

## BENDING

Three terms used for forming sheet metal.

**AIR BENDING:** 3 point contact of metal. Punch tip and die edges. Air bending is what most bend allowance formulas are based on. When forming mild steel the inside bend radius is based upon bottom die V opening. It is close to 15.6 percent of the die opening. Therefore a 3/8 die opening would produce an inside bend radius of .059.

$$.375 \times .156 = .0585 \text{ (Almost a } 1/16 \text{ bend radius)}$$

On most aluminum alloys the inside bend radius would be determined by the punch tip radius (i.e. if using a punch tip with .06 radius on .063 5052-H32 aluminum the bend radius will be close to .06).

To stay in the air bending range the inside bend radius needs to be no less than about 80 percent of the material thickness. Anything less would be considered bottom bending. For example: Let's take that .375 die opening which produces a .0585 bend radius and try to apply it to .090 cold roll steel. We take the .0585 and divide it by the material thickness to see what percentage of the material the radius is.

$$.0585 \div .090 = .65$$

The radius produced is 65 percent of the material thickness, that would put us into the bottom bending range. We would have to go to a larger V opening for the die. To find out what size V opening you need for a 3/32 or .094 Bend radius just take the radius and divide it by 15.6 percent.

$$.094 \div .156 = .6025$$

.602 rounding it off to a 5/8th V die would work just fine.

**BOTTOM BENDING:** This is where material is bent to conform to a set of dies that are doing the forming. Full surface contact of metal to dies will occur. Angles and inside bend radius of formed sheet metal are determined by the punch and die

**COINING:** This is where actual deformation of the material occurs. The sheet metal that is compressed between the punch and die is actually thinner than it was originally before the forming operation.

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