

# Projecting Geometry in Sheet Metal Parts

By Neil Munro

In the last Autodesk® Point A Toplines newsletter, we examined methods for projecting existing edges and other geometry to a feature sketch within the same part. Now let's look at an Autodesk Inventor 4 tool that projects geometry in sheet-metal parts.

There are a number of enhancements to the sheet-metal tools in Autodesk Inventor 4. One of these is the ability to cut complex shapes across a bend. To get started, let's create a sheet-metal part.

## Creating a Sheet-Metal Part

1. Start a new sheet-metal part.
2. Sketch and dimension a 4-inch by 8-inch (100mm x 200mm) rectangle.
3. Click the Face tool on the Sheet Metal Panel Bar and select OK to create a sheet-metal face.
4. Click the Flange tool on the Sheet Metal Panel Bar and add a 2.5-inch (65mm) flange at 45 degrees to the long edge as shown in Figure 1.

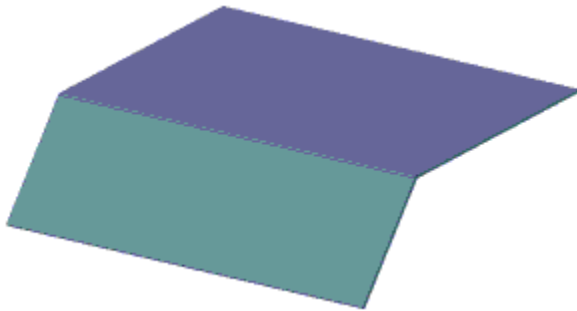


Figure 1: Sheet-metal face and flange.

5. Add a second 2.5-inch (65mm) flange to create the stepped part shown in Figure 2.

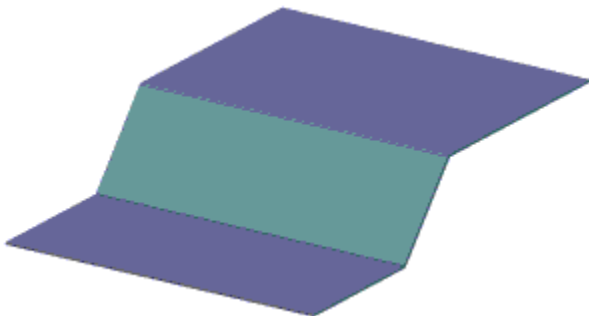


Figure 2: Second flange.

When you create a sketch that extends across a bend, the sketch geometry can wrap around the bend (or bends) when you create a sheet-metal Cut feature. Because the cut will remove material on more than one face, you may need to create geometric or dimensional constraints between the sketch geometry and features or edges on any of the affected faces. That's where the Project Flat Pattern tool comes in.

## Project Flat Pattern Tool

1. Click the top surface of the original face and Enter "S" to start a new sketch. You will create a sketch that will cut through all three faces.

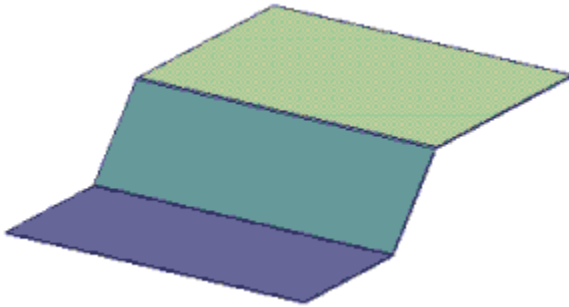


Figure 3: Sketch face selection.

2. In the Sketch Panel Bar, click the down arrow next to the Project Geometry tool and select the Project Flat Pattern tool.

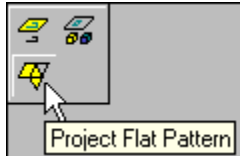


Figure 4: Project Flat Pattern tool icon.

You need to know the following rules for projecting flat pattern geometry:

- If you plan to project flat pattern geometry, you must start the sketch on a part face, not on a work plane.
- You must click a face to project the flat pattern of that face and all geometry linking it to the sketch face.
- You must select a face that is on the same side of the sheet-metal stock as the sketch face.
- The selected face must be joined to the sketch face through one or more bends.

3. Click the lower face parallel to the sketch face. The flat pattern of the unfolded part is projected onto the sketch. Use the Orbit tool to examine the projected geometry.

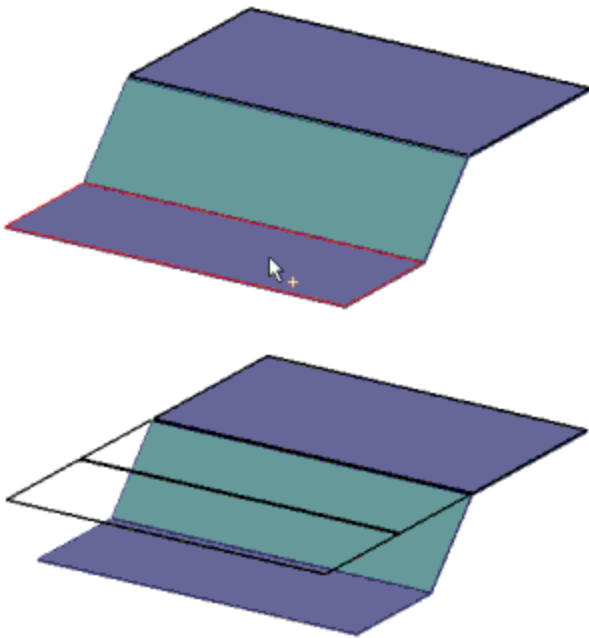


Figure 5: Face selection (above) and projected flat pattern (bottom).

### The Cut Across Bend Option

1. Sketch a shape that has edges crossing the bends at an angle. Use the sketch shown in Figure 6 as an example. Note that you can dimension and constrain to the projected flat pattern edge.

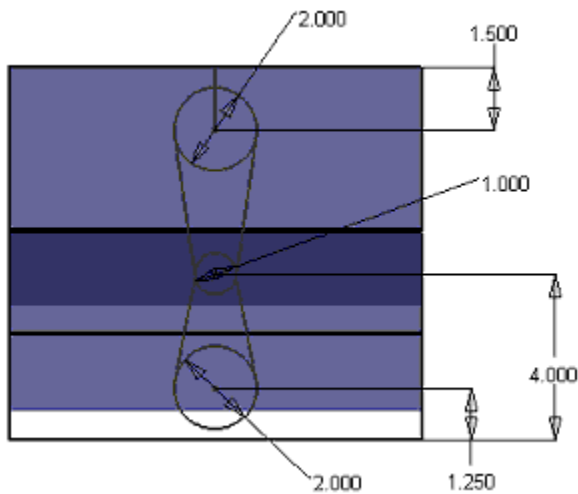


Figure 6: Sketch dimensioned to projected flat pattern edge.

2. Switch to an isometric view and Enter "S" to complete the sketch. In the Sheet Metal Panel Bar, click the Cut tool and select the profiles inside the circles and the tapered profiles that cross the bends.

**Tip:** To see a preview of the wrapped cut, click inside the Extents edit box (the one containing "Thickness") before you select the Cut Across Bend option.

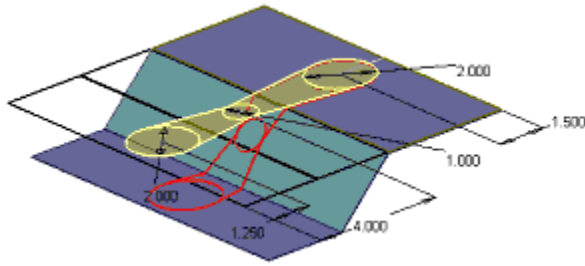


Figure 7: Preview of wrapped cut.

3. Ensure that the Cut Across Bend option is checked in the Cut dialog box.
4. Click OK to complete the cut.

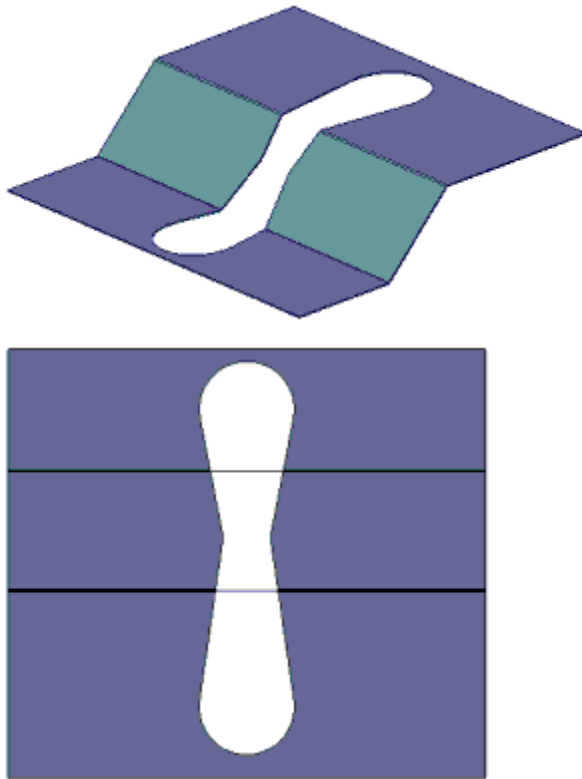


Figure 8: Cut complete: Folded model and flat pattern.

Use the Project Flat Pattern tool whenever you need to reference unfolded geometry in a sheet-metal sketch.

**Note:** The flat pattern updates to match changes to the underlying features. Your

sketch retains any defined relationships to the projected flat pattern geometry and updates to match.

## **Conclusion**

The Project Flat Pattern tool enables you to reference unfolded sheet-metal features while building a sheet-metal part in its folded state. During manufacturing, feature cuts are usually created on flat stock prior to bending. Use projected flat pattern geometry to include required reference geometry when a cut crosses one or more bends.