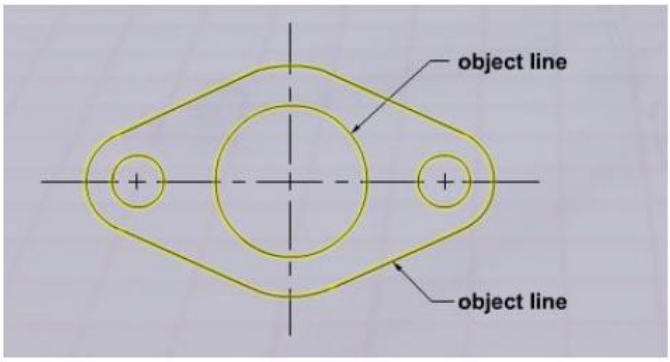
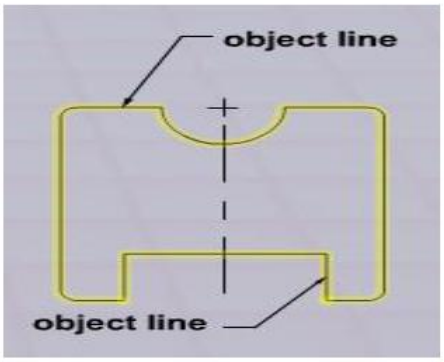
Visible/Object Lines

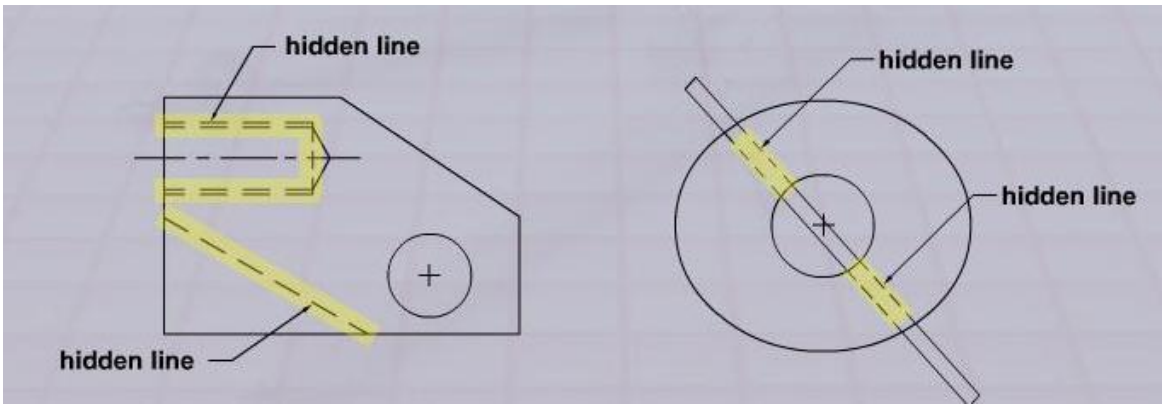
- Dark, heavy lines.
- Used to represent the outline or contour of the object being drawn.
- Define features you can see in a particular view.

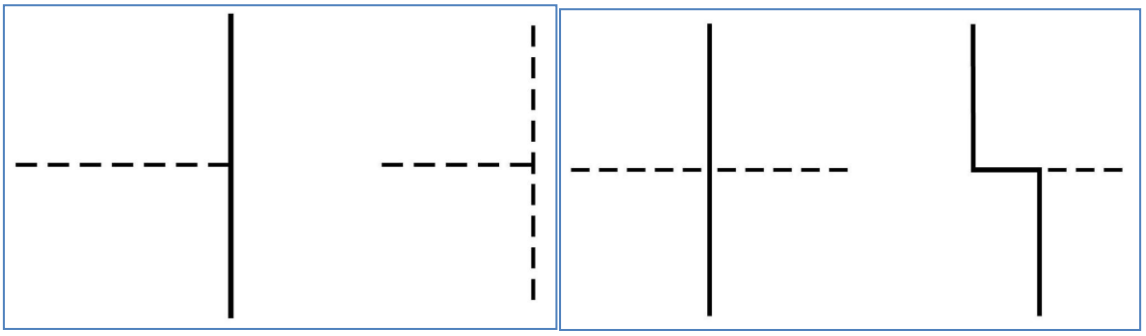


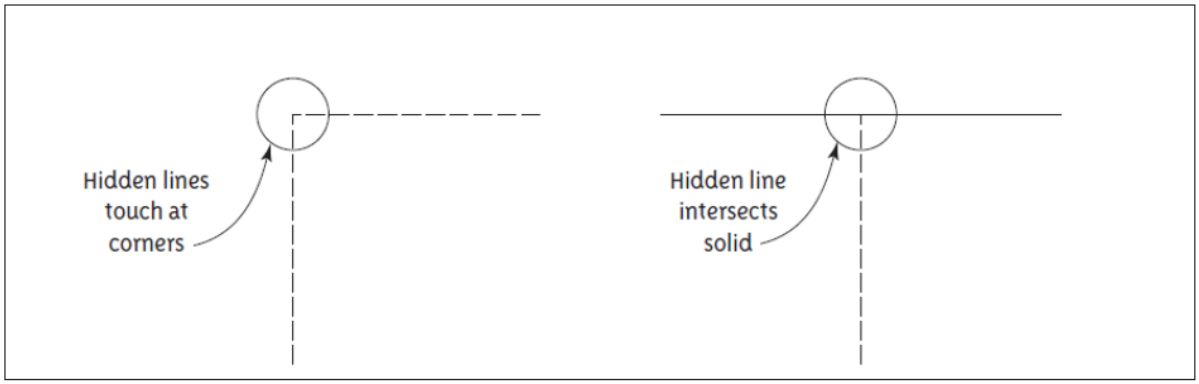


Hidden Lines

- Light, narrow, short, dashed lines.
- Shows the outline of a feature that cannot be seen in a particular view.
- Used to help clarify a feature, but can be omitted if they clutter a drawing.
- Hidden lines should always begin and end with a dash. Exception: When the hidden line begins or ends at a parallel visible or hidden line.
- Dashes should join at corners.

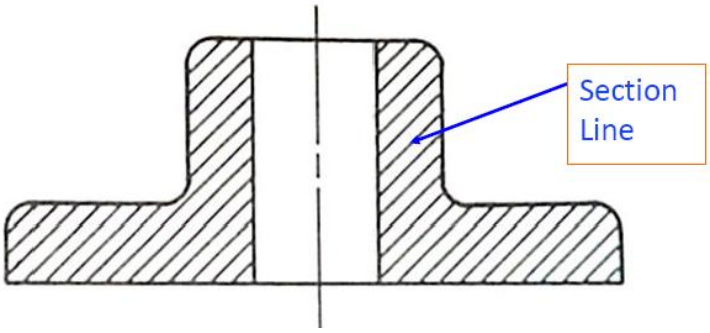






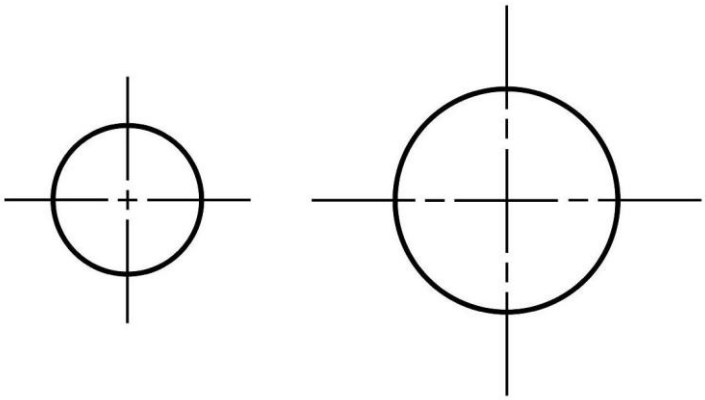
Section Lines

- Thin line usually drawn at a 45 degree angle.
- Indicates the material that has been cut through in a sectional view.

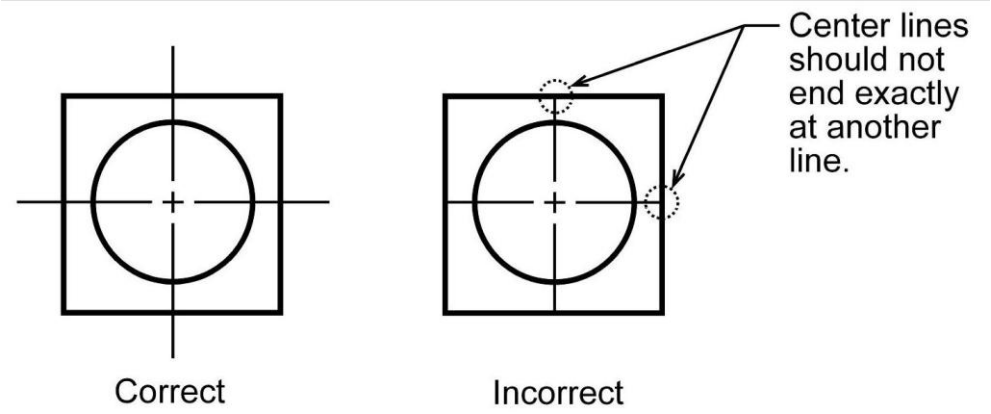


Center Lines

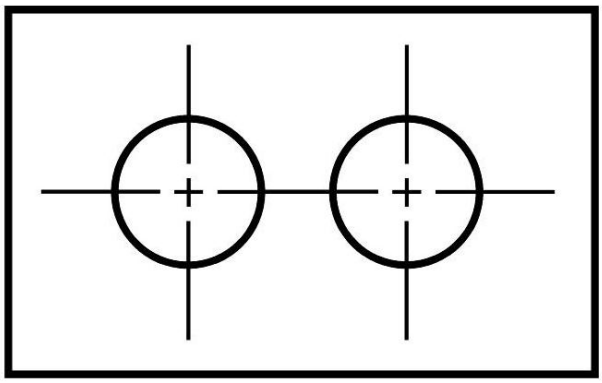
- Thin line consisting of alternating long and short dashes.
- Used to represent the center of round or cylindrical features, or the symmetry of a feature.
- Center lines should start and end with long dashes.



- Center lines should intersect by crossing either the long dashes or the short dashes.
- Center lines should extend a short distance beyond the object or feature.

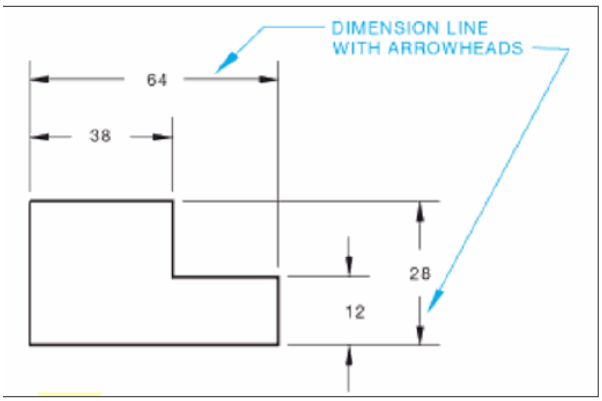


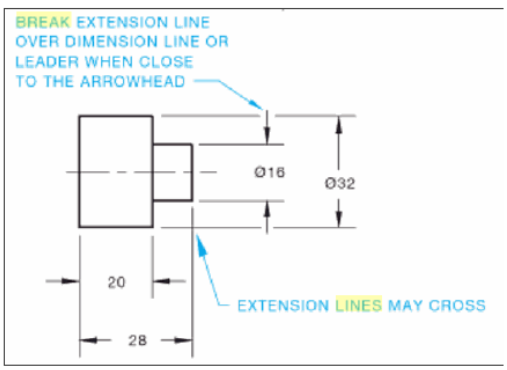
- Center lines may be connected **within a single view** to show that two or more features lie in the same plane. Center lines should not extend through the space between views.



Dimension Lines

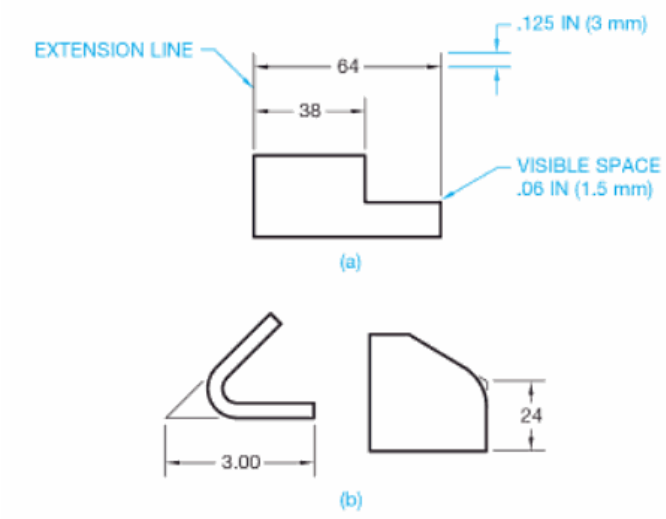
- Thin lines capped on the ends with arrowheads and broken along their length to provide a space for the dimension numeral.
- They indicate length.





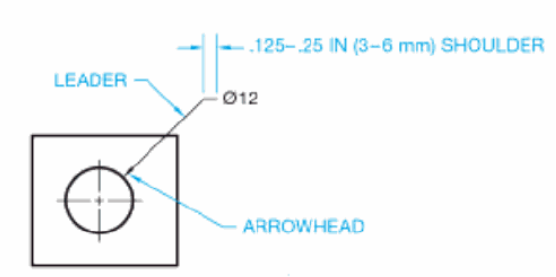
Extension Lines

Thin lines used to establish the extent of a dimension. Can also be used to show extension of a surface to a theoretical intersection as shown in (b). Begin 1.5mm from the object and extend to 3mm beyond the last dimension. They should not cross dimension lines.



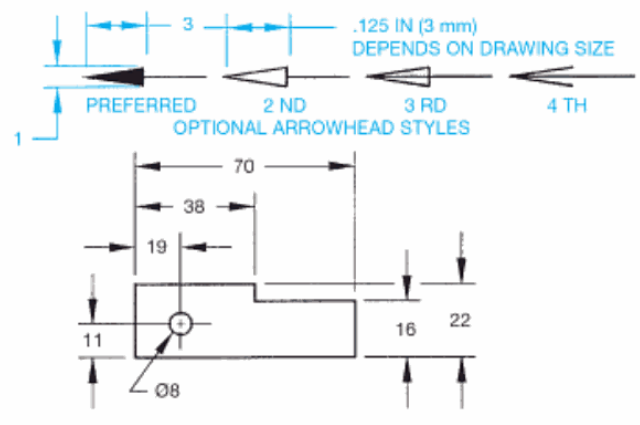
Leader Lines

- Thin lines used to connect a specific note to a feature.
- Also used to direct dimensions, symbols, item number and part numbers on a drawing.
- Commonly drawn at ***45, 30 and 60*** degrees.
- Has a ***short shoulder*** (3-6mm) at one end beginning at the center of the vertical height of text, and a ***standard dimension arrowhead*** at the other end touching the feature.
- Leader lines should not cross each other.
- Leader lines should not be excessively long.
- Leader lines should not be vertical or horizontal.
- Leader lines should not be parallel to dimension lines, extension lines or section lines.



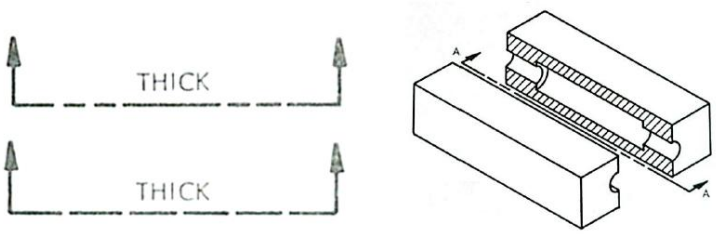
Arrowheads

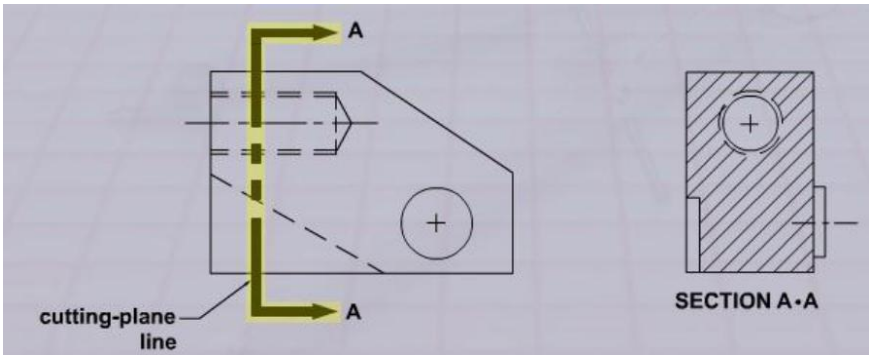
- Used to terminate dimension lines and leader lines and on cutting-plane lines and viewing plane lines.
- They should be three times as long as they are wide.
- They should be the same size throughout the drawing.
- The filled arrowhead is generally preferred because of its clarity.



Cutting Plane Lines

- Thick broken line that is terminated with short ***90 degree arrowheads***.
- Shows where a part is mentally cut in half to better see the interior detail.



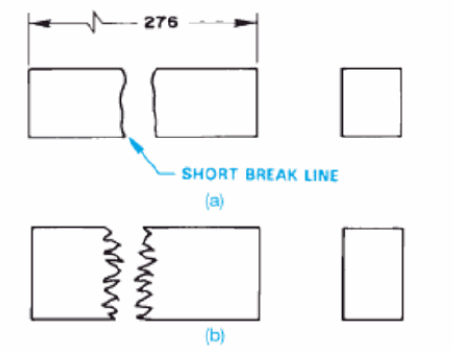


Break Lines

Break Lines are used to break out sections for clarity or for shortening a part.
Three types of break lines with different line weights:

a) Short Break Lines.

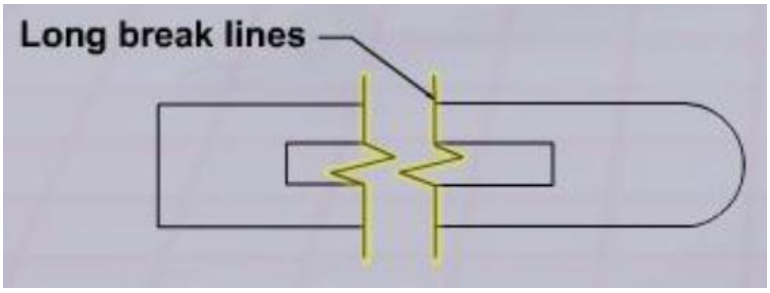
- Thick wavy line.
- Used to break the edge or surface of a part for clarity of a hidden surface.



(a) Short break line on metal shape;
(b) Short Break Line on wood shape.

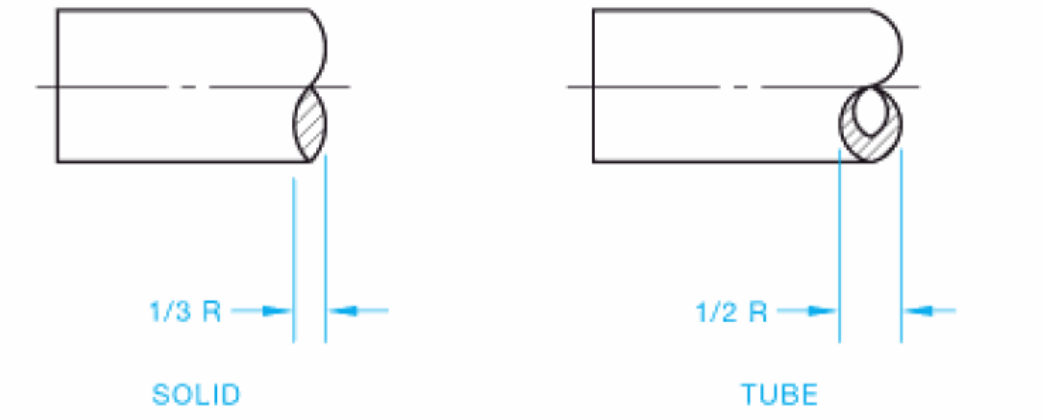
b) Long Break Lines

- Long, thin lines.
- Used to show that the middle section of an object has been removed so it can be drawn on a smaller piece of paper.



c) Cylindrical Break Lines.

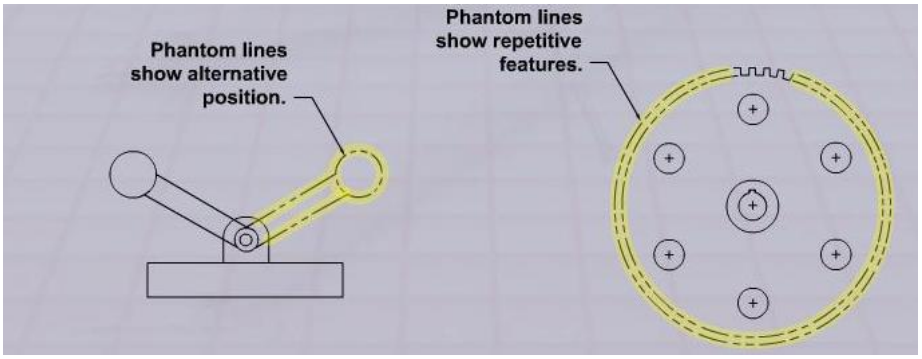
- Thin lines.
- Used to show round parts that are broken in half to better clarify the print or to reduce the length of the object.

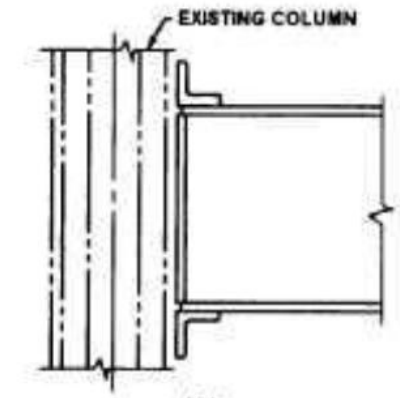


Cylindrical conventional breaks for a solid and tube;
where R = Radius

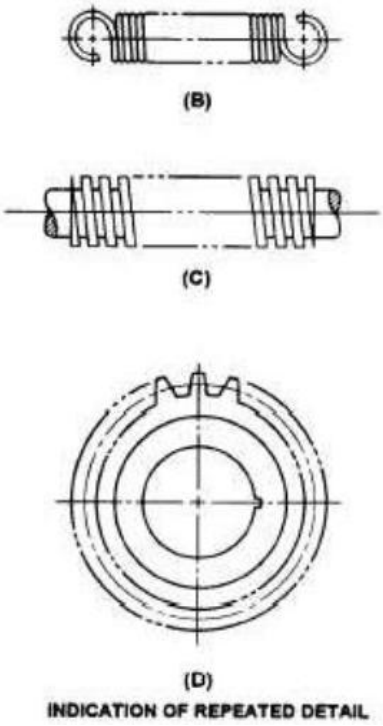
Phantom Lines

- Thin lines made up of long dashes alternating with pairs of short dashes.
- Three purposes in drawings:
  - To show the alternate position of moving parts.
  - To show the relationship of parts that fit together.
  - To show repeated detail.





INDICATION OF ADJANCENT PARTS



INDICATION OF REPEATED DETAIL

Line Precedence

If two lines occur in the same place, the line that is considered to be the least important is omitted. Lines in order of precedence/importance are as follows:

- Cutting plane line
- Visible line
- Hidden line
- Centerline