

EDU[**CAD**]TION **STUDY GUIDE**

How to Master Dimple Design in Sheet Metal

Chapter 5, Lesson 10

SendCutSend

What is Dimple Forming?

- Dimple forming is a secondary operation performed after cutting.
- It uses a male and female die to press the sheet metal, forming a raised or recessed 'dimple' (see Figure 1.1).
- This improves part rigidity, much like folding a sheet of paper to make it more stiff. It's a common feature for aerospace, automotive, and performance applications.

<https://sendcutsend.com/services/dimple-forming/>

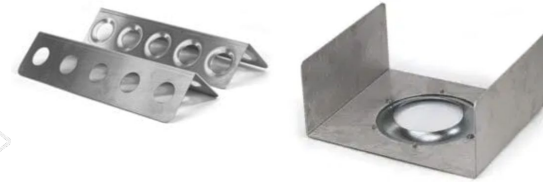


Figure 1.1

How the Process Works

- A hole is first cut into the flat sheet during the cutting process.
- A male and female die pair press into the material around the hole (see Figure 1.2).
- The dies 'coin' the material under high pressure, permanently deforming it.
- The resulting dimple increases stiffness and reduces weight while maintaining strength.



Figure 1.2

Key Measurements in Dimple Design

There are three essential dimensions to understand when adding dimples (see Figure 1.3):

- **Tool Outside Diameter (OD):** The total diameter of the forming tool. Everything within this area must remain flat for proper forming.
- **Dimple Major Diameter:** The outermost diameter of the formed dimple at its tangent points.
- **Dimple Size:** The diameter of the through-hole that will be cut by the laser and used during forming. These dimensions control spacing, clearance, and structural integrity.

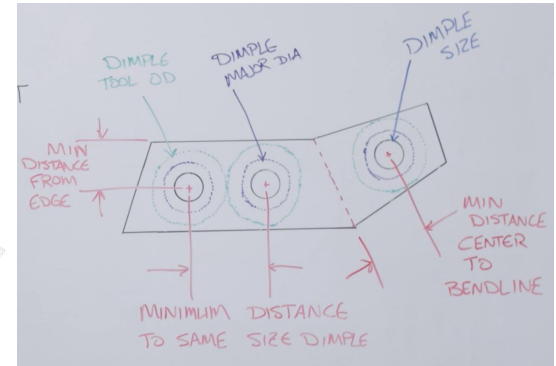


Figure 1.3

Minimum Distance Guidelines

To prevent deformation or tooling interference, several minimum distances must be maintained (see Figure 1.4):

- **Minimum Edge Distance:** Space from the dimple to the nearest edge, too close may distort edges.
- **Minimum Distance to Bend Centerline:** Allows clearance between the forming die and bend tooling.
- **Minimum Distance Between Dimples:** Equal to the sum of the radii of both dimple ODs. These clearances are crucial to prevent overlapping tooling or weak material zones.

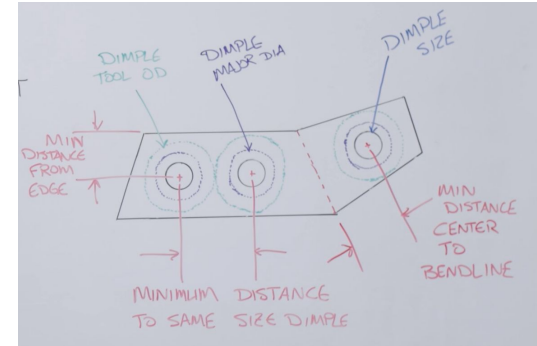


Figure 1.4

Design Rules and Considerations

- Each dimple size has its own minimum part size requirement.
- Use SendCutSend's dimple forming guidelines to verify spacing and clearance.
- Keep designs under 4 inches in hole diameter for automatic resizing in checkout.
- Excessive dimples on long parts can cause warping or bowing due to material stretching.
- Adding bends or flanges can counteract this effect and improve straightness.
- Dimple forming is a coining process, visible tool marks or impressions may occur. These are cosmetic and can be hidden with finishes like anodizing or powder coating.

Dimples in CAD

1. Create a new sketch, and in your Sketch Palette, add a construction line through the center of the part.
2. Press **C** to create a circle. Turn off Construction Line mode, then draw a circle at the desired dimple center (see Figure 1.5).
3. Add another construction circle equal to the dimple tool's outer diameter (OD) (see Figure 1.6).
4. To add additional dimples, go to **Create** → **Rectangular Pattern**. Make sure both circles are selected. In the Pattern dialog box, set the Direction to **Symmetric** and adjust the **Quantity** as needed (see Figure 1.7).
5. Use **Extrude** → **Cut** to remove the center of each circle.
6. Export your DXF file for import into SendCutSend.

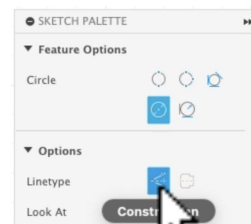


Figure 1.5

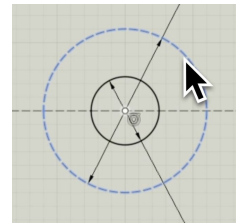


Figure 1.6

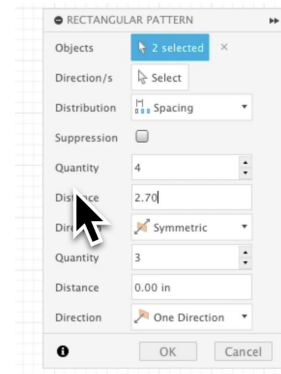


Figure 1.7

Dimples in CAD

To SendCutSend:

1. Upload your DXF file to SendCutSend's website.
2. Select the Dimple Forming hole operation.
3. Choose your desired dimple size (e.g., 0.5", 1.0", 1.5") (see Figure 1.8).
4. Review direction (up or down) and confirm spacing.
5. Add to cart and order. If you change dimple sizes later, recheck spacing, improper spacing can fail DFM checks

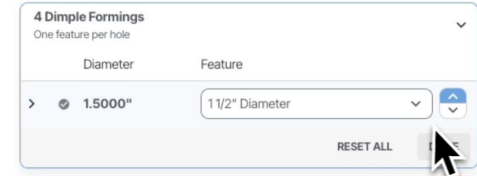


Figure 1.8

Summary

Dimple forming is a powerful design tool for achieving strong yet lightweight sheet metal parts. By following SendCutSend's guidelines and maintaining proper clearances, you can create visually appealing and structurally efficient components. Dimples not only improve part performance but also give your designs a professional, aerospace-inspired look.

Learn more at <https://sendcutsend.com/education/>