

**Knowledge domain: Mechanical**

**Unit: Casing**

**Skill: Panels/Doors/Lids**

**Tools and Parts Required:**

- 1) Door / panel / large piece of wood
- 2) 2 Hinges
- 3) 6 Flat-head Screws
- 4) Pencil
- 5) Hand drill and bit
- 6) Screwdriver
- 7) Tape measure
- 8) Straight edge
- 9) Saw

- 10) Sandpaper
- 11) Metal Shears
- 12) Sheet metal (thin as possible), at least 30 by 30 cm
- 13) Pliers, Lineman's
- 14) Work Gloves
- 15) Metal File
- 16) Marker
- 17) Paper

**Introduction**

A door is a moveable barrier used to cover an opening. Doors are hinged along one side. Hinged doors usually have two or three hinges. Some medical equipment has small case doors that will need replacing or repair. Use this skill to replace any panels and doors. Incubators, medical storage cabinets and cribs are examples of medical equipment with doors.

A lid is also a moveable barrier. Lids rest on top of medical equipment. Some lids are hinged and some are not. Use this skill to replace any broken or missing lids. Hot water baths and centrifuges are examples of medical equipment with lids.

A panel is a non-moveable barrier. Use this skill without hinges to replace or repair panels. Most medical devices that have doors also have panels.

**Example**

Below are pictures of the different types of hinged doors.



## Identification and Diagnosis

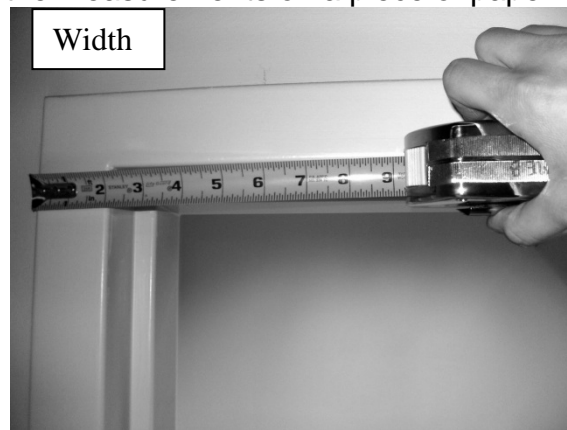
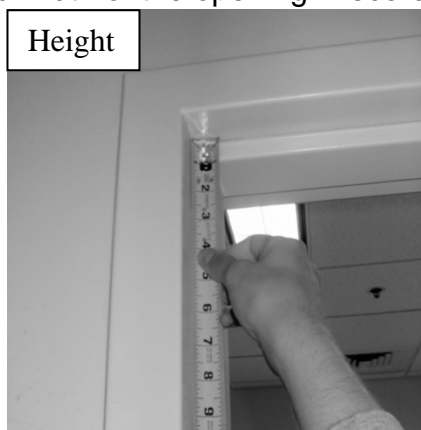
Sometimes doors, panels or lids are cracked, missing or otherwise broken. For broken barriers, try repairing the barrier first with epoxy or another method. Also try to find the exact replacement. If replacement and repair are not possible, use this skill to fabricate a replacement.

## Procedure

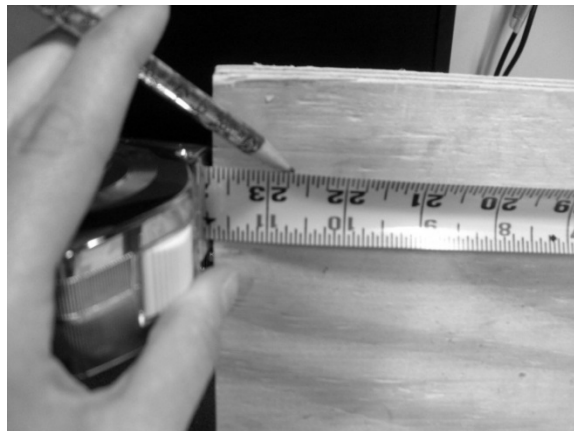
Before you begin construction, determine if your new door, panel or lid should be two-dimensional or three-dimensional. Two-dimensional barriers are flat. Three-dimensional barriers have a hollow space within them.

### Constructing flat or two-dimensional doors, panels and lids:

1. Measure the opening or frame. Use a tape measure. Measure the height (or length) and width of the opening. Record the measurements on a piece of paper.



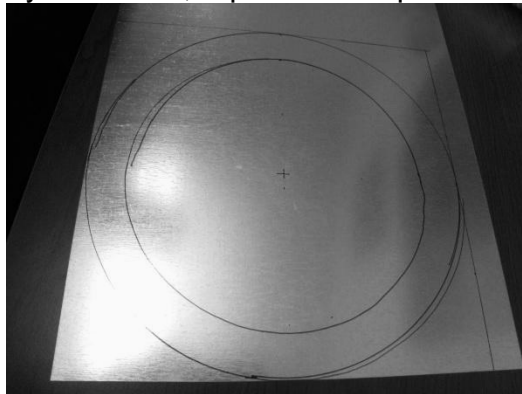
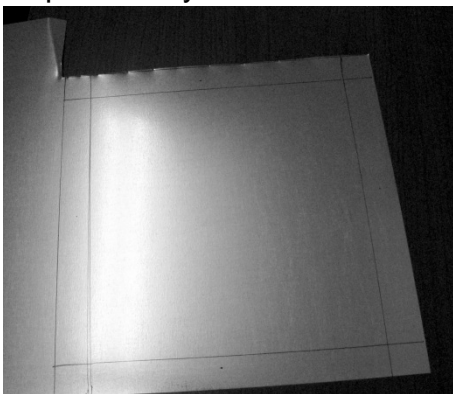
2. Select a piece of wood or metal for your door, panel or lid. When replacing a previous door, panel or lid, use the original dimensions as reference. The replacement should have the approximate dimensions of the frame. The material can be a little larger because you can trim the material to the desired dimensions.
3. Mark the replacement door for trimming. On wood, use a pencil and a straight edge to mark the cutting line on the replacement door. On metal, use a permanent marker and a straight edge.



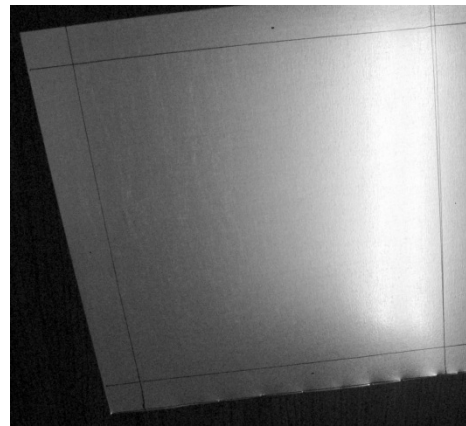
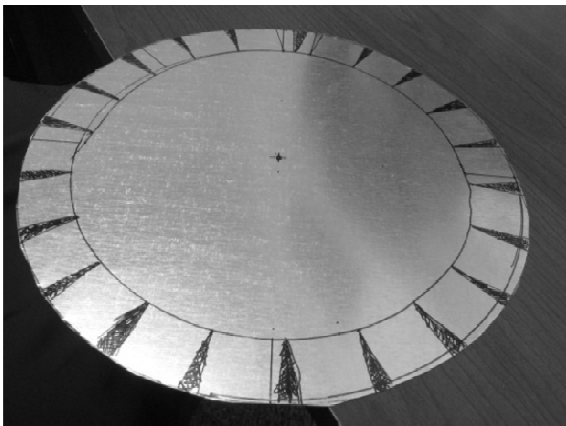
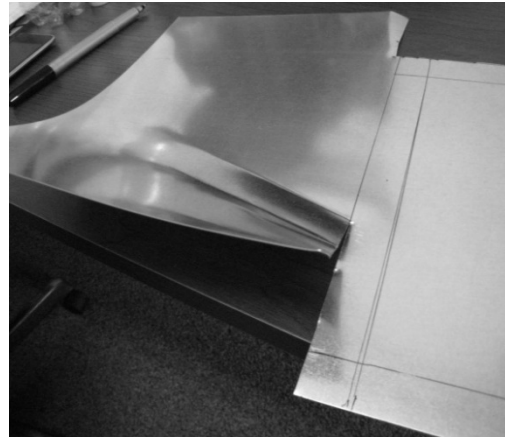
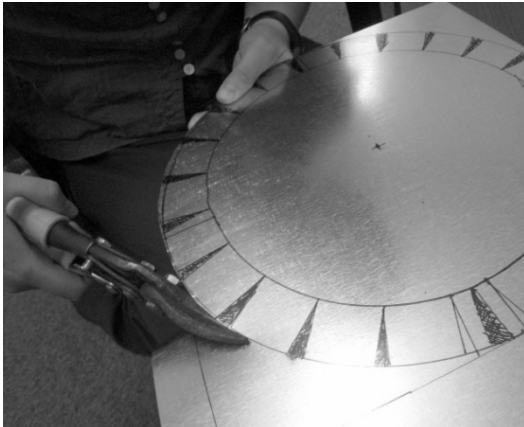
4. Trim the door, panel or lid. For wood, use a wood saw to trim. Sand the edges until they are smooth. For metal, use metal shears to cut the metal sheet. Use a metal file to smooth the edges. Don't trim past the marker or pencil marks.
5. Verify that the replacement door, panel or lid fits. Work with a partner to hold the replacement in the frame. If the replacement does not fit properly, you will need to trim again.
6. Affix your trimmed wood or metal sheet to the frame.
  - *Panels*: Use screws or nails to attach the panel to the frame.
  - *Doors*: Install hinges. \*\*Refer to *Mechanical-Casing-Hinges* for detailed information on how to hang a hinge.\*\* Remember, most doors open out of medical equipment. Room doors open in to the room.
  - *Lids*: Install a hinge or handle as necessary.

### **Constructing three-dimensional doors, panels and lids:**

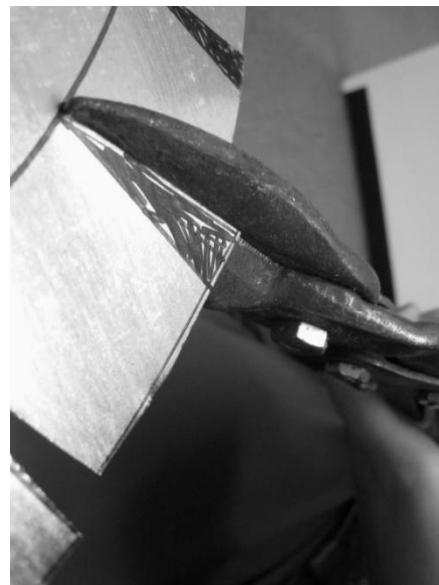
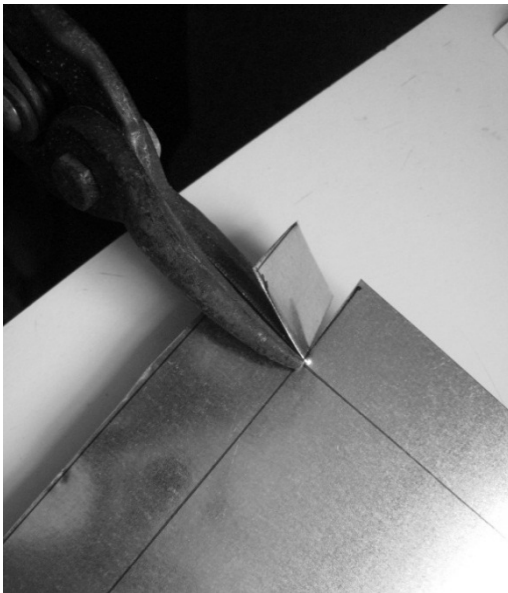
1. Measure the opening or frame. Use a tape measure. Measure the length, width and height of the opening. If the opening is circular, measure the diameter. If the opening is irregular, make as many measurements as necessary. Record the measurements on a piece of paper
2. Decide on your design. Use a permanent marker to draw your design on a metal sheet.
  - Use the thinnest metal you can find. If the metal sheet is too thick, you will have a hard time bending the metal. (Note: three-dimensional doors are easier to construct with metal than wood. Instructions here are only for metal.)
  - *Rectangular doors, panels and lids*: Draw a rectangle with the dimensions of your frame. Draw a larger rectangle around it. The difference between the smaller and larger rectangles is the height or thickness of the lid.
  - *Circular doors and lids*: Draw two concentric circles. The smaller circle should have the same diameter as your frame. The difference in diameter between the smaller and larger circles is the height or thickness of the lid.
  - *Other shapes*: Be creative! If you are unsure of your design, make a model first with paper. Use a large piece of paper instead of sheet metal for the following steps. Once you are satisfied with your model, repeat the steps with metal.



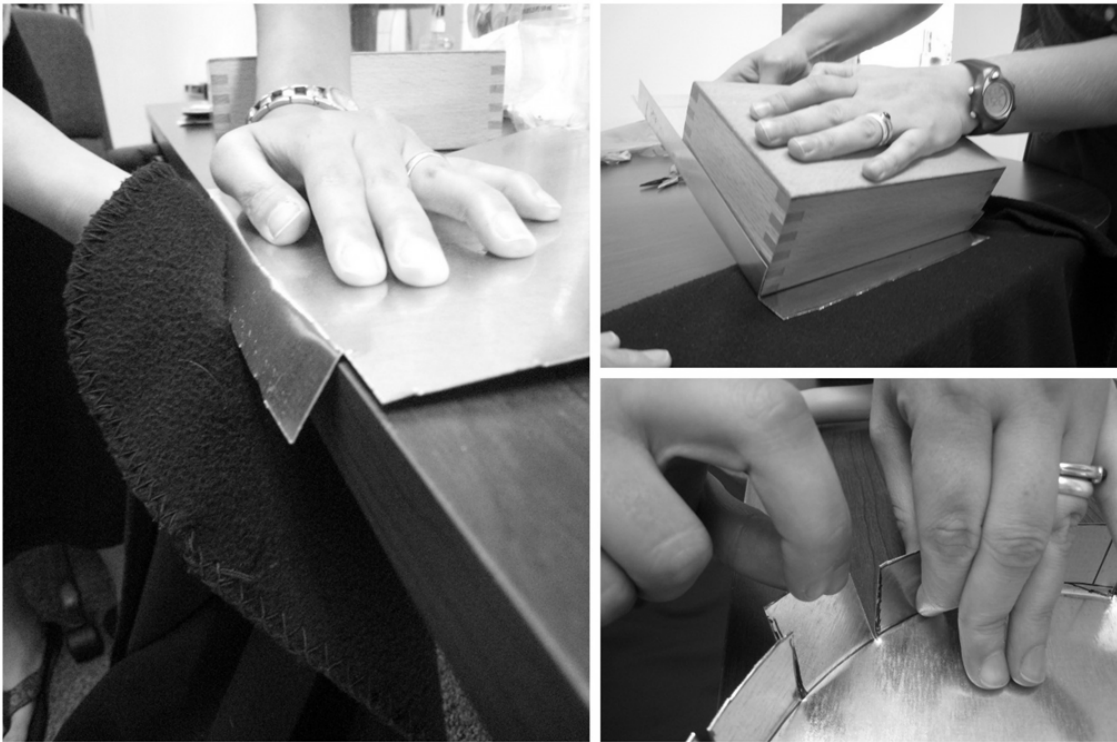
3. Use metal shears to cut out your design from the sheet metal. You may need to bend the metal up or down as you cut.



4. Use metal shears to cut out the smaller pieces in your design.

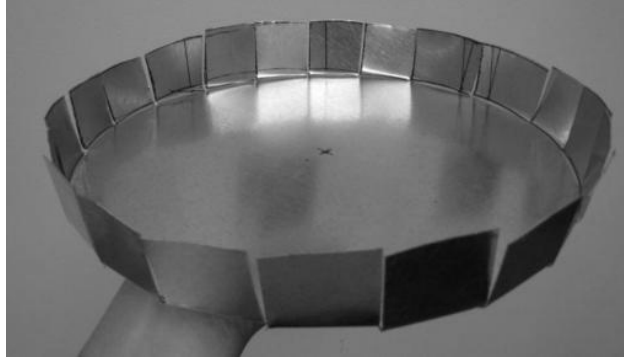
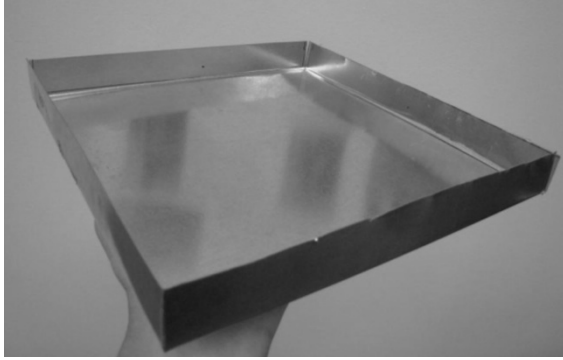


5. Bend the pieces to the desired angle. For shorter folds, use your hands. For longer folds, use the edge of the table or a block of wood. If the metal is difficult to fold, wear work gloves or use a towel to protect your hand.



6. If there are any sharp edges, smooth them with a metal file or cover them with tape.
7. You're done! Affix your door, panel or lid to the frame if desired. (See step 6 in the two-dimensional barrier instructions above).





### **Exercise**

Design a replacement door, panel or lid for a medical device. Construct the barrier with sheet metal.

Your instructor must verify your work before you continue.

### **Preventative Maintenance and Calibration**

Doors with loose hinges should be repaired or replaced. Do not wait until the door completely falls off or someone might be injured. Doors that are bent or rusty should be repaired or replaced.

Check doors and panels for chipped or old paint. Glossy paint can help prevent the spread of infection. Consider painting the doors of infant incubators and supply cabinets.

Always calibrate every medical device before returning it to use.