**Fabricate a Coat Hook**

# Description

Metal fabrication involves the use of a basic set of skills—cutting, bending, and assembling processes—to create something from raw material. Such a simple project as a coat hook incorporates many skills that will be used many times in other projects of various sizes and degrees of difficulty. Various hand tool skills learned while completing this project will be applied to all future metalworking projects and possibly other trade areas.

# Lesson Objectives

The student will be able to:

* Identify common metals
* Identify common fasteners
* Demonstrate appropriate shop behaviour
* Demonstrate safe and appropriate use of hand tools and equipment
* Use appropriate layout tools

# Assumptions

The student will:

* Know basic metallurgy
* Understand basic layout techniques
* Know basic measurement
* Know how to use hand tools safely

The teacher will:

* Possess layout skills
* Know and be able to demonstrate the safe and correct use of the tools and equipment used for this activity plan
* Know and be able to demonstrate riveting processes

# Terminology

**Burr**: a sharp edge on metal left after cutting.

**Countersink drill bit**: a drill bit that creates a chamfered edge around the top of the drill hole to accommodate a machine screw or rivet head.



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**Rivet**: a short piece of metal, typically aluminum or steel, used to join two or more pieces of metal together. One end of the rivet will have a flat or rounded head, and the other end is headless and is beaten with a hammer to spread it out and fasten the metal together.

**Rivet set**: a metal block with hemispheres drilled out to allow the rivet head to sit in while riveting.

# Estimated Time

5–8 hours

The time for this activity will depend on the familiarity of students with tools and the scope of the project (how much teachers prepare for students ahead of time, or how far they take the finishing portion of the project, availability of tools/equipment).

# Recommended Number of Students

20, based on *BC Technology Educators’ Best Practices Guide*

# Facilities

Secondary school metal shop or equivalently equipped technology education shop

# Tools

* + Hacksaw
  + Scribe
  + Hand drill
* 3⁄8" countersink
* Double cut file
* Single cut file
* Emery cloth
* Compact bender
* 3⁄16" drill bit
* Centre punch
* Rivet set

**Materials**

**Note**: Material can be partially or completely pre-cut by the instructor in order to facilitate ease of construction. This would be determined by the experience of students in the class, time constraints, and tools available.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **# of pieces** | **Material** | **Thickness** | **Width** | **Length** |
| Backing plate | 1 | 2" flat bar | 1⁄8" | 2" | 2" |
| Hook | 1 | 1" flat bar | 1⁄8" | 6" | 1" |
| Rivets | 2 | Steel | N/A | ½" | 7" |

# Resources

## How to use a Di-Acro bender to bend flat stock:

https://[www.youtube.com/watch?v=bt7ocmHzsnc](http://www.youtube.com/watch?v=bt7ocmHzsnc)

## How to rivet

https://[www.youtube.com/watch?v=xv2RBLPYikY](http://www.youtube.com/watch?v=xv2RBLPYikY)

# Teacher-led Activity

Lead the class through the following steps to fabricate a coat hook.

## Hook

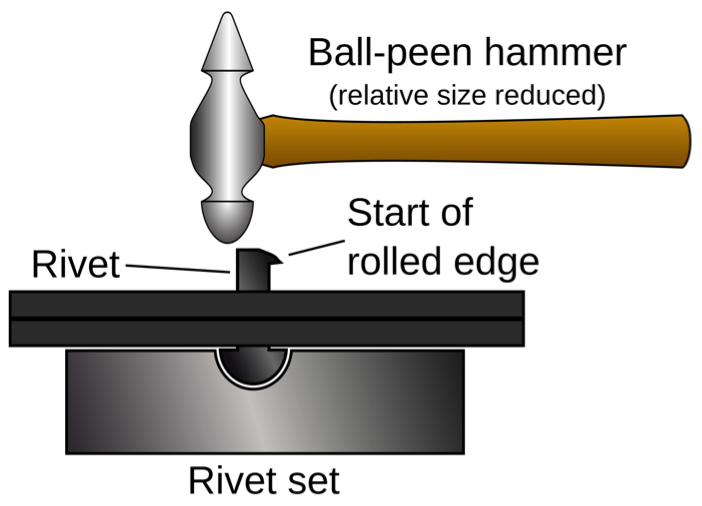
1. Acquire a piece of 1" × ⅛" flat bar.
2. Teacher demonstrates the Beverly shear to students. You can use a hacksaw if a Beverly shear is unavailable.
3. Lay out a line at 7⅛". Cut with a Beverly shear or hacksaw.
4. Deburr and file flat bar ends square until overall length of the hook piece is 7".
5. Using emery cloth, sand off any scale.
6. Lay out radius on both ends of hook and file to lines.
7. Use a smooth file to finish the ends and edges.
8. Draw a line down centre of hook.
9. Measure 2½" down from one end and centre-punch.
10. Measure 1" down from previous mark and centre-punch.
11. Teacher demonstrates a drill press to students. You can use an electric hand drill if a drill press is unavailable.
12. Drill centre-punch marks with ⅛" drill bit.
13. File any burrs from drill holes.
14. Use a vise to bend top 2" section to 45° angle.
15. Teacher demonstrates a bender to students.
16. Use manual bender with 1½" radius die to create bend at the bottom.

## Backing Plate

1. Acquire a piece of 2" × ⅛" flat bar. Lay out a line 2⅛" from a square end.
2. Cut a piece 2⅛" long using a bench shear or hacksaw.
3. Deburr and square up the ends with a file. File the bar until it is exactly 2" long.
4. File a small chamfer along outside edges on front side of plate.
5. Using emery cloth, clean off any scale from project.
6. Draw diagonal lines across the backing plate that run from corner to corner.
7. Mark drill holes ½" from centre intersection along lines, as per drawing, for rivet holes.
8. Mark drill holes 5⁄8" from 2 opposite corners along lines, as per drawing, for mounting holes.
9. Centre-punch intersections for drill holes.
10. Drill rivet holes with ⅛" drill bit in the drill press.
11. Drill mounting holes with 3⁄16" drill bit in drill press.
12. Countersink mounting holes with 3⁄8" drill bit on front side of plate.
13. Countersink rivet holes with 3⁄8" drill bit on back side of plate.

## Assembly

1. Teacher demonstrates the riveting process to students.
2. Place rivet set in the vise.
3. Acquire a ⅛" rivet and place through hook and backing plate. Ensure the back is facing upwards at this step.
4. Position head of rivet into the correct rivet set anvil hole.



https://upload.wikimedia.org/wikipedia/commons/thumb/f/fd/Riveting.svg/2000px-Riveting.svg.png

1. Using a ball peen hammer, hammer the rivet into a mushroom head shape to fill the countersink hole.
2. Repeat steps 2–4 for second rivet.
3. Hammer both rivets as flat as possible against backing plate.
4. File off any excess material from rivets on backing plate.

## Finishing

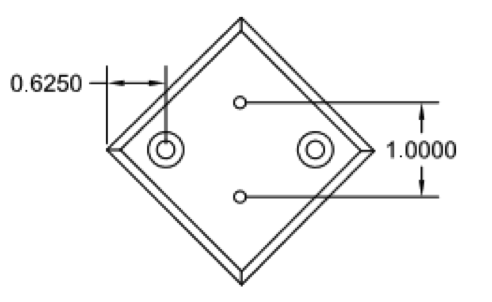
1. Clean any grease, dirt or scratches off metal using emery cloth.
2. Choose an appropriate method of finishing (painting, powder coating, etc.).

# Assessment

Consider co-creating the assessment criteria with your students at the beginning of the activity/ project. You may want to include the following:

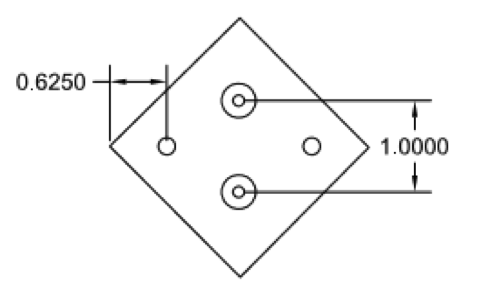
* + Hook filed radii are within 1⁄16"
  + Hook top bend is a perfect 45°
  + Bottom bend is uniform, even, and straight to the back of hook
  + Backing plate sides are within 1⁄16" and four corners are square
  + Mounting holes are within 1⁄16" of plan
  + Both rivets sit flat into backing plate

# Backing Plate – front view



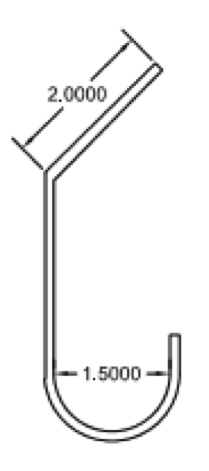
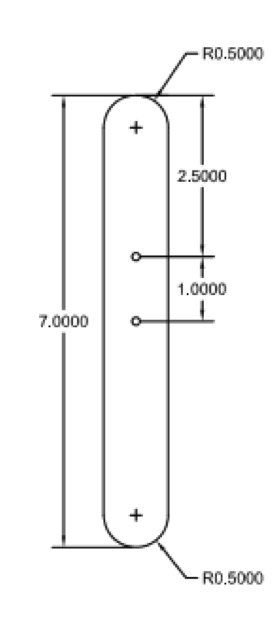
Backing plate—front view

# Backing Plate – back view



Backing plate—back view

# Hook



Hook