Workshop Technology
[Sheet Metal Works]

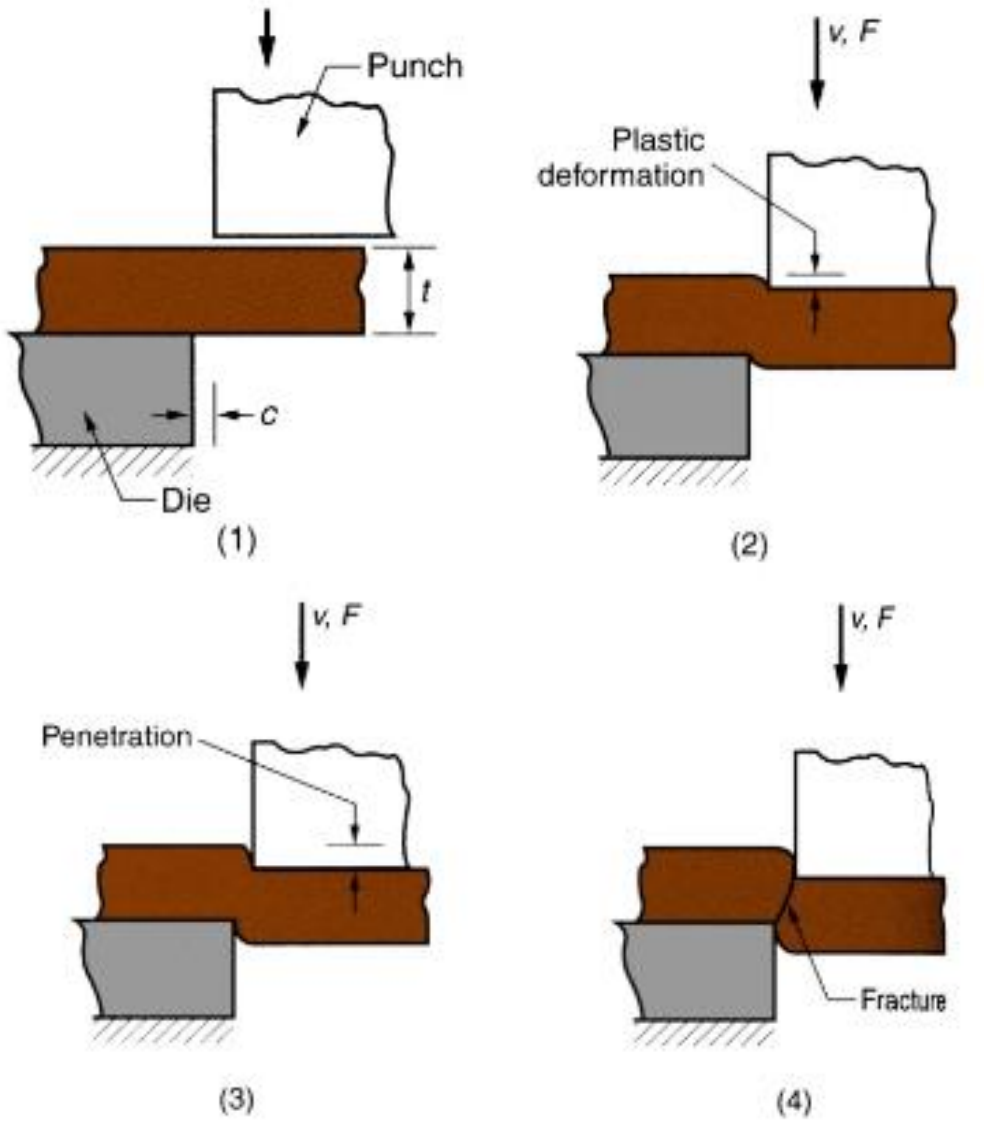
Introduction

- Sheet metal: Thin and flat metal pieces
- Thickness: 0.006 inch (0.15 mm) to 0.25 inch (6.35 mm)
- Foil: Thickness < 0.15 mm; Plate: Thickness > 6.35 mm
- Sheet thickness is generally measured in gauge. Greater the gauge number, thinner the sheet of metal

Sheet metal processes

- Cutting
  - Shearing to separate large sheets
  - Blanking to cut part perimeters out of sheet metal
  - Punching to make holes in sheet metals
- Bending
  - Straining sheet around a straight axis
- Drawing
  - Forming of sheet into concave or convex shapes

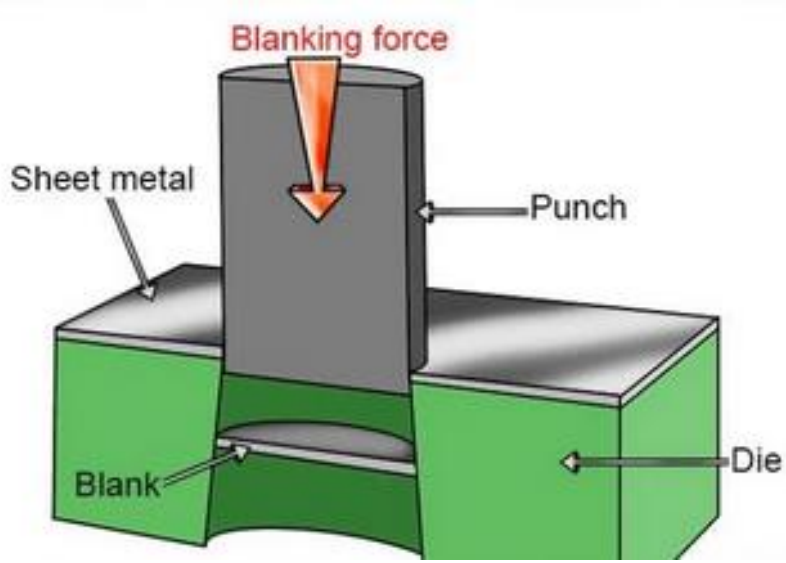
Shearing

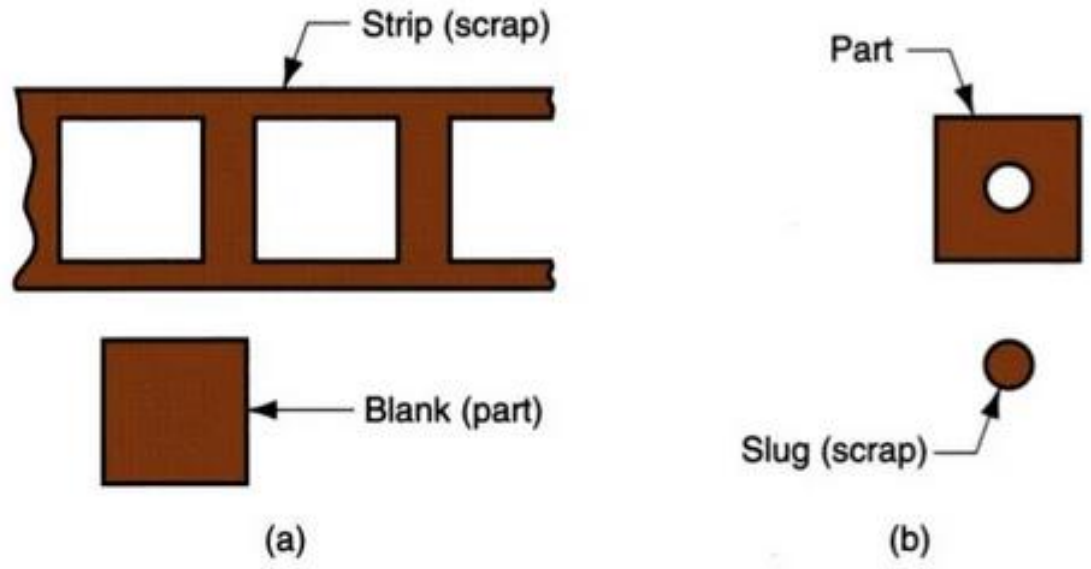


- Sheet metal cutting operation along a straight line between two cutting edges
- Typically used to cut large sheets

Blanking and Punching

- Blanking: sheet metal cutting to separate piece (called a blank) from surrounding stock
- Punching: similar to blanking except cut piece is scrap, called a slug

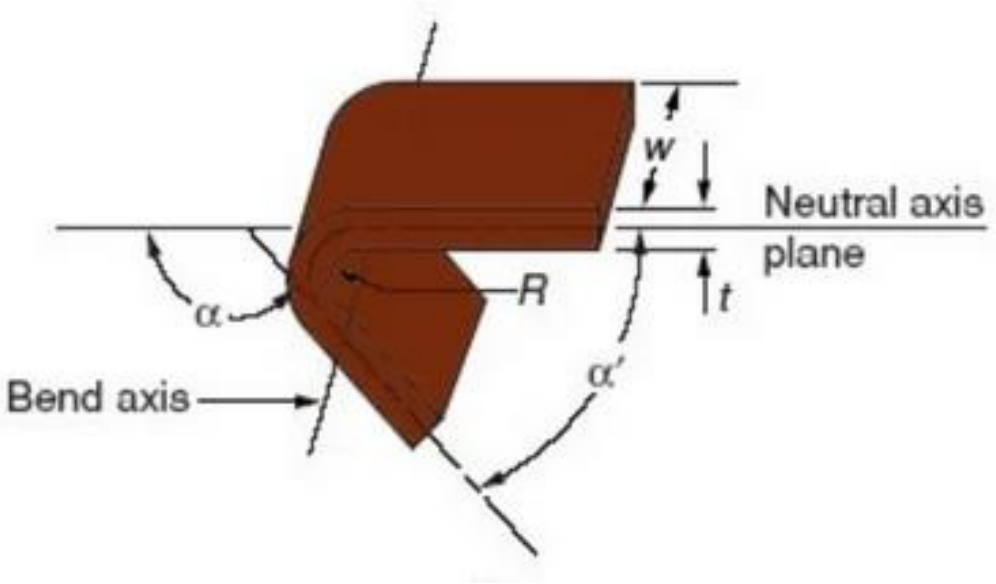


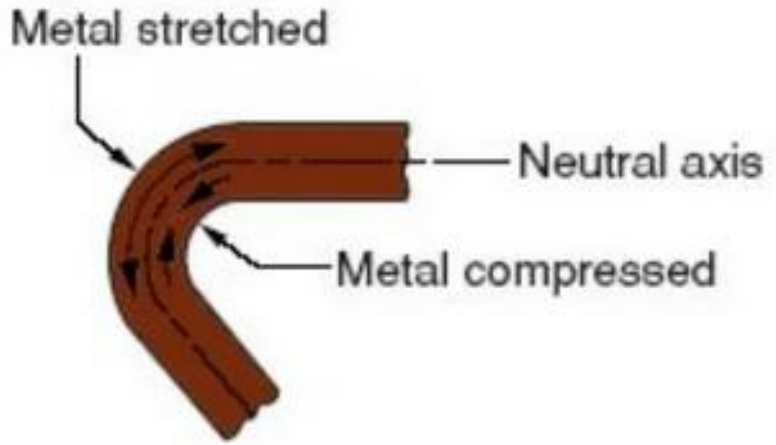


a) Blanking b) Punching

Sheet Metal Bending

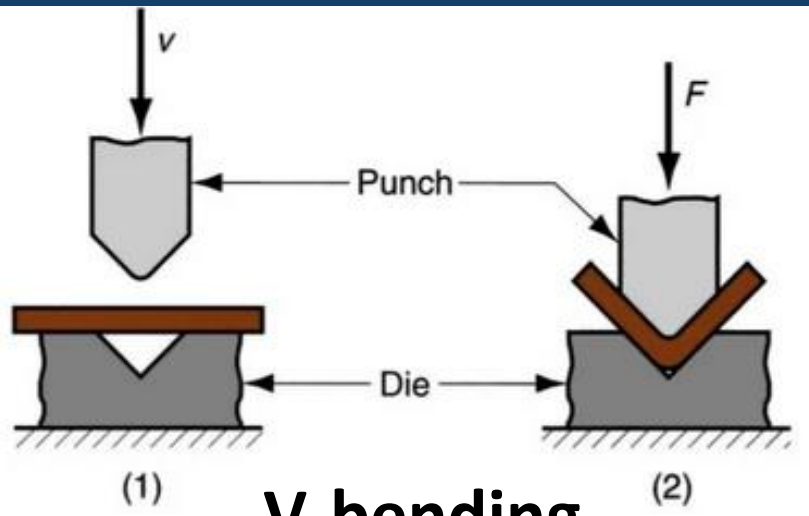
- Straining sheet metal around a straight axis to take a permanent bend
- Metal on the inside of neutral plane is compressed, while metal on outside of neutral plane is stretched





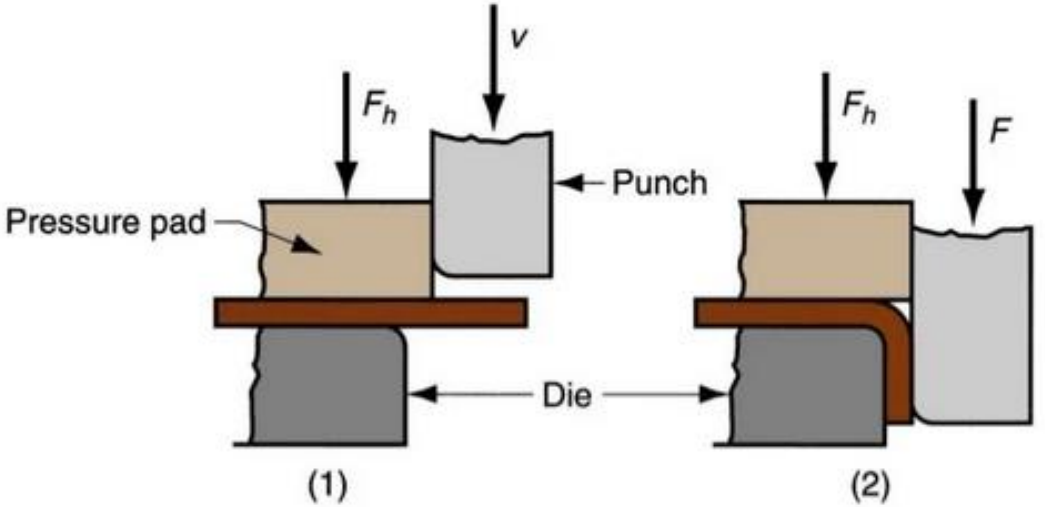
Types of Sheet Metal Bending

- V-Bending: Performed with v-shaped die
  - For low production
  - Performed on press bench
  - V-dies are simple and inexpensive



V-bending

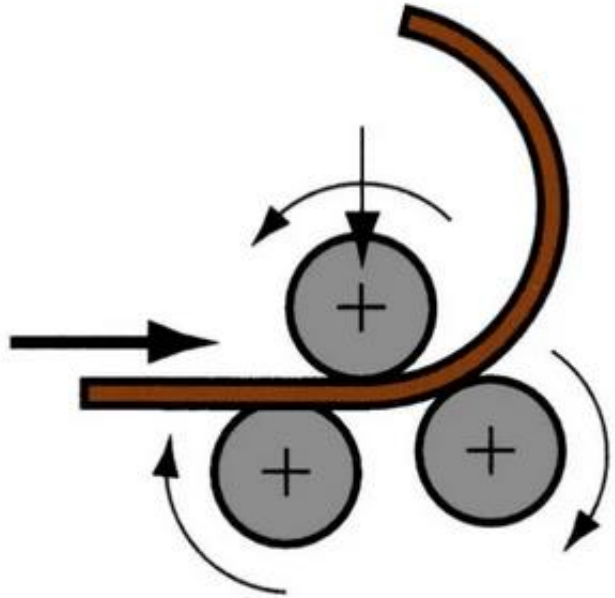
- Edge Bending: Performed with a wiping die
  - For high production
  - Pressure pad required
  - Dies are more complicated and costly



Edge bending

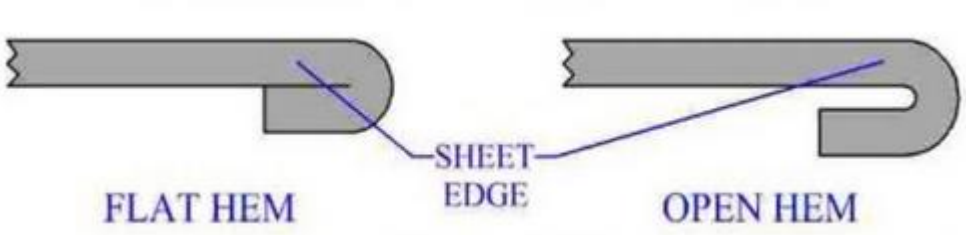
Types of Sheet Metal Bending

- Roll bending
  - Large metal sheets and plates are formed into curved sections using rolls
  - Distance between rolls are adjustable to control the curvature radius



Roll bending

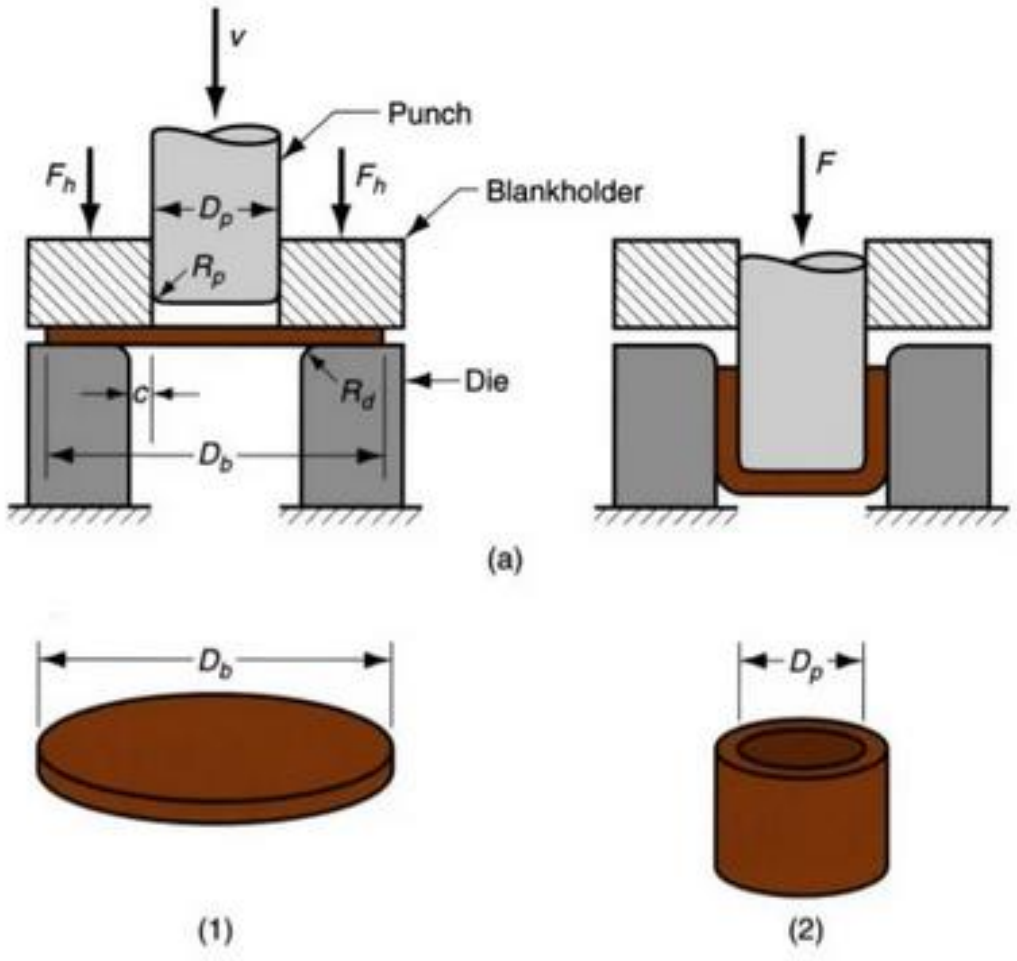
- Hemming
  - Edge of the sheet is folded over itself
  - Increases stiffness of the part and eliminate sharp edges



Hemming

Drawing

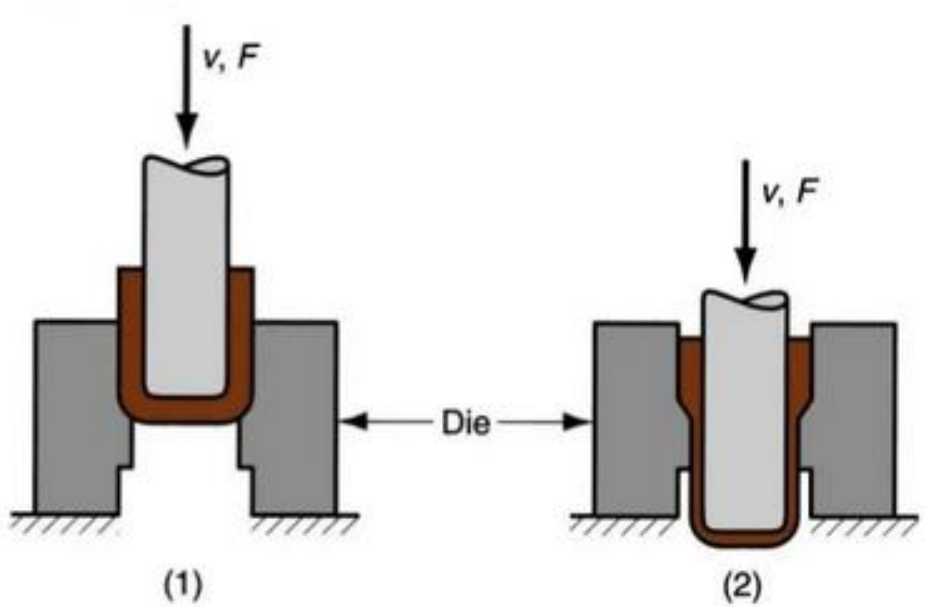
- Sheet metal forming to make cup-shaped box-shaped, or other complex-curved hollow-shaped parts
- Sheet metal blank is positioned over die cavity and then punch pushes metal into opening
- Products: beverage cans, ammunition shells, automobile body panels
- Also known as deep drawing (to distinguish it from wire and bar drawing)



Drawing of cup-shaped part

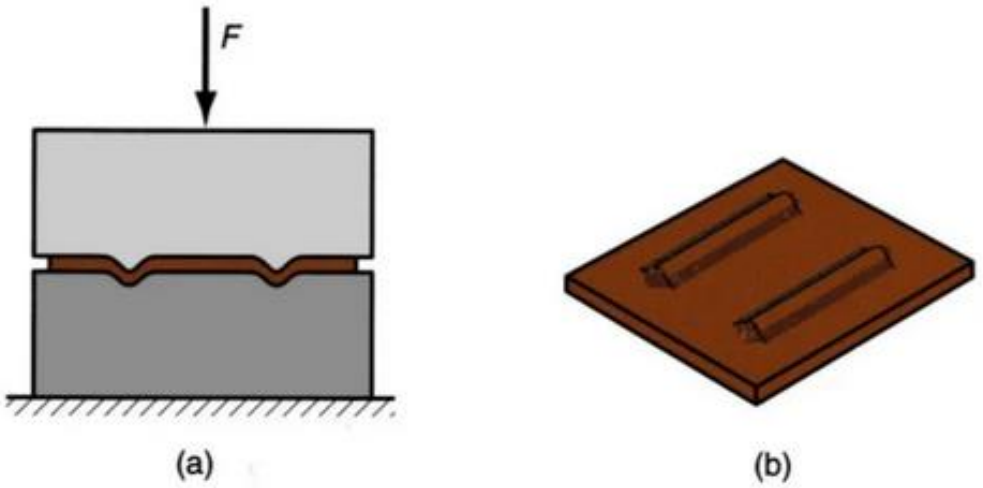
Other sheet metal forming on presses

- Ironing
  - Makes wall thickness of cylindrical cup more uniform



Ironing

- Embossing
  - Creates indentations in sheet, such as raised (or indented) lettering or strengthening ribs



Embossing

Thank You