Exercise 3 - Hidden Lines

You now understand how to draw all six views of an object, but you still need to understand how to represent hidden parts of the object.

Supplies required for this exercise:

- Open GRID.pdf or obtain a sketchbook.
- Pencil
- Scale
To sketch hidden lines

1. Objects, like the button shown below, have parts cut away from them. The button has four holes, the top is recessed, and the button’s top edges are round.

![Button Image]

2. A sketch of the bottom side of this object would appear as shown below.

![Hidden Line Diagram]

3. In this example, only object lines are represented. You represent the holes and cutaway parts in the object with hidden lines. Hidden lines are dashed lines with 0.125" dashes and 0.0625" spaces to represent the cutaway from the object. You draw hidden lines 0.4 mm thick.

4. Add hidden lines to represent the recessed part of the object. The hidden lines follow the rounded part inside the object, as well as the recessed part.
5. Add hidden lines to represent the four holes. The hidden lines intersect the hidden line representing the recessed part of the button.

The bottom view is now complete.

**Note**: Hidden lines do not have a space at the intersection with an object line. Hidden line dashes should touch the object line or another hidden line.
Add hidden lines to the sketches

1. Add hidden lines to the sketches you completed in the previous exercise. Remember to use your scale and grid paper.

For these exercises, use the American National Standards Institute (ANSI/ASME) standards. ANSI standards recommend two line thicknesses, 0.6 mm for thick lines and 0.3 mm for thin lines, but the actual width of lines can be more or less. Companies vary in their lineweight, as you will for these exercises.

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- 0.4 mm line width
- 0.125" dashes
- 0.0625" spaces
- Meet or cross object lines

2. Save your work for future lessons.

In this exercise, you learned that cutaway parts of an object are represented by hidden lines.

Other linetypes

With different linetypes, you have a common visual language to communicate by.

In this exercise, you learn the different linetypes and how you use them in a drawing.

1. Use construction lines to aid in the drawing of other views. You use object lines to define the object with a 0.6 mm thickness. You use hidden lines to draw cutaway parts of an object with 0.6 mm thickness.
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- CONSTRUCTION LINE - hardly visible continuous line
- OBJECT LINE - 0.6 mm continuous line
- HIDDEN LINE -
  - 0.4 mm line width
  - 0.125" dashes
  - 0.0625" spaces
  - meet or cross object lines

In addition to construction, object, and hidden lines, other linetypes are used to improve the understanding of drawings:
For these exercises, use American National Standards Institute (ANSI) standards. All linetypes have specific lengths for dashes and spaces.

2. Use *center lines* to identify the center of a circle, arc, or other symmetrical feature.

Center lines have center dashes about 0.125" long and spaces 0.0625" in length.

The length of the long dash is about 0.75" to 1.5" in length.

Center lines extend 0.25" outside the object lines if needed. The center line thickness is 0.3 mm.
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- CENTER LINE
  - 0.3 mm line width
  - 0.125" short center dashes
  - 0.0625" spaces
  - 0.75" to 1.5" long dashes
  - 0.25" extension, when needed

3. Use **phantom lines** to show alternative positions of moving parts.

Phantom lines are 0.3 mm in thickness and you use them in place of object lines.

They have center dashes about 0.125" long and spaces 0.0625" in length. The length of the long dash is about 0.75" to 1.5" in length.
• PHANTOM LINE
  o 0.3 mm line width
  o 0.125" dashes
  o 0.0625" spaces
  o 0.75" to 1.5" long dashes

4. Use *viewing-plane lines* to identify a view enlargement or for a partial view of an object.

Viewing-plane lines are 0.6 mm in thickness and are 0.25" with an arrowhead outside of the view. Both ends of the lines have arrowheads that are 0.3 mm long and 0.1 mm high.

You position them directly across from each other in the view. They are also labeled to correspond with the labeled view.

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• VIEWING-PLANE LINE
  o 0.6 mm line width
  o 0.25" extension with arrowhead
  o 0.3 mm length and 0.1 mm width for arrow
5. Use cutting-planes to identify a sectional view of a part. A sectional view is a cross section of a part. Sectional lines are 0.3 mm in thickness and are spaced parallel at 0.125" apart at 45°.

Cutting-plane lines have center dashes about 0.125" long and spaces 0.0625" in length.

The length of the long dash is about 0.75" to 1.5" in length. They are 0.7 mm in thickness and lines are 0.25" to 0.5" with an arrowhead outside of the view.

Both ends of the lines have arrowheads that are 0.3 mm long and 0.1 mm high. You position them directly across from each other in the view. You label them to correspond with the labeled view.

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- Cutting-plane line
  - 0.6 mm line width
  - 0.125" dashes
  - 0.0625" spaces
  - 0.75" to 1.5" long dashes
  - 0.25" extension with arrowhead
6. Use a break line to represent part of a view. Break lines can be short and long.

A short break line is a sketchy 0.6 mm wide line to indicate the break in the view.

A long break is a continuous 0.3 mm line accompanied by two zigzag's at 0.125" high and 60°. The long break line extends 0.25".

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- BREAK SHORT LINE - 0.6 mm sketchy continuous line
- BREAK LONG LINE -
  - 0.3 mm line width
  - 2 zigzag's at 0.125" dashes and 60°
7. You must remember that it is the continuous *border line* at 0.8 mm that presents all of the views, dimensioning, and annotations. Dimensioning and annotation will be discussed in the next lessons.

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- **BORDER LINE**
  - 0.8 mm continuous

8. You can now add additional linetypes to the sketches from the previous exercises. Remember to use your scale and grid paper.

In this exercise, you learned about linetypes and how to apply ANSI standards.