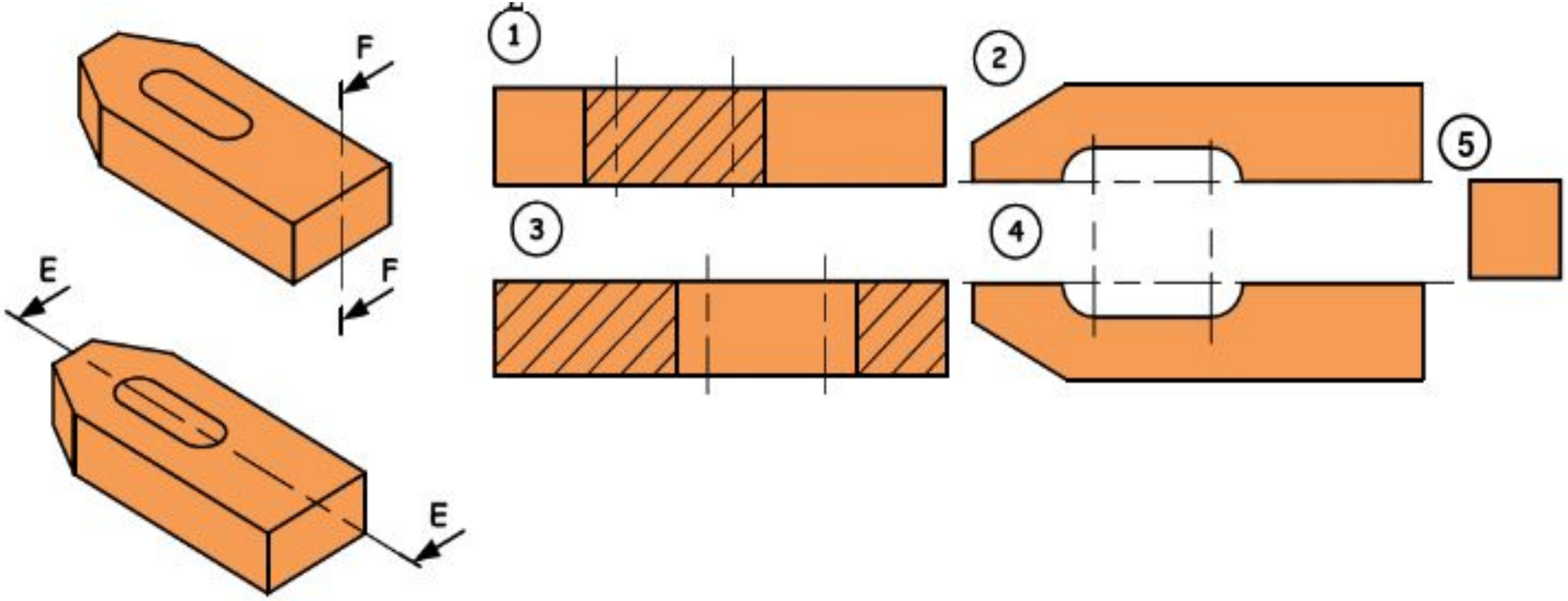
Example 2:

Which part of the component will be represented with cutting plane A-A; B-B; C-C?



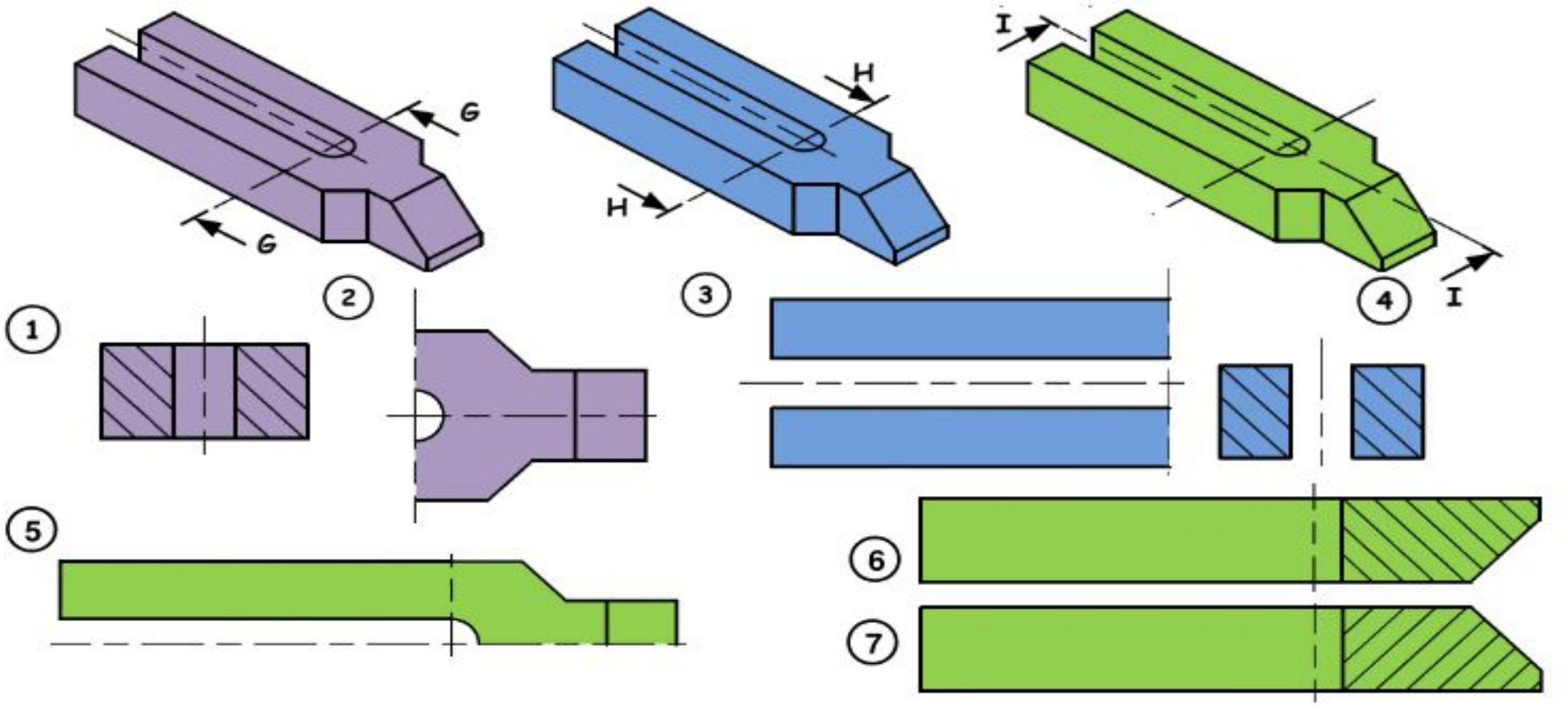
Example 3:

Which view of the component will be obtained with cutting plane E-E; F-F?

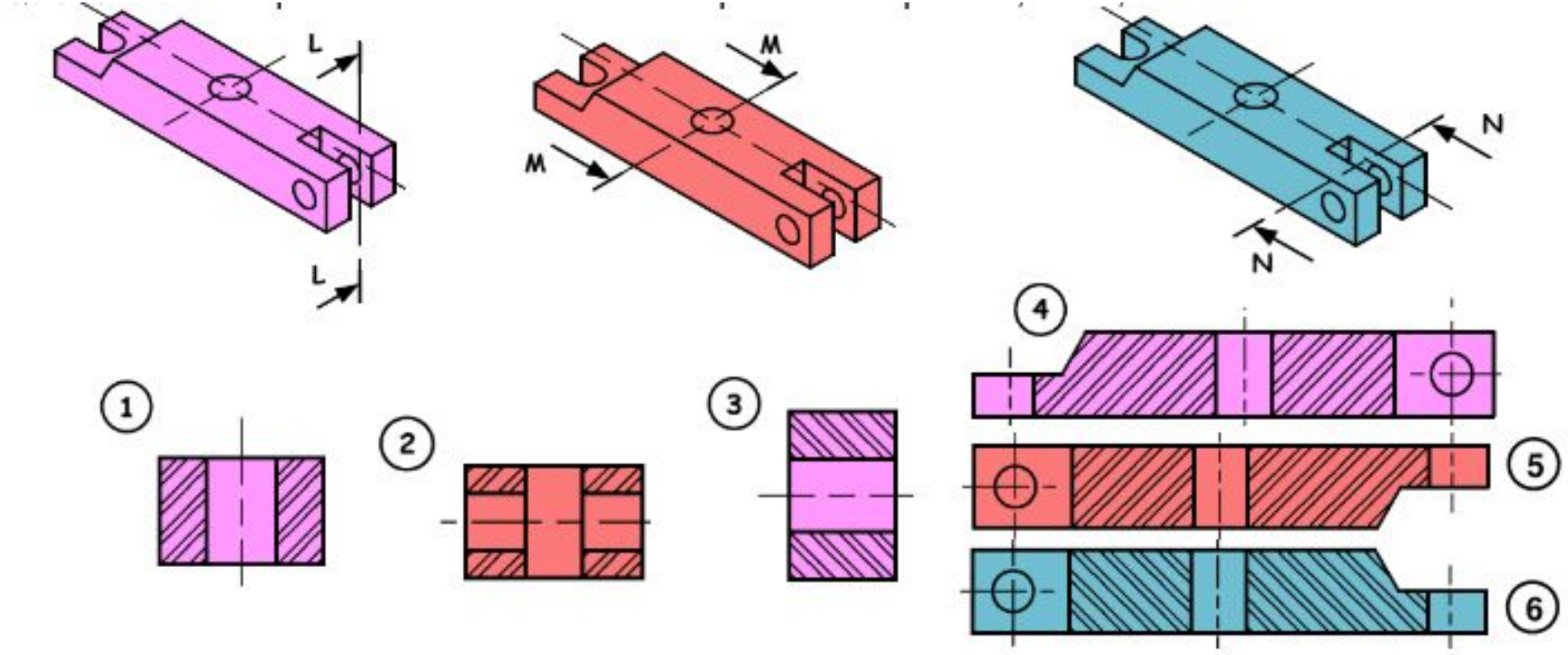


Example 4:

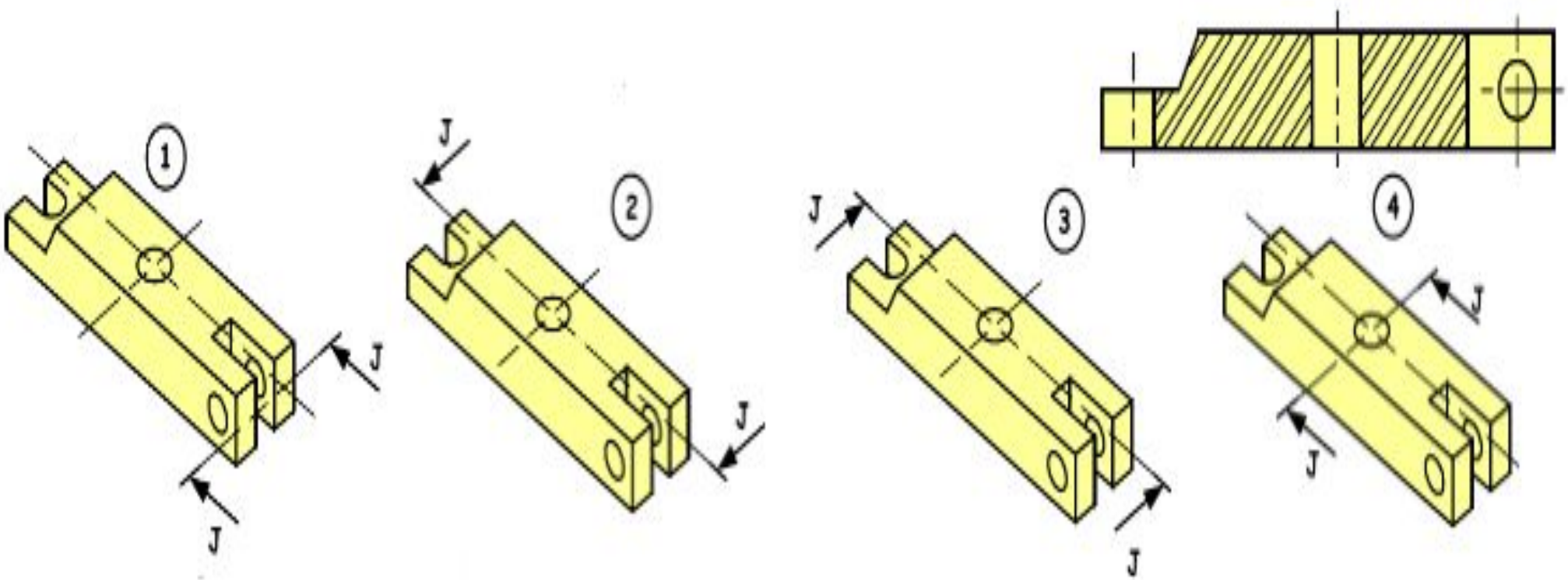
Which view of the component will be obtained with cutting plane G-G; H-H; I-I?



Example 5:
What view of the part will be obtained with cutting plane L-L; M-M; N-N?



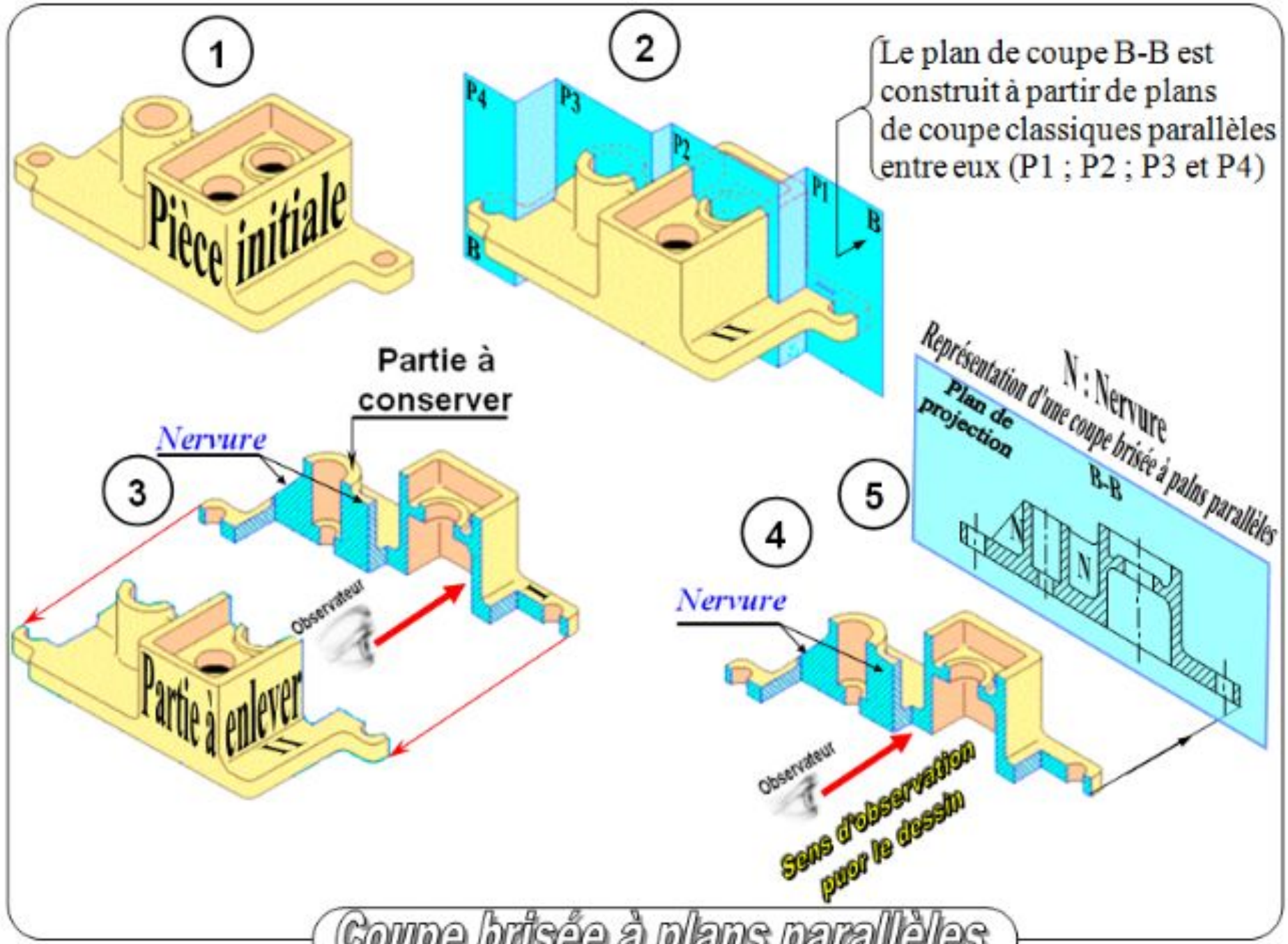
Example 6:
Which cutting plane corresponds to the view of the part shown opposite?



Offset Cutting View with Parallel Planes:

- It is used for objects with relatively complex internal contours.
- It provides a great deal of information and avoids the use of multiple regular cutting views.

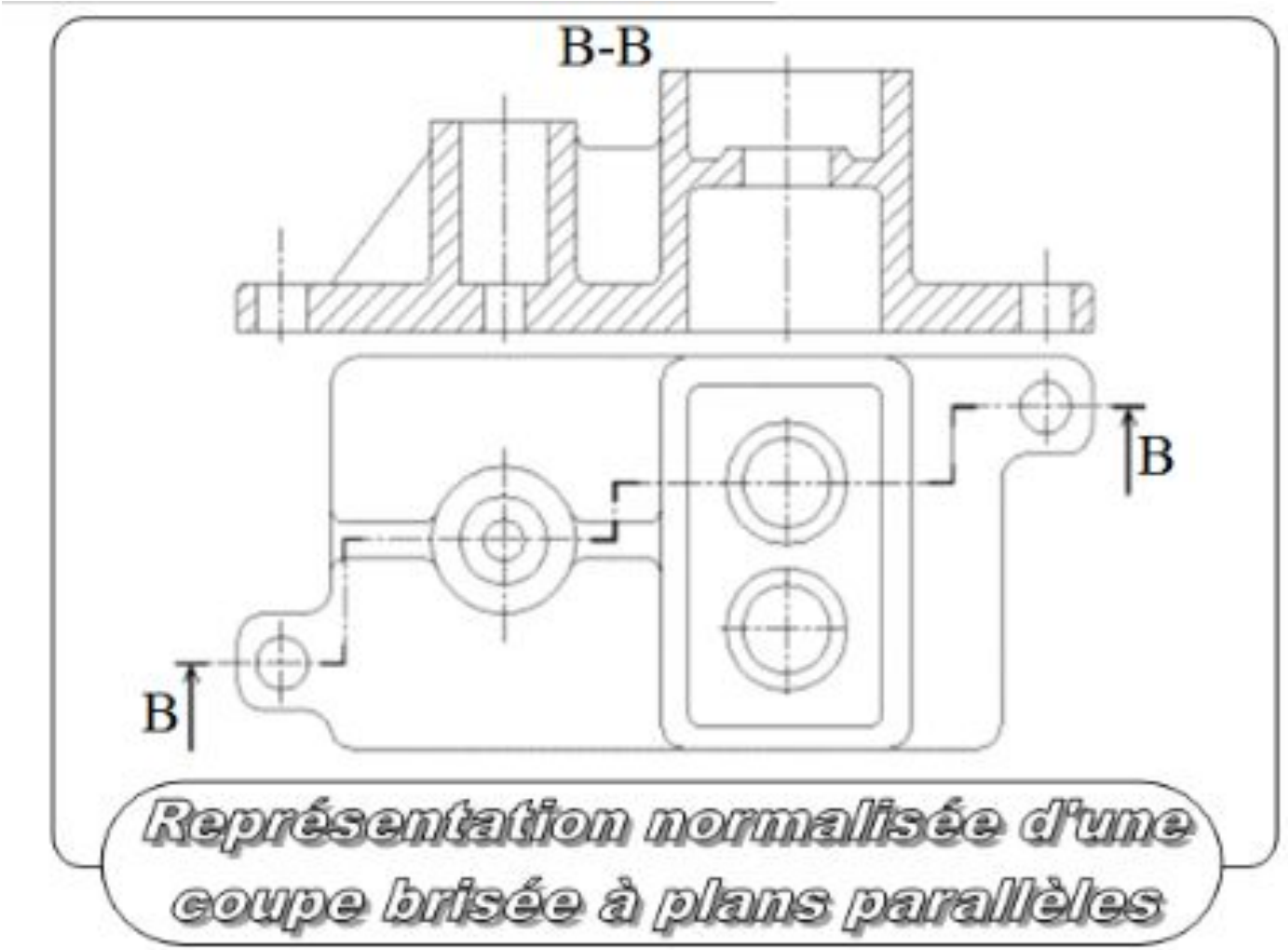
1. Original part.
2. Choose a cutting plane B-B that splits the part into two sections, leaving its trace .
3. Separate the cut part and position the observer between the two sections I and II.
4. Remove (delete) cutting II of the part.
5. Draw the interior details of the part using the orthogonal projection method on the projection plane, and hatch the trace of the cutting plane on the part.



Coupe brisée à plans parallèles

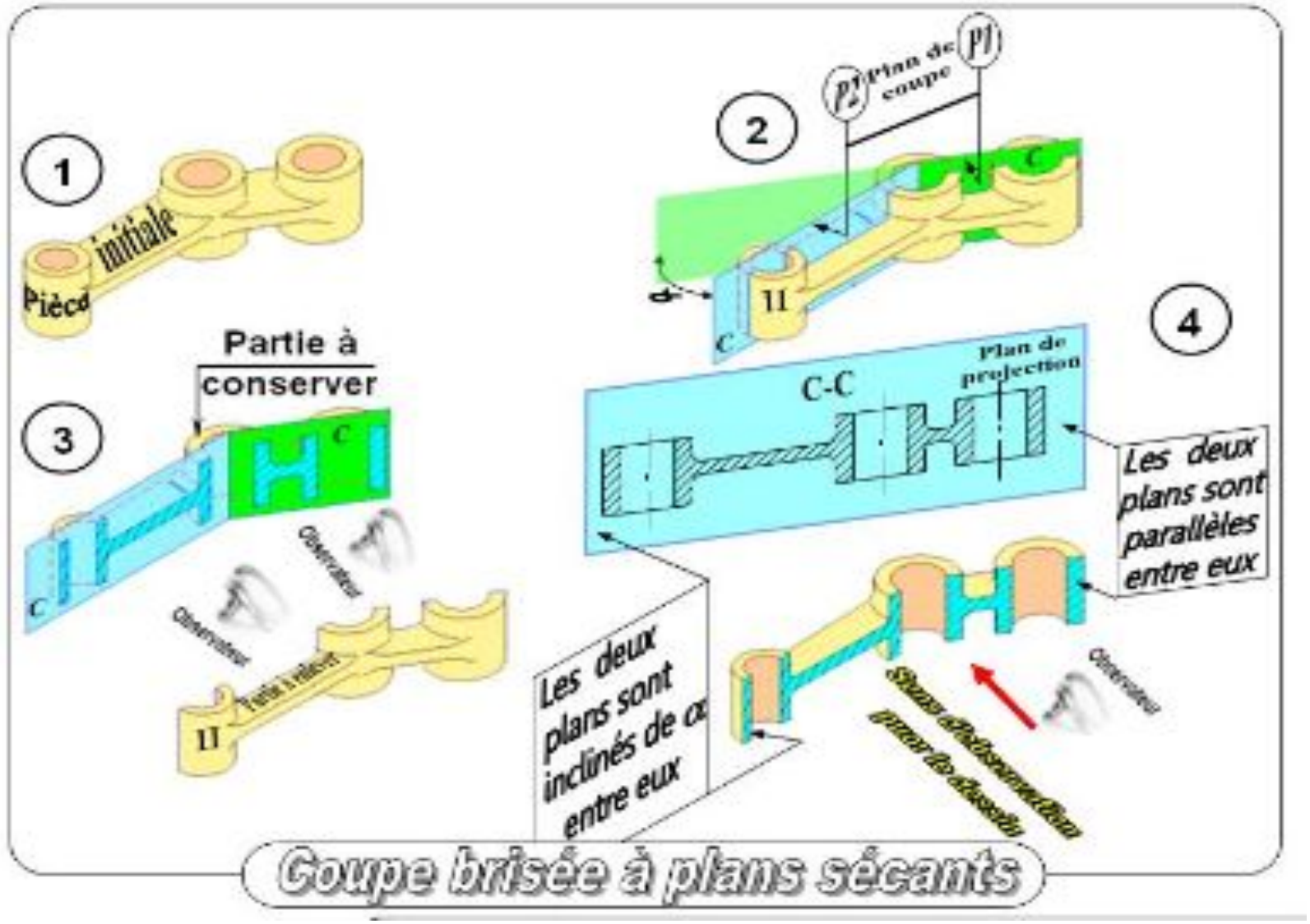
Note 1:
In general, hidden lines are not drawn in section views, except when they are essential for understanding.
Standardized representation rules

The cutting plane is constructed from conventional cutting planes that are parallel to each other.
The trace of the cutting plane is always represented by a fine dashed line.
The change in orientation of the cutting plane is indicated by "bracket lines" in thick solid lines.

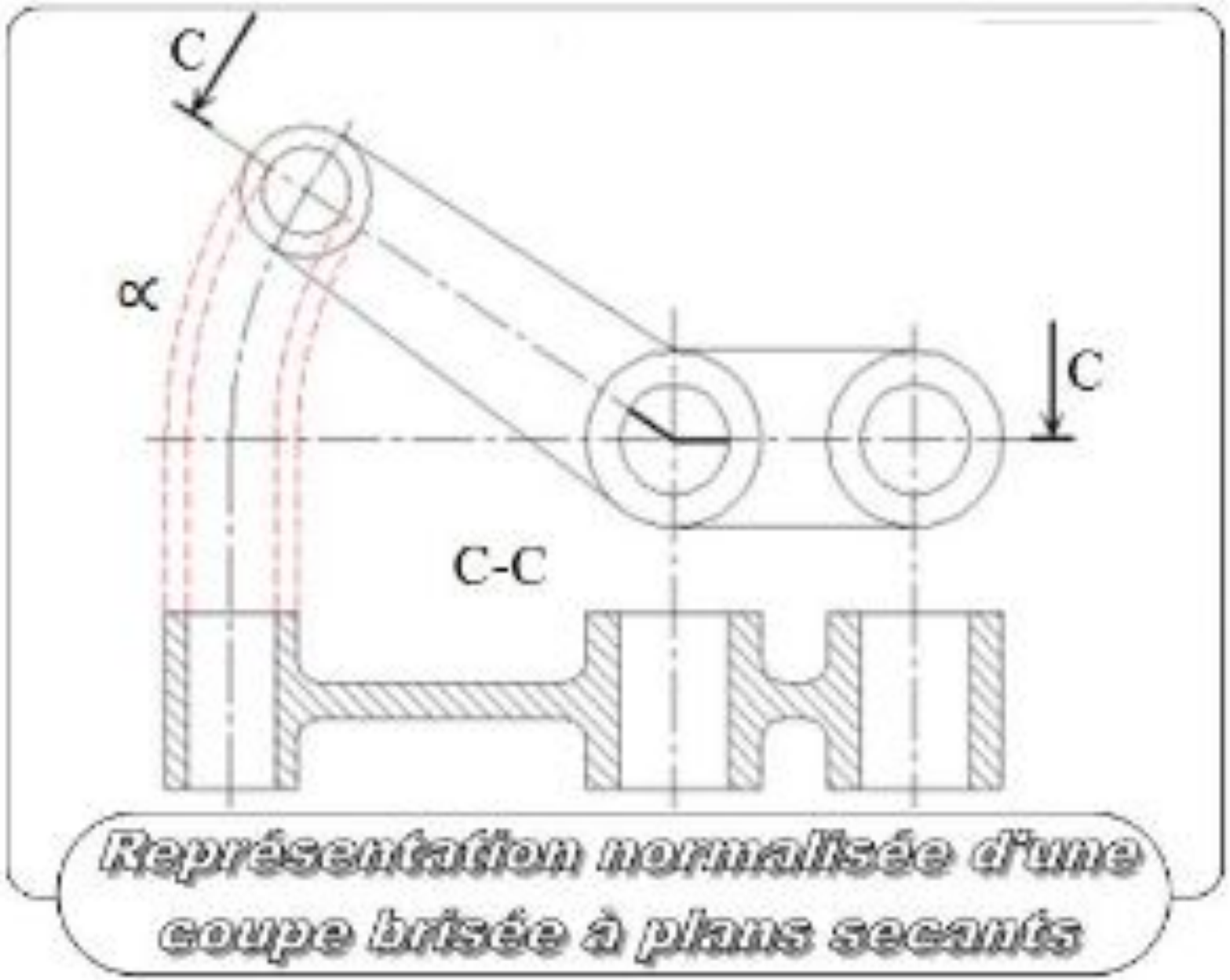


Offset Cutting with Two Intersecting or Inclined Planes:

The cutting plane consists of two intersecting (concurrent) planes.
The sectioned view is obtained by bringing all the cut segments from the successive cutting planes into a single plane.
The discontinuities of the cutting plane (edges or angles) are not represented.



Standardized Representation

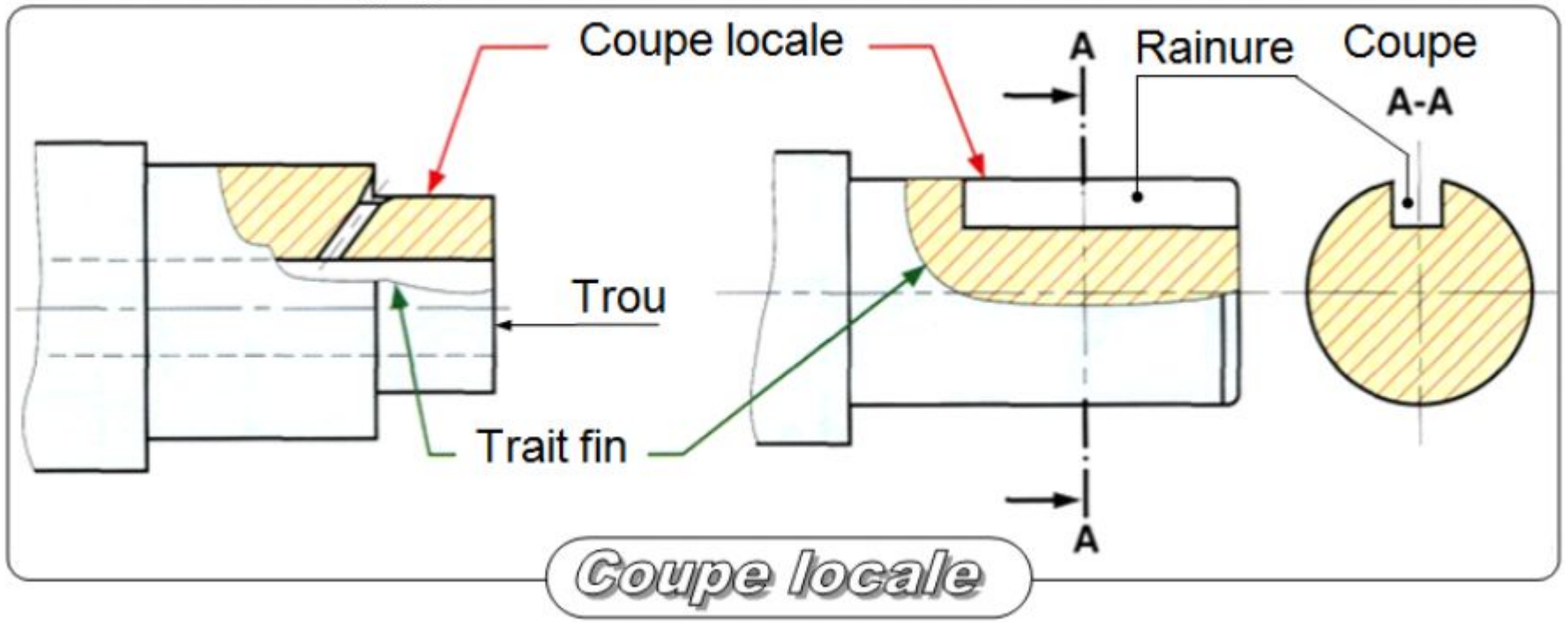


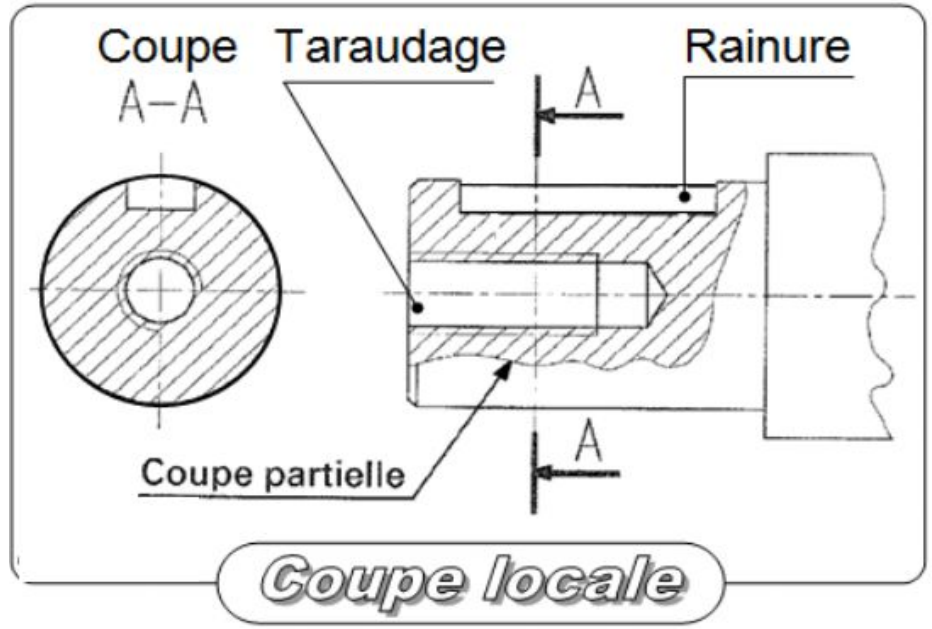
Représentation normalisée d'une coupe brisée à plans secants

Local or Partial Cutting :

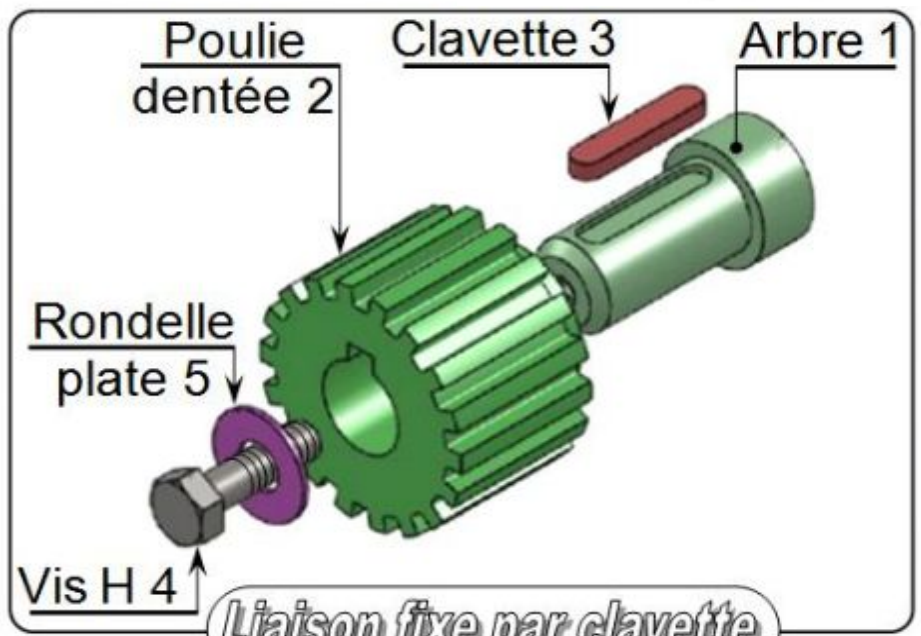
It frequently happens that one only needs to define a single detail (a hole, a particular shape, etc.) of the internal contour. In such cases, it is advantageous to use a local section rather than a full section. The indication of the cutting plane is unnecessary in this case.

A fine wavy or zigzag line serves as the limit of the hatching.

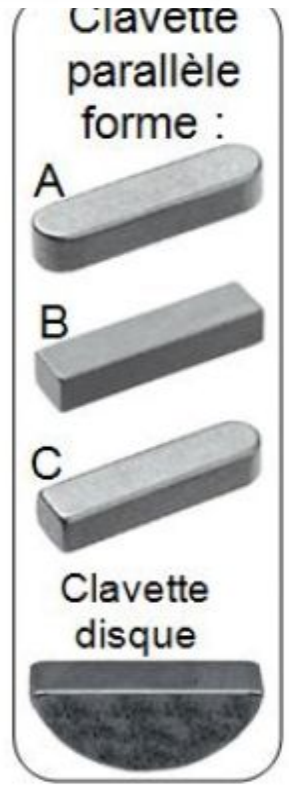


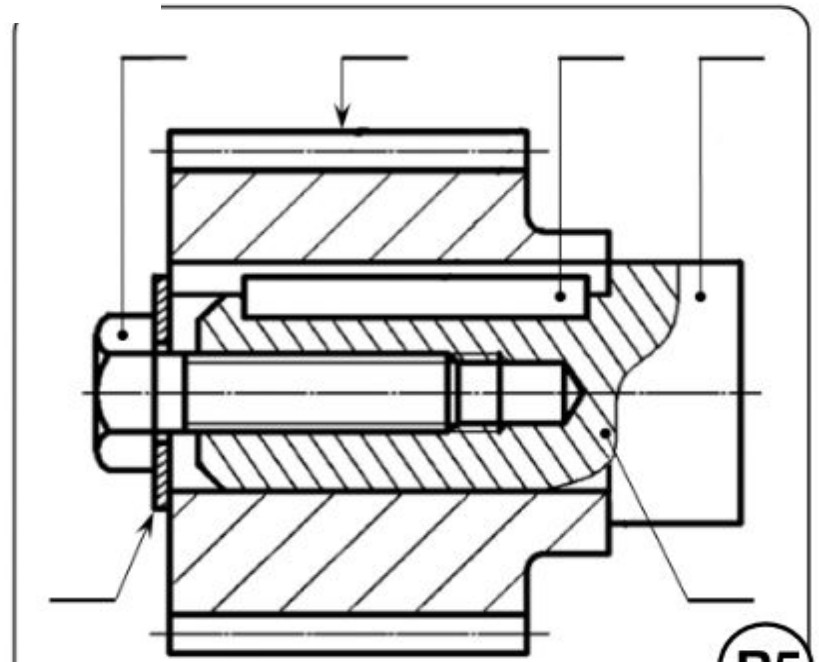


Coupe locale

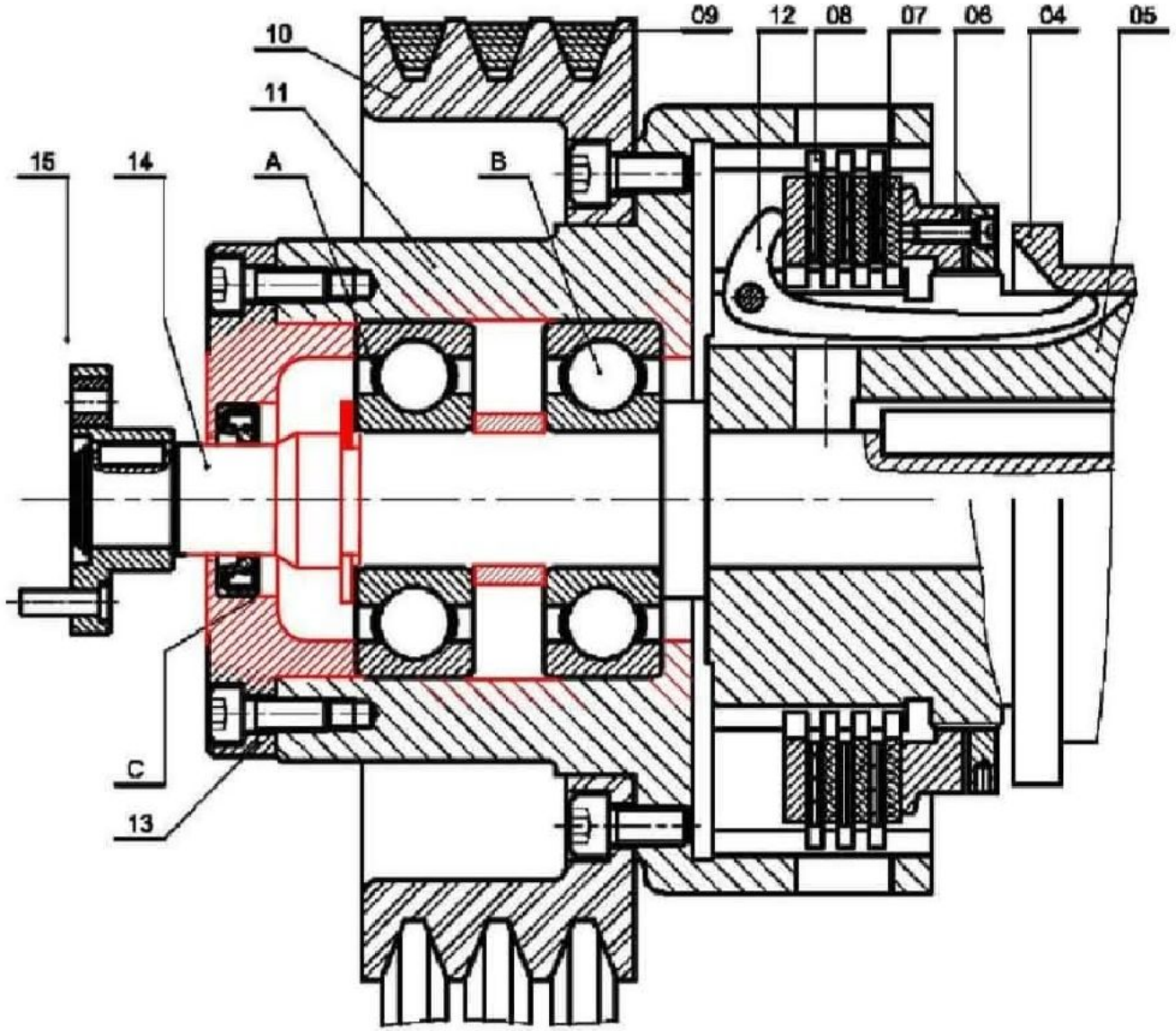


Liaison fixe par clavette





Dessin normalisé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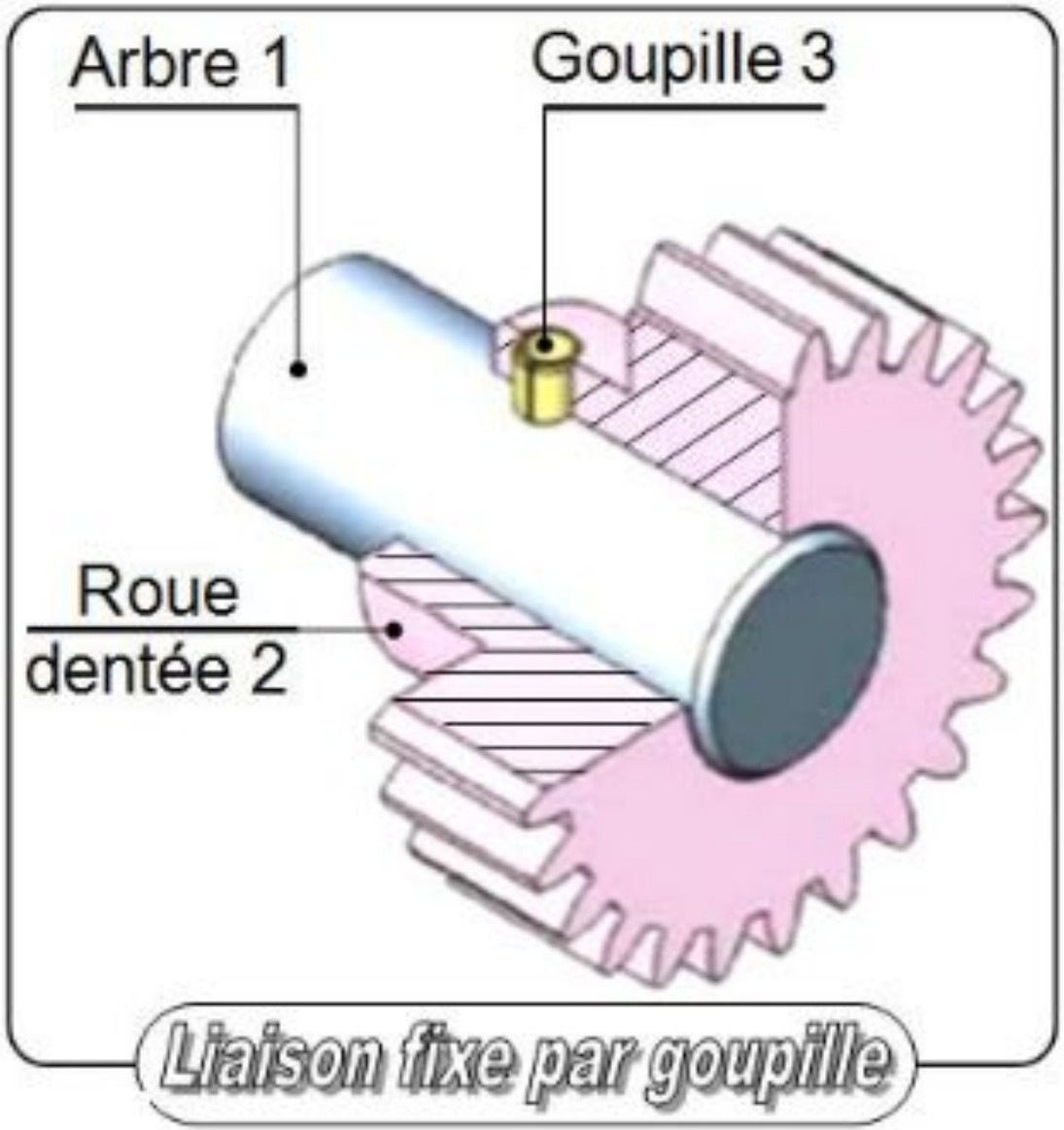
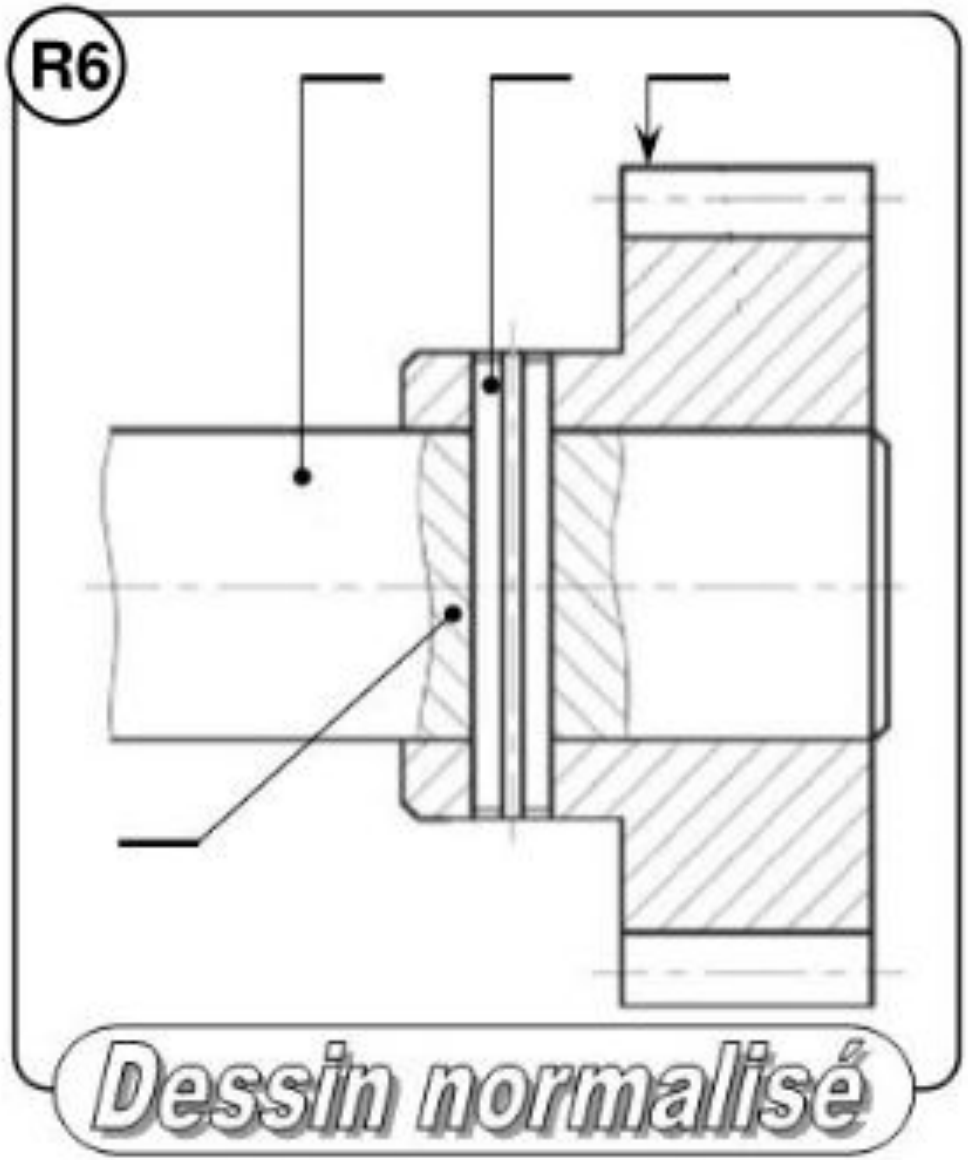


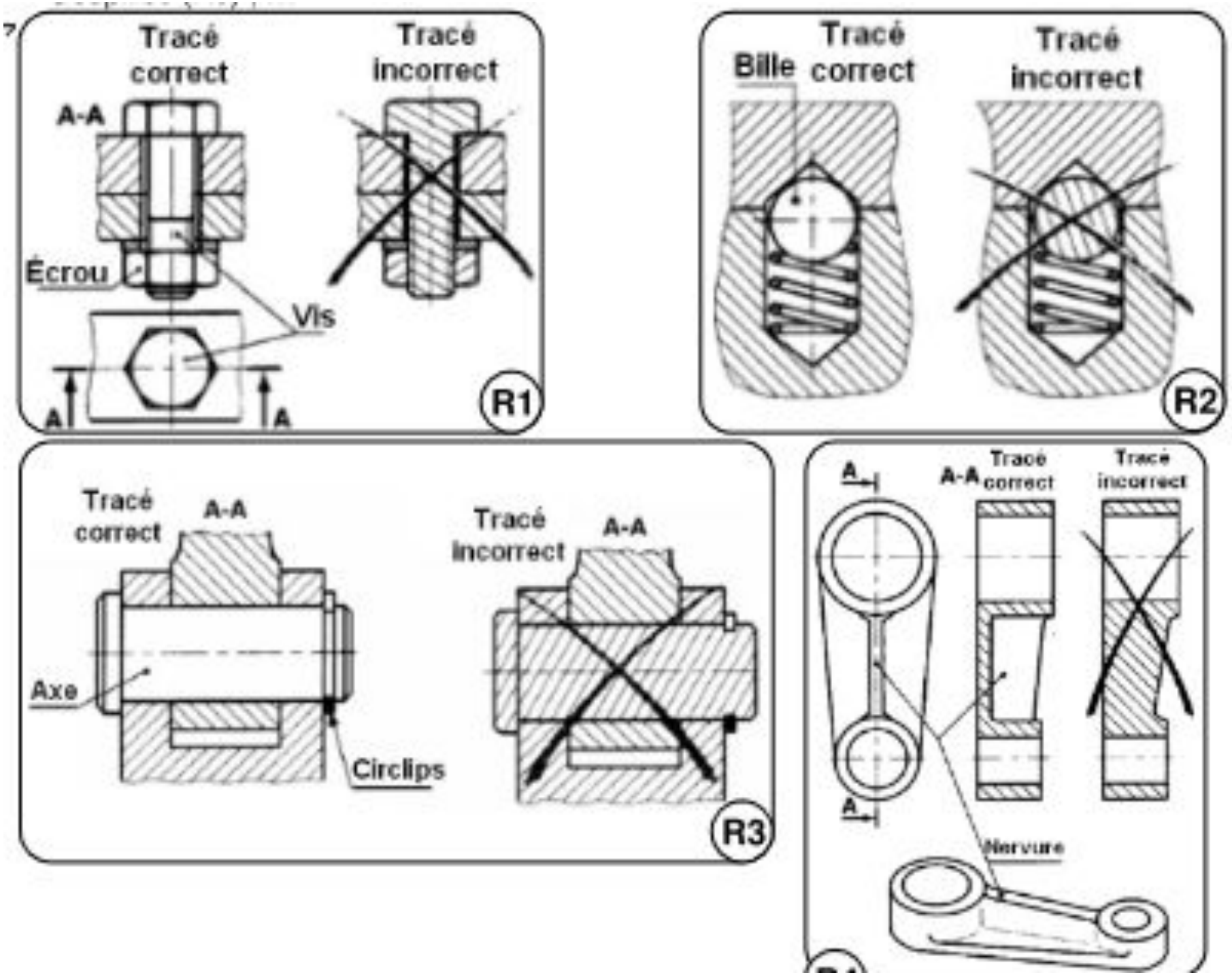
Liaison fixe par goupille

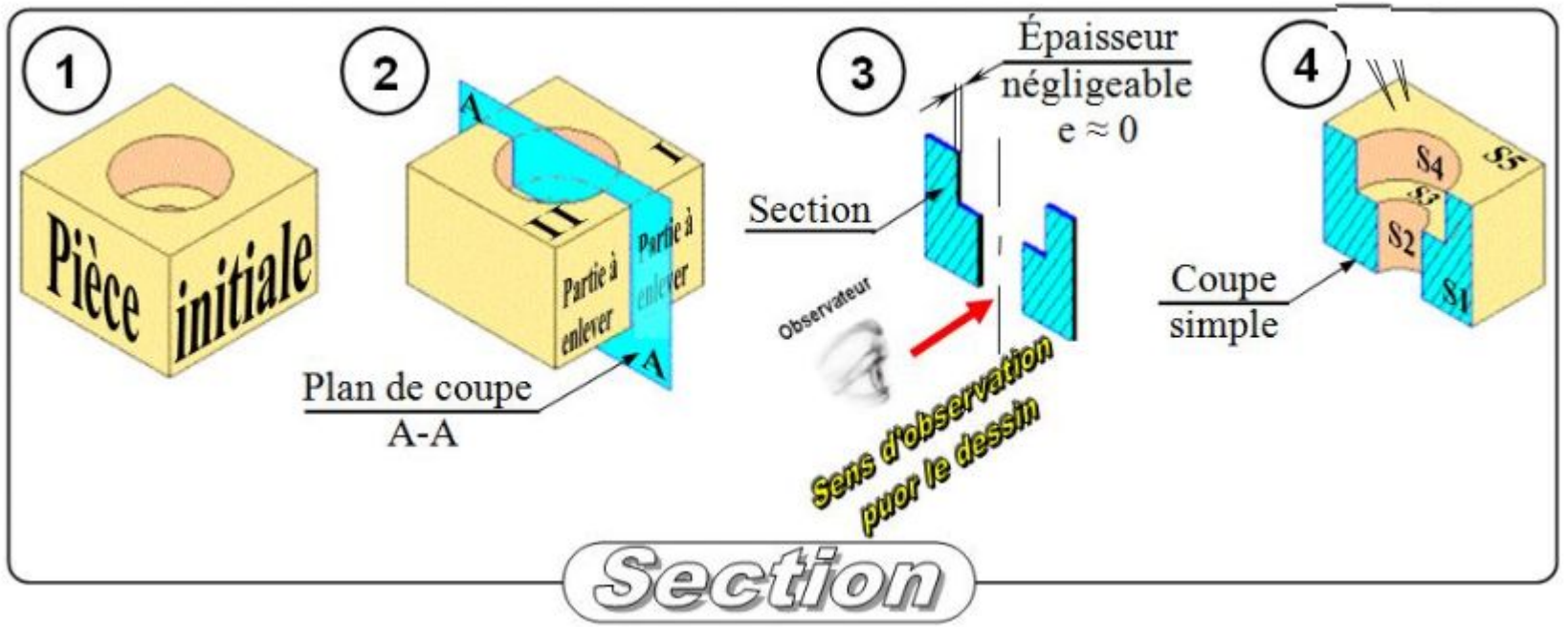
Goupille :

Cannelée



Dessin normalisé


Tracé correct
Tracé incorrect
A-A
Écrou
Vis
A
A
R1
Bille
Tracé correct
Tracé incorrect
R2
Tracé correct
A-A
Axe
Circlips
Tracé incorrect
A-A
R3
A
A-A
Tracé correct
Tracé incorrect
A
Nervure



SECTIONS:

They can be considered as complementary or auxiliary views. They appear as a simplified variant of section views and allow for the precise definition of a shape, a contour, or a profile by eliminating a large number of unnecessary lines. Sections are defined in the same way as cuts: cutting plane, arrows, etc.

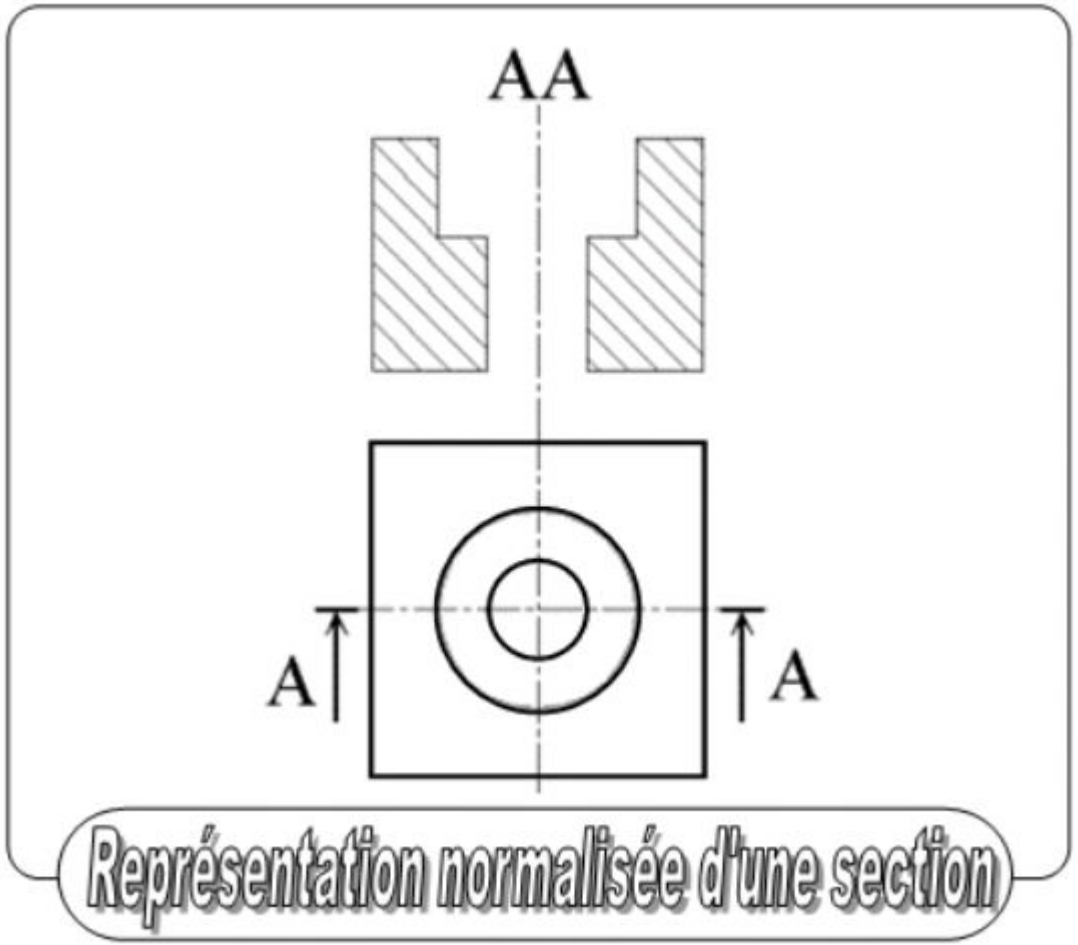
2.1- Principle of a Section:

In a normal section view, all visible parts beyond (behind) the cutting plane are drawn.

In a section, only the cut portion is drawn (where the material is actually cut or sawn).

Standardized Representation

Re-draw in thick continuous line
the outlines of section A-A
on the drawing opposite.



Section definition : A section represents the part of the object located in the cutting plane.

Note : A Cut view = a Section + the part of the object located behind the cutting plane.
There are two types of sections (removed section and revolved section).

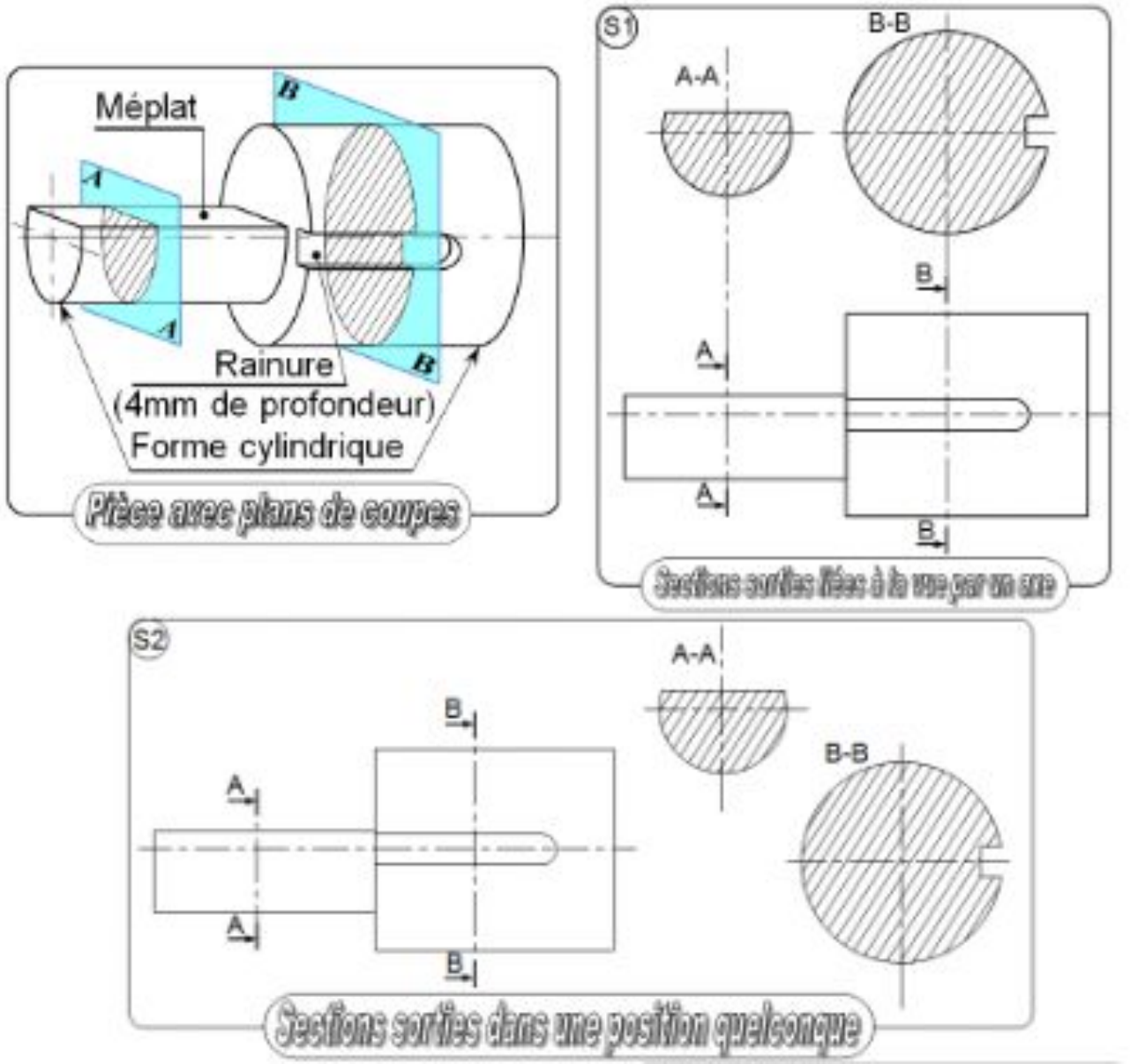
Removed Sections:

They can be placed:

Close to the view and connected to it by a fine center line (S1).

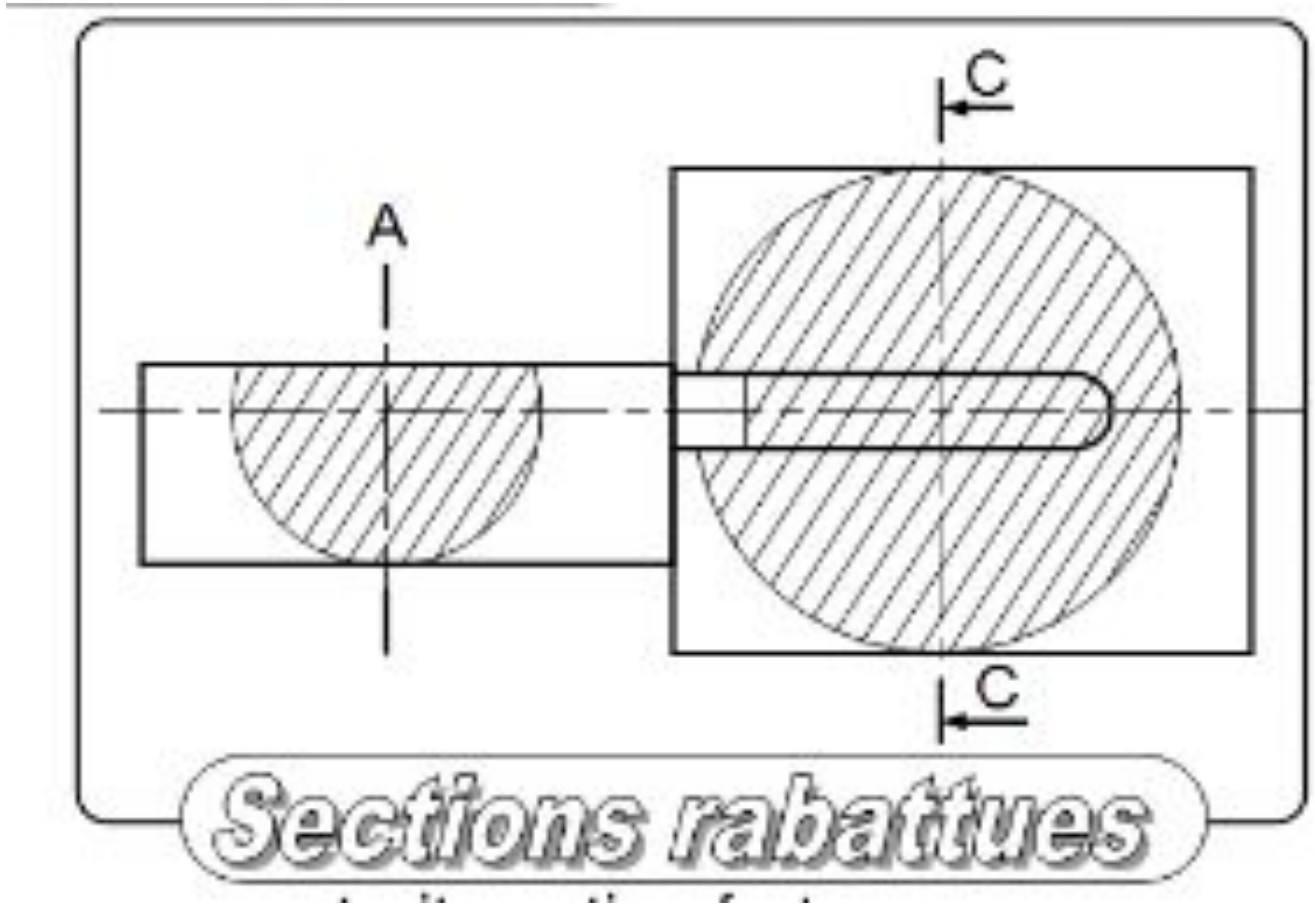
Or in another position with identification elements (cutting plane, viewing direction) (S2).

The outlines of removed sections are drawn with a thick continuous line.



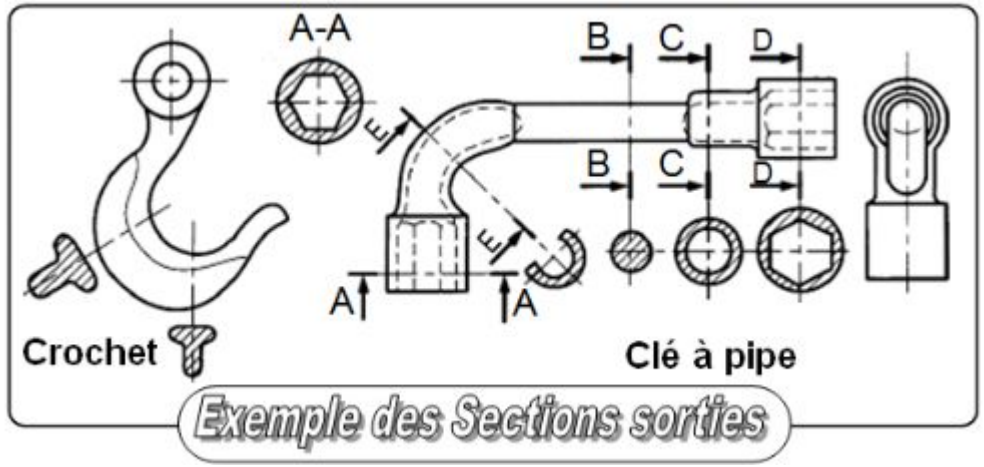
Revolved Sections:

These are special sections drawn with a fine continuous line directly on the chosen view.
Indications (cutting plane, viewing direction, designation) are generally unnecessary.
For greater clarity, it is preferable to eliminate or "erase" the shapes of the object visible beneath the section.

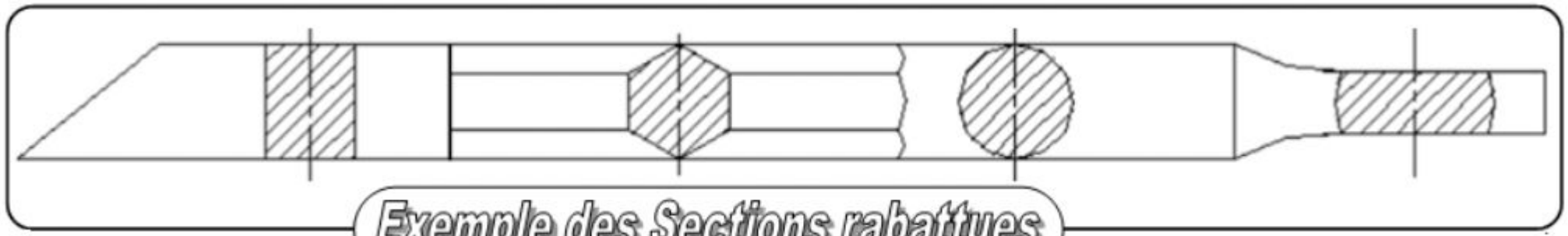


Notes:

The hatching of the section may intersect a thick continuous line.
Do not represent a revolved section on a sectioned object.
There should never be fine dashed lines in a section.

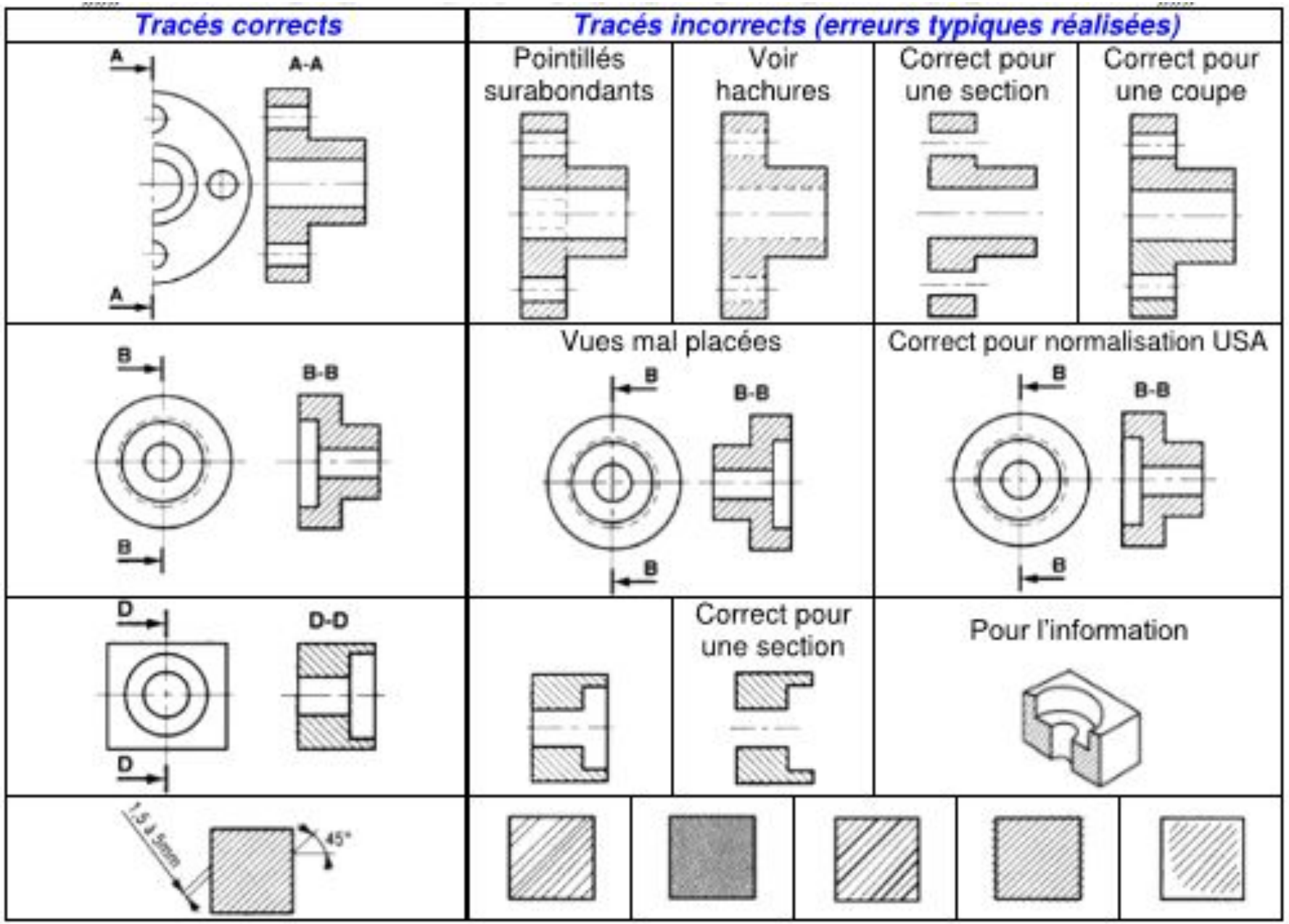


Exemple des Sections sorties



Exemple des Sections rabattues

Common Mistakes to Avoid



Thank You