

WORKSHOP
DEPARTMENT OF MECHANICAL
ENGINEERING
LAB MANUAL
OF
SHEET METAL OPERATION



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OBJECTIVES

- (i) To prepare a sheet metal product (square container).
- (ii) Report the various parameters for the various passes during the rolling of the given metal piece.

EQUIPMENT & MATERIAL

Mallet, Hand shear, Bench shear, Grooving and Riveting tool, Metal Sheet, Soldering Equipment.

In the workshop, mostly the work will be done with small tools stated above. In reality for the mass production, it is not an economical method. Making sheet work by hand is a time taking and less accurate method. Sheet bending machines are used in the industries for fast and accurate work. A sheet bending machine is shown here:



Fig. Sheet bending machine

If you visit a fabricator of Almira etc, you can see this machine outside the shop. Most of the time it is few meters long and height about 1-2 m.

DEMONSTRATION

Self secured sheet metal joints

(a) Internal grooved joint

- Mark out portions of given sheets near edges to be joined with a marker (Fig. 1.1a)
- Fold the sheets at edges in the portion marked, first at right angles to the plane of the sheet (Fig. 1.1 b) and then at 180° to the plane (Fig.1.1c)

- Insert one folded sheet into the other (Fig. 1.1d)
- Groove the seam using grooving die (Fig. 1.1e)

(b) Double grooved joint

- Fold sheets after making them as per the instructions given (Fig. 1.2a)
- Cut a piece of sheet (called strap) of required width
- Strap width = (4x size of marked edges) + (4 x thickness of sheet)
- Close the edges of the strap slightly as shown in Fig. 1.2(b)
- Slip the strap on the bent edges of the sheets after bringing them together (Fig.

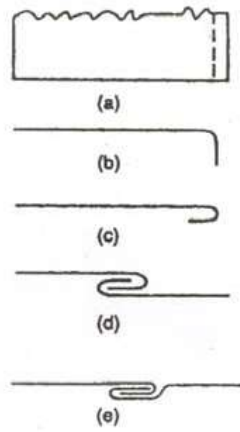
1.2c)

(c) Knocked-up joint

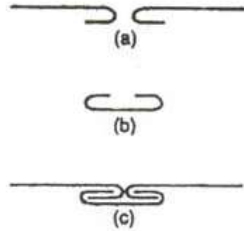
- Fold one sheet and close edges slightly (Fig. 1.3a)
- Bend one sheet to form a right angles band (Fig. 1.3b)
- Slip the second sheet in the folded one (Fig. 1.3c)
- Close the right angled sheet using a mallet (Fig. 1.3d)

Procedure for Square Container:

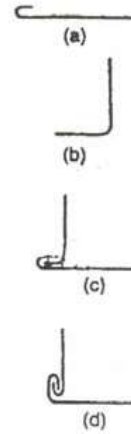
- Cut a sheet of 120 mm x 120 mm, and mark a center of 60 mm x 60 mm to indicate bend lines.
- Mark bending lines of 4 mm and 6 mm on outer edge of square sheet as shown in figure
- Join the diagonals and mark 15° from corners of inner-square (60 x 60 mm) ...i.e. 7.5° on the either side of the diagonals
- Mark the intersection of 15° line with 10mm outside bending line, mark a 60° to the bending line (for all four corners, or eight times).
- From 60° intersecting line at 4mm from outer edge, now mark 172.5° to bending line (for all four corners, or eight times).
- Now remove the corner portions
 - i.e. 60° till 6 mm (from inner corner edge towards outside edge), and then
 - 172.5° for last 4 mm till outer edge.
- Fold the sides of container (try avoiding waviness)
- Seam the edges at all corners and make sure it is leak proof



1.1

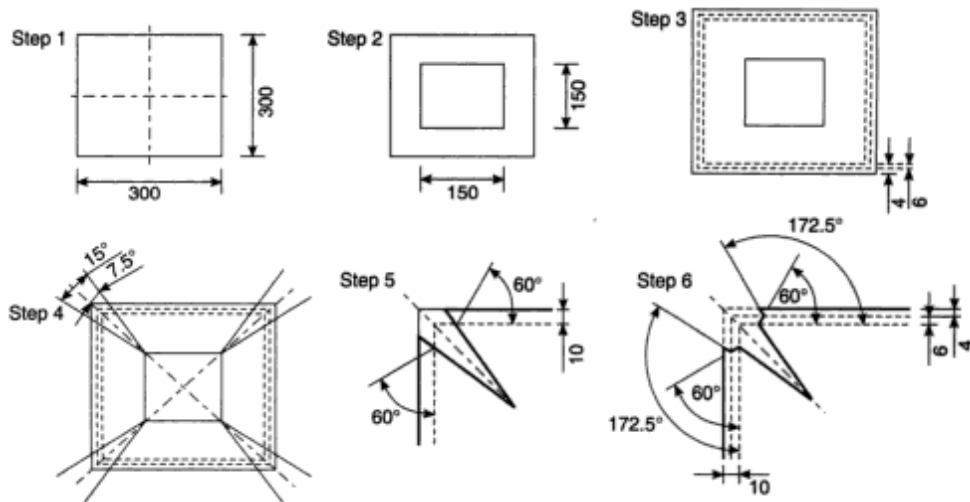


1.2



1.3

Figure: Sheet Metal Joints



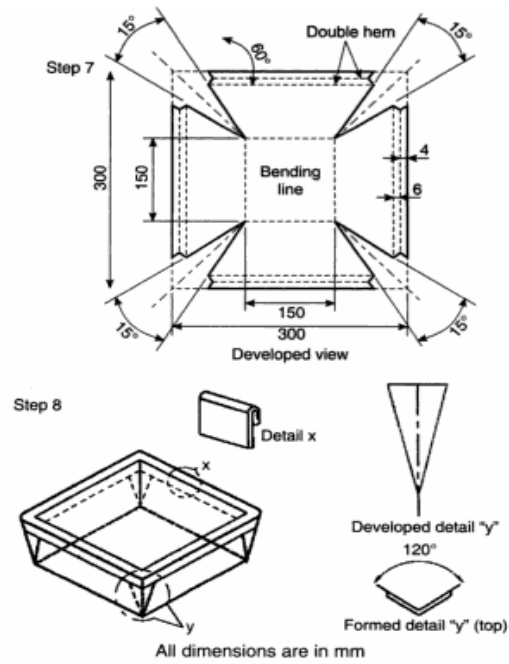


Figure 2: Sheet metal forming of square container

REPORT THE FOLLOWING

1. Precautions to be taken during sheet metal working.
2. Draw the sketches showing the principle of the development of the job as shown in the sheet metal forming demonstration.
3. What are the machines used in the shearing and bending operation.