

## Module 1C: Adding Dovetail Seams to Curved Edges on A Flat Sheet-Metal Piece

In this *Module*, we will explore the method of adding dovetail seams to curved edges such as the circumferential edge of a circular sheet-metal piece in Autodesk Inventor. There are two basic methods:

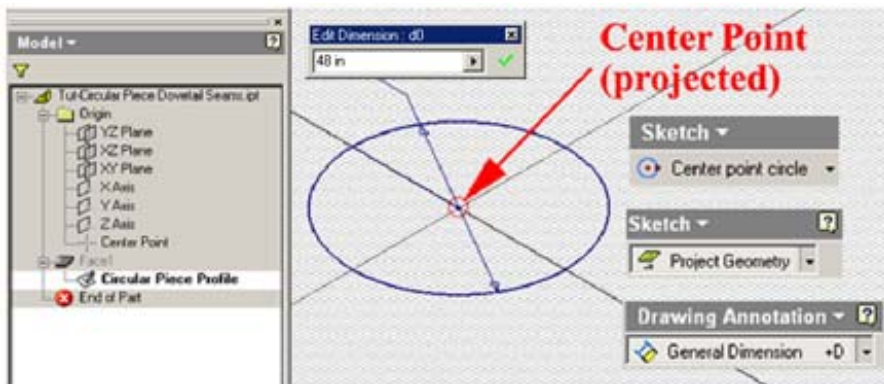
- Creating the circular piece with the **Face** tool; add short straight edge **Face** elements to the circumferential edge; and add **Flange** features to the **Face** elements to create dovetail seams;
- Creating the circular sheet-metal piece as a polygonal **Face** feature with tiny polygonal straight edges; and add **Flange** features to the tiny polygonal edges to create dovetail seams as **Flange** features.

In this *Module*, both methods will be explored.

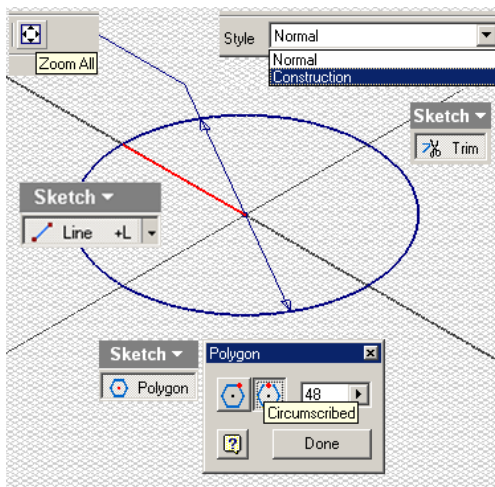
### *Step 1: Creating dovetail seams with a polygonal Face feature*

Launch Inventor, start a new **Sheet Metal (in).ipt** file under the **English** tab. An Inventor sheet-metal file opens. “*Sketch1*” is created by default in the **Model** panel on the **XY Plane**. Click the **Return** button on the **Command Bar** to dismiss this **Sketch** feature. Right-click the *Sketch1* feature for the shortcut menu and choose the **delete** option to delete it. Click-select the **XZ Plane** from the **Model** pane and click the **Sketch** button on the **Command Bar** to start a new sketch; rename the new sketch as *Circular Piece Profile* in the **Model** panel; click-select the **Project Geometry** tool button from the **Sketch** tool panel, and then the **Center Point** feature under the **Origin** folder in the **Model** panel; the **Center Point** is projected onto the sketch to provide a snap point; next, select the **Circle Center Point** tool, move the mouse closer to the projected **Center Point**, and click once when the green dot snap point indicator appears, then move the mouse outward and click one at any convenient location on the screen; next, click-select the **General Dimension** tool and click the circumference of the circle; in the text field window that opens, type 48 in (inches) and click the green checkmark; the diameter of the circle changes (*Figure 1C-1A*). If the circle expands beyond the boundary of the screen, then click the **Zoom All** button from the **Command Bar** to bring the entire circle within the screen; next, select the circle and go to the **Style** pull-down menu to change the circle’s line **Style** to **Construction**. Next, select the **Line** tool, move the mouse closer to the projected **Center Point** and click once when the green dot snap point indicator

appears, move the mouse to the left (or right or straight up or down) along the horizontal (or vertical) major grid line beyond the circumference of the circle, close once when the parallel indicator appears. Next, select the **Trim** tool, click on the portion of the line just drawn that is outside of the circumference of the circle to trim it off. Next, select the **Polygon** tool, choose the **Circumscribed** option in the tool's dialog window (we choose the **Circumscribed** option to allow the dovetail seams to bend beyond the area of the circular piece so as to cover the outside face of the adjacent cylindrical piece in the sheet-metal assembly; if we intend to allow the dovetail seams to bend toward the area of the circular piece so as to cover the inside face of the adjacent cylindrical piece in the sheet-metal assembly, then we can choose the **Inscribed** option); type 48 in the **Number of Sides** text field; move the mouse cursor closer to the projected **Center Point** and click once when the green dot snap indicator appears; then move the mouse cursor closer to the end point of the line that touches the circumference of the circle, click once when the green dot snap indicator appears (*Figure 1C-1B*). The profile for the circular piece is completed. Click the **OK** button to exit the **Sketch** mode.

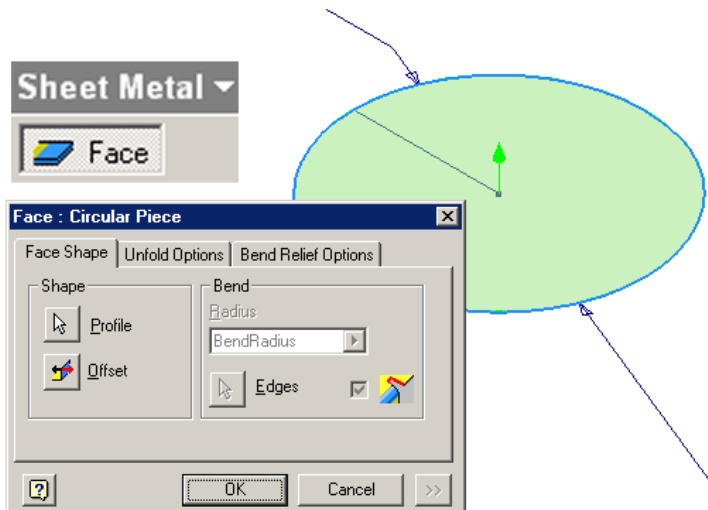


*Figure 1C-1A: Projecting the Center Point, drawing the circle and applying dimension*

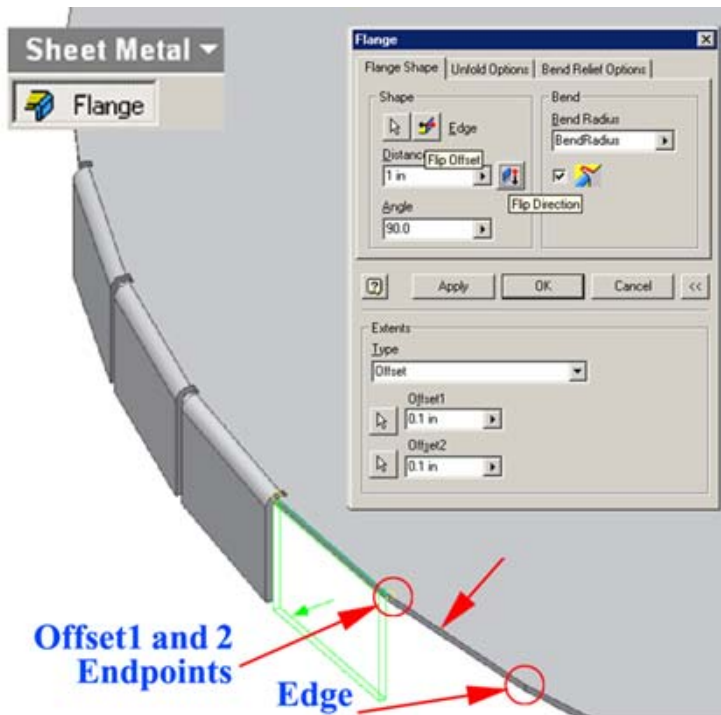


*Figure 1C-1B: Drawing the line, trimming it against the circumference of the circle, and creating the polygon.*

Next, select the **Face** tool; the circular profile is automatically selected and shown in light green with a green arrow pointing up for the direction of the **Face** extrusion; click the **OK** button; the **Face** feature is created; rename it as *Circular Face* in the **Model** panel (*Figure 1C-1C*). The polygonal **Face** feature is created.

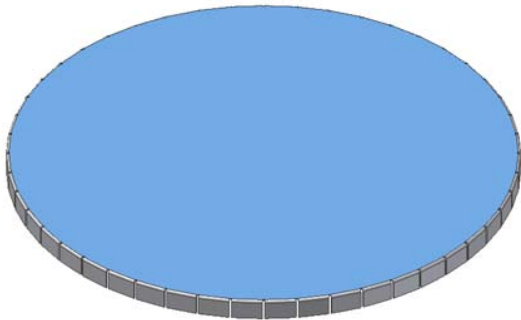


*Figure 1C-1C: Creating the Circular Face feature.*

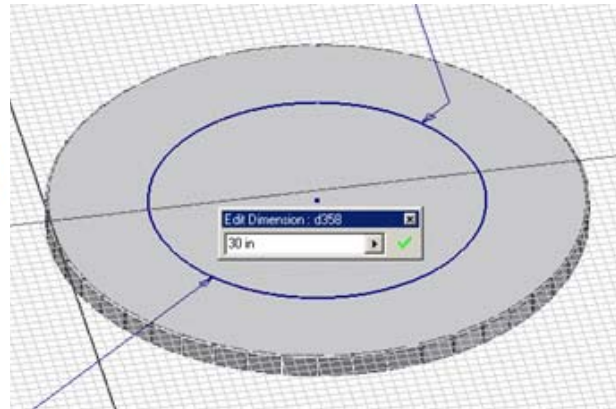


*Figure 1C-1D: Creating dovetail seams.*

Next, use the **Flange** tool to add dovetail seams as **Flange** features on the short edges of the polygonal **Face**. Select the **Flange** tool; in the tool's dialog window (*Figure 1C-1D*); type 1 in (inch) in the **Distance** text field and 90.0 in the **Angle** text field; click the << button to open up click the arrow button to open the **Extents** section, and select the **Offset** from **Type** drop-down menu, type 0.1 in (inch) in both **Offset1** and **Offset2** text field; then click-select any of the top short edges of the *Circular Face* feature; the arrow button on the **Offset1** text field is automatically selected; click one of the endpoint of the selected edge and then another endpoint; make sure that the green arrow points outward; if not, then click the **Flip Offset** button to change the direction; make sure that the outline of the **Flange** points downward; if not, then click the **Flip Direction** button to change the direction; click the **Apply** button to create the first dovetail seam **Flange** feature; repeat the same procedures to create the remaining 47 dovetail seam **Flange** features; and rename them *Outer Sean 1, 2, 3, ...48* in the **Model** panel.



*Figure 1C-1E: Creating all 48 Outer Seams. Selecting the top surface for a new sketch.*



*Figure 1C-1F: Creating the Hole sketch.*

### ***Step 1: Creating dovetail seams with a circular Face feature***

In this part of the Module, we will explore another method of creating dovetail seams on a circular **Face** feature.

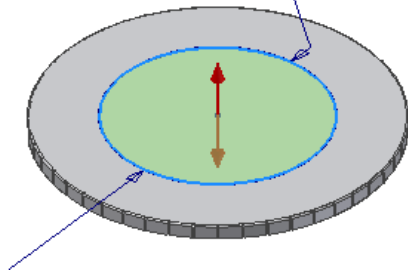
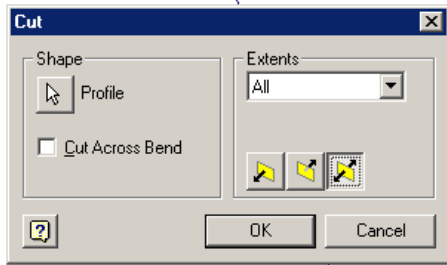


Figure 1C-1G: Using the Cut tool.

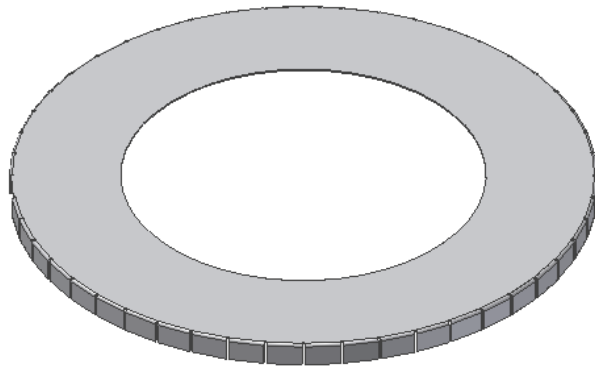
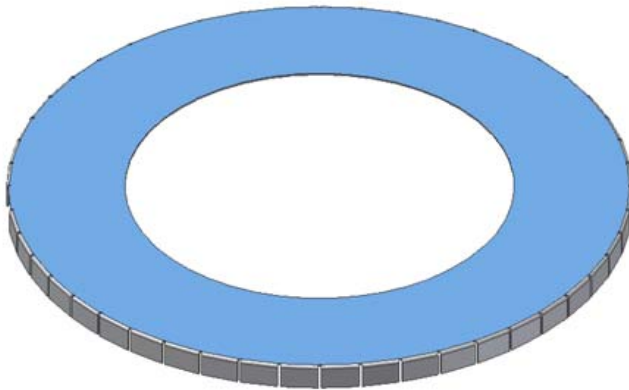


Figure 1C-1H: Creating the Hole Cut feature.

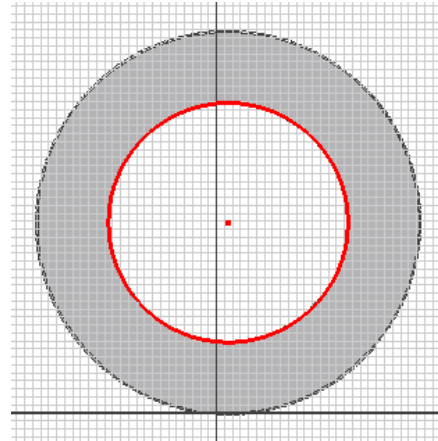
First, select the top surface and click the **Sketch** button to start a new sketch (Figure 1C-1E); select the **Project Geometry** tool and then the **Center Point** feature in the **Model** panel to project the **Center Point** onto the new sketch; next, select the **Circle Center Point** tool, click on the projected **Center Point** (a green dot snap indicator appears), drag the cursor out and click again to draw a circle; then use the **General Dimension** tool to apply a 30-inch diameter dimension; rename the sketch *Hole* in the **Model** panel; click the **Return** button to exit the sketch (Figure 1C-1F). Next, select the **Cut** tool; in the tool's dialog window, select **All** in the **Extents** drop-down menu; and select the **Midplane** for direction; click the **OK** button to create the cut; rename it *Hole Cut* in the **Model** panel.

Next, cut short straight edges from the circular edge of the *Hole Cut* for dovetail seam **Flange** features. The short straight edges should be tangent to the circular edge of the *Hole Cut*. Select the top surface again and click the **Sketch** button to start a new sketch (Figure 1C-1J); select the **Project Geometry** tool, click on the **Center Point** feature in the **Model** panel and then the inner circular edge of the *Circular Piece* to project them onto the sketch (Figure 1C-1K); use the **Line** tool to draw a vertical line (the "centerline") from the projected **Center Point** upward; use the **Offset** tool to draw offset lines from the "centerline" and use the **General Dimension** tool to apply a 0.5-inch dimension from both offset lines to the "centerline" (Figure 1C-1L); next, use the **Line** tool to draw a horizontal line above the top portion of the projected edge of the *Hole Cut*, and use the **Tangent** tool to move the horizontal line to tangency with the circular edge (Figure 1C-1M); next, use the **Zoom Window** tool to zoom in the area around the short

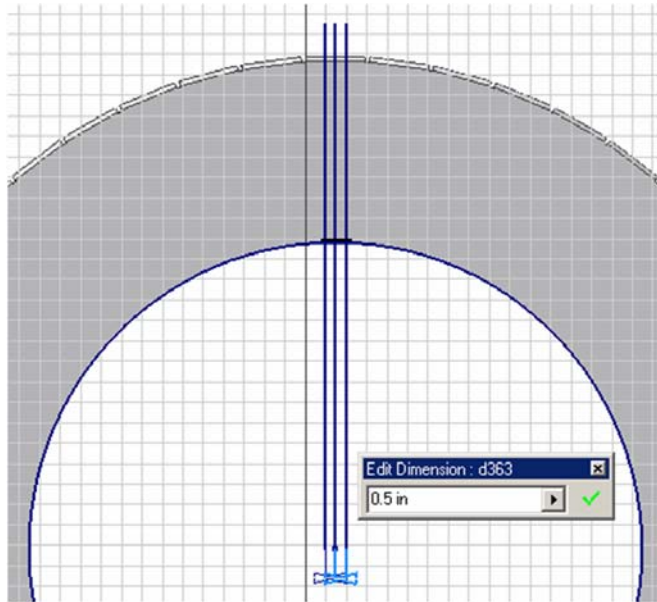
tangent edge line; use the **Line** tool again to draw a horizontal line beneath the short horizontal tangent line; and use the **Trim** tool to trim off all unneeded line segment so that only a rectangular profile remains (*Figure 1C-1N*); click the **Return** button to exit the sketch; and rename it *Inner Straight Edge* in the **Model** panel.



*Figure 1C-1J: Starting the Inner Straight Edge sketch.*



*Figure 1C-1K: Projecting the Center Point and the circular edge.*



*Figure 1C-1L: Offset lines.*

Next, select the **Cut** tool, choose **All** in the **Extents** text field and **Midplane** for direction; click **OK** button to create the **Cut** feature; and rename it *Inner Straight Edge Cut* in the **Model** panel.

Next, select the **Circular Pattern** tool, click the **Features** button and select the *Inner Straight Edge Cut* feature from the **Model** panel; click the **Rotation Axis** button and the **Y-Axis** from the; type 48 in the **Count** text field, and 360 deg in the **Angle** text field; click the **OK** button to create additional straight edge cuts along the circular edge of the hole; rename the **Circular Pattern** feature *Inner Straight Edge Cuts* in the **Model** panel.

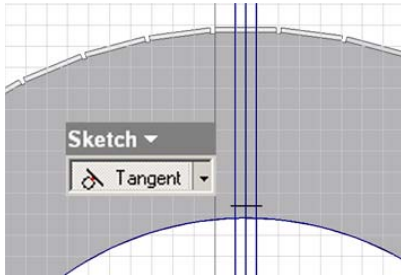


Figure 1C-1M: Applying Tangent constraint.

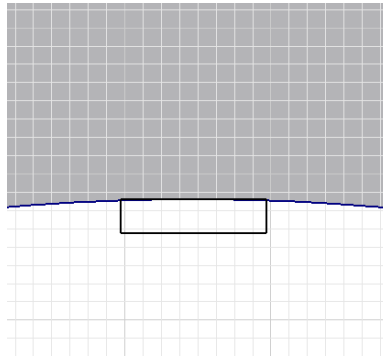


Figure 1C-1N: The rectangular profile of the Inner Straight Edge sketch.

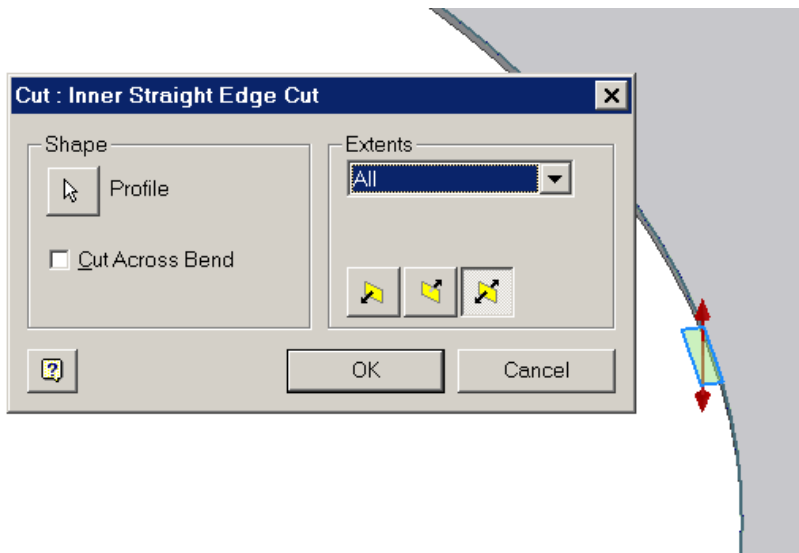


Figure 1C-1P: The Inner Straight Edge Cut feature.

Next, select the **Flange** tool to add dovetail seams as **Flange** features on the short straight edges of the circular hole. Select the **Flange** tool; in the tool's dialog window (*Figure 1C-1D*), type 1 in (inch) in the **Distance** text field and 60.0 in the **Angle** text field; make sure that the green arrow points outward; if not, then click the **Flip Offset** button to change the direction; make sure that the outline of the **Flange** points upward at an angle; if not, then click the **Flip Direction** button to change the direction; click the

**Apply** button to create the first dovetail seam **Flange** feature; repeat the same procedures to create the remaining 47 dovetail seam **Flange** features; and rename them *Inner Sean 1*, 2, 3, ...48 in the **Model** panel. All dovetail seams that overlays the lateral surface of a cone are completed. Save the file.

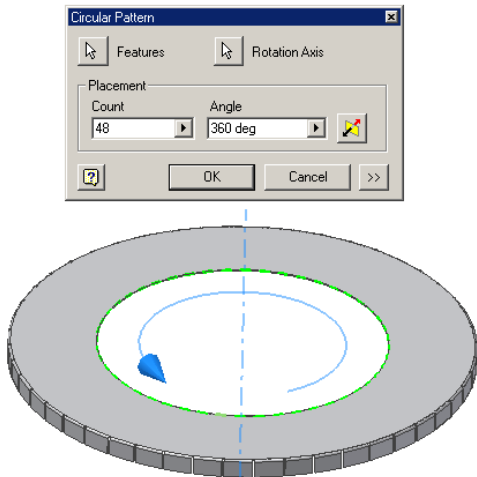


Figure 1C-1Q: Using the circular pattern tool.

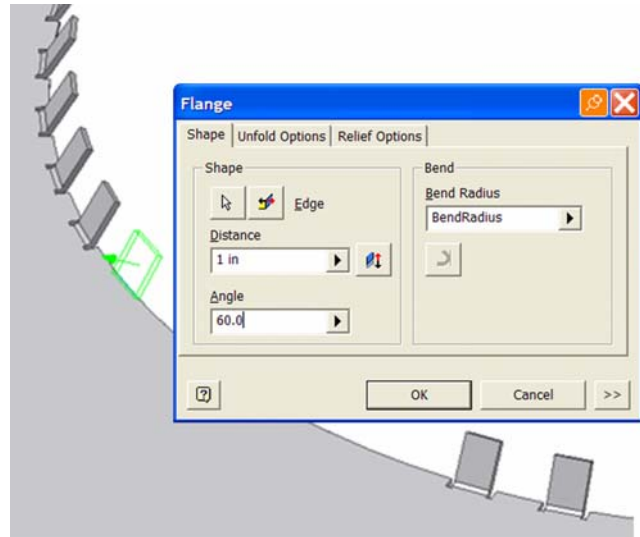


Figure 1C-1Q: Creating dovetail seams.

Next, click-select the top surface of the circular piece and click-select the **Flat Pattern** tool; the **Flat Pattern** window opens (*Figure 1C-1R*). All features of the circular piece with dovetail seams are listed in the **Model** panel (*Figure 1C-1S*).



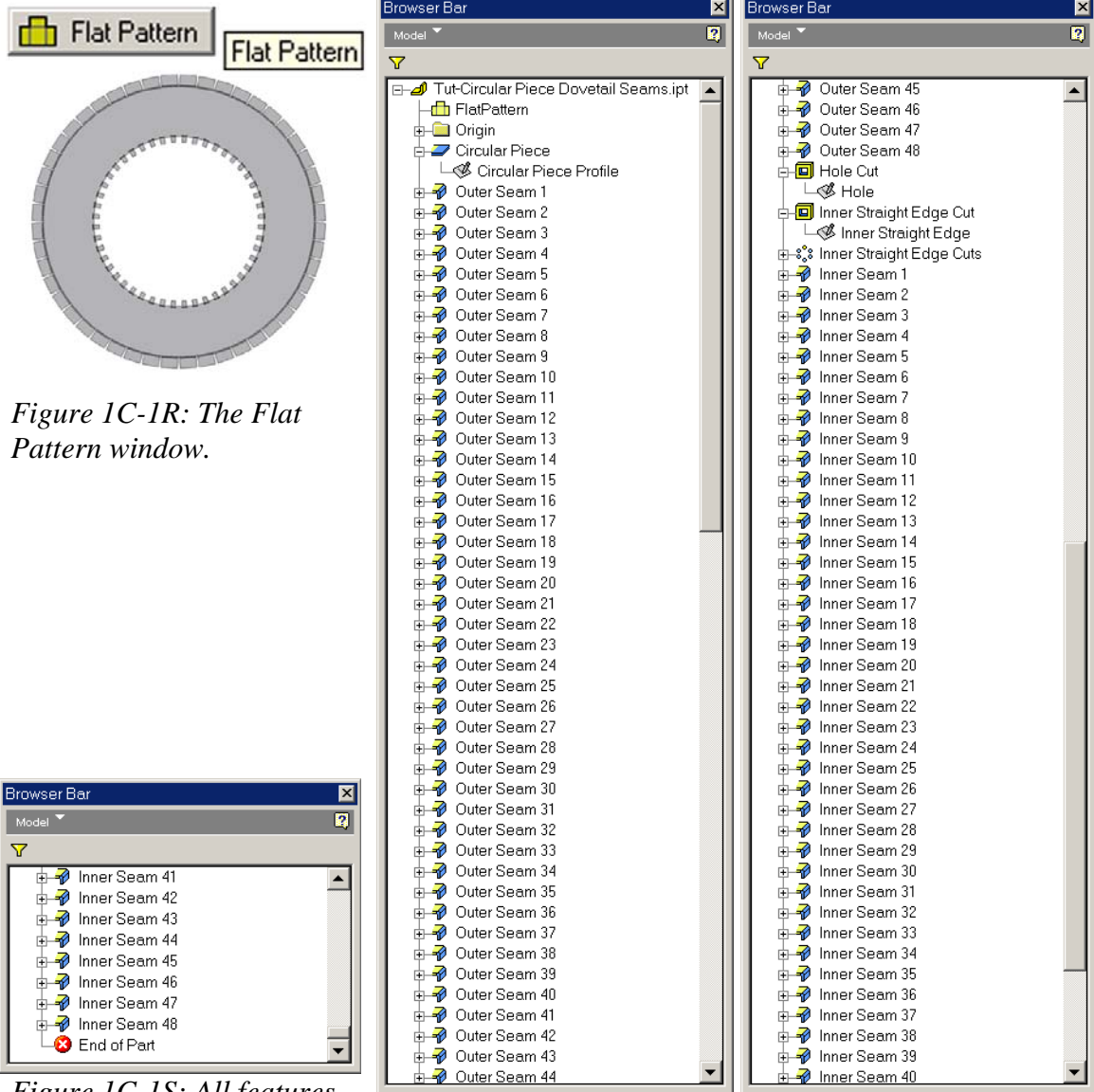


Figure 1C-1R: The Flat Pattern window.

Figure 1C-1S: All features listed in the Model panel.

Congratulations!

In this Module, you have learned how to create dovetail seams along a circular edge with the **Flange** tool.