**Youth Explore Trades Skills Metal Work – Fabrication**

**Fabricate a Trivet**

# Description

Metal fabrication involves basic skills such as cutting, bending, and assembling to create something from raw material. In this activity plan, students will lay out, cut, bend and assemble a trivet according to the blue prints. Trivets are a functional low platform used to keep hot objects off surfaces that cannot tolerate high heat. Teachers will lead equipment and process demonstrations and the students will follow up by building a trivet.

# 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 and scales

# Assumptions

The student:

* Knows basic metallurgy
* Knows how to use hand tools safely
* Knows basic measurement
* Understands basic layout techniques

# Estimated Time

5–10 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, based on the 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



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# Equipment/Machinery

* + Bench grinder
  + Box and pan brake or bar folder
  + Di-Acro bender
  + Drill press
  + Foot shear
  + Hand drill

# Tools

* + Aviation snips
  + Beverly shear or hacksaw
  + Centre punch
  + Pop rivet gun
  + Scribe
  + Sharpie
  + Square
  + Steel scale
  + Emery cloth

# Materials

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **# of pieces** | **Material** | **Thickness** | **Width** | **Length** |
| Trivet legs | 4 | ½" flat bar | 1⁄8" | ½" | 6" |
| Trivet body | 1 | 22 ga sheet metal | 22 ga | 7" | 7" |

8 – 1⁄8" steel rivets

# Resources

## How to use a Beverly shear

https://[www.youtube.com/watch?v=1vKgqse-40k](http://www.youtube.com/watch?v=1vKgqse-40k)

## How to use a foot shear

https://[www.youtube.com/watch?v=w8d3n\_kvlyM](http://www.youtube.com/watch?v=w8d3n_kvlyM)

## How to use a pop rivet gun

https://[www.youtube.com/watch?v=WPwNsQMnx88](http://www.youtube.com/watch?v=WPwNsQMnx88)

## How to use a box and pan brake

https://[www.youtube.com/watch?v=d4RWkf7eo1g](http://www.youtube.com/watch?v=d4RWkf7eo1g)

# Teacher-led Activity

Lead the class through the following steps to fabricate a trivet. Refer to the plans provided below.

## Legs

1. Obtain ½" flat bar.
2. Teacher demonstrates safe and correct use of Beverly shear or hacksaw.
3. Lay out lines at 6" and cut bar stock on Beverly shear (4 pieces required). (If Beverly shear is not available, have students use a hacksaw.)
4. File ends of 6" bar stock round and remove any sharp edges.
5. Using layout tools:
   1. Draw a centreline down the length of the flat stock.
   2. From one end, measure ½" and mark with centre punch.
   3. Then measure ½" from previous mark.
   4. Centre-punch both marks.
6. Teacher demonstrates safe and correct use of drill press.
7. Drill ⅛" holes at centre punch marks.
8. File excess metal from drilling.
9. Teacher demonstrates safe and correct use of the Di-Acro bender.
10. Use Di-Acro bender to bend a 1" radius bend on all four bars of metal, at opposite ends to the drilled holes.

Di-Acro bender

If no bender is available, a simple jig can be made for students using a 1" diameter pipe held in a bench vise to create radius.

## Base

1. Get 7" strip of sheet stock (22 gauge mild steel).
2. Teacher demonstrates safe and correct use of the foot shear.
3. Cut one piece at 7" (perfectly square).
4. Using layout tools on one side:
   1. Scribe lines from corner to corner diagonally on one side of sheet metal.
   2. Measure and centre-punch holes 1" from the intersection.
5. Using layout tools on reverse side:
   1. Scribe a line 4 mm from edge of all four corners.
   2. Scribe a second line 8 mm parallel to the first.
   3. At 24 mm from each corner on the outside edge, mark a point, draw a line on each corner to join these points.
6. Cut off corners with foot shear.
7. Drill ⅛" holes on centre punch marks along the diagonal lines.
8. Teacher demonstrates safe and correct use of bar folder (or box and pan brake).
9. Fold along scribed lines using bar folder (or box and pan brake).
   1. First fold, all the way.
   2. Second fold, 90 degrees.

## Assembly

Teacher demonstrates safe and correct use of pop riveter.

1. Using a pop riveter, rivet the first hole in the sheet metal to the legs.
2. Use the second hole in the legs to line up the second hole on the base.
3. Drill second ⅛" hole with hand drill.
4. Rivet second ⅛" hole.

## Finishing

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

# Evaluation

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

* All four corners are square
* All four sides are the same height and all sides are parallel to bottom
* Rivets are secure and filed flat and smooth
* All four legs are of uniform size and bend
* Finish: All files marked are removed, and sanding is uniform

# Trivet Body drawings

7.0000

7.0000

Trivet body drawings

6.0000

# Trivet Leg specifications

1.0000

0.5000

Trivet leg specifications