

APPLYING CUSTOM TOOLPATHS FOR THIN WALLS AND BOSSES

SOFTWARE/PRODUCT/FINISHING

OVERVIEW

When processing an STL file, smaller or larger toolpath widths are sometimes required to achieve proper fill for certain portions or features of a part. While changing the tip or modifying global toolpath settings for the entire part will generally work, often times it is unnecessary. **Custom Groups** provide a means to specify different toolpath parameters for an individual curve or curves.

Examples include:

- Features too small to fill using the default toolpath width
- Features requiring reinforced walls such as bosses and flanges
- Areas that require different fill styles

A common situation requiring custom toolpaths is when the default toolpath cannot fill in the space between two walls, resulting in voids and weak wall strength (Figure 1). This is corrected by modifying the toolpath width parameter (Figure 2).

A similar situation arises with bosses, holes and flanges where the default toolpath results in small gaps between the contour (outer wall) and raster (infill) (Figure 3). This is corrected using additional contours applied with custom toolpath parameters (Figure 4).

1. OPTIONS

1.1 **Custom Groups** are accessed from the **Toolpaths** drop-down menu (Figure 5). When creating a new group, all of the options and parameters that can be modified are displayed (Figure 6).

The key parameters that eliminate gaps between contours and reinforce walls around bosses and holes are **Contour width**, **Raster width** and **Contour controls**.

- **Modifying contour width** – Eliminates gaps between single contours by adjusting contour widths so that the contours touch.
- **Modifying contour and raster width** – Eliminates gaps between two contours by adjusting the contour width and raster width such that the gap is raster filled.
- **Strengthening features with additional contours** – Eliminates gaps at the contact point between raster and contour by using multiple contours. Linking the contours joins successive contours, improving seam quality and reducing porosity. This provides additional strength if the hole will be drilled or tapped.

NOTE: Descriptions of all the options in the parameters sheet are available through the Insight™ software Help Menu. However, many of these settings can have detrimental effects on your parts if not used properly. It is recommended that only experienced or advanced users make changes to these values. To insure the best possible part quality, Stratasys® recommends that you always review the toolpaths on your parts and make modifications if necessary, before downloading them to your system.

Companion and reference materials:

- Video
- Show Me How

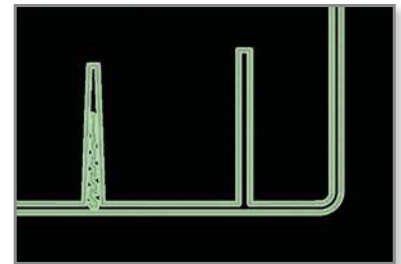


Figure 1: Inner and outer toolpaths that do not meet each other which causes a hollow area in between.

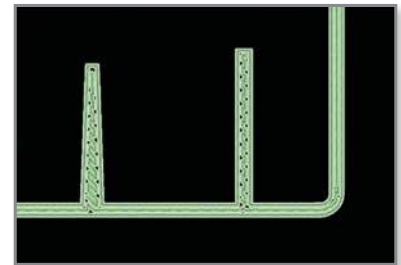


Figure 2: Custom toolpaths are applied to achieve proper fill resulting in a stronger feature.

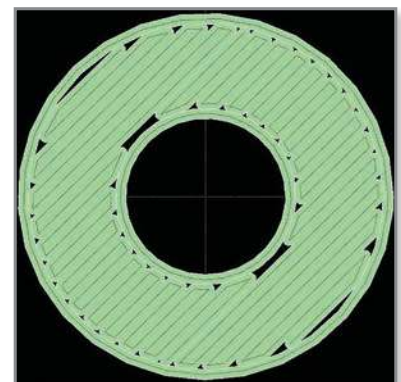




Figure 3: Gaps between the raster fill and contours result in porosity that weakens the boss or hole.

2. PROCESS

2.1. Modifying Contour Widths



- STEP 1:** Configure the modeler.
- STEP 2:** Open, orient and slice the STL file.
- STEP 3:** Click  to create toolpaths. View the toolpaths in top-down view.
- STEP 4:** Identify the area and layer(s) where a void exists between contours. Measure the total width between contours and divide by 2. Make note of this value for use in Step 7.
- STEP 5:** From the *Toolpaths* menu, select *Custom groups*.
- STEP 6:** Click **New** to create a new custom group. In the *Toolpath parameters* window, give the custom group a name.

NOTE: Give each new custom group a unique name. Reusing a name will result in the toolpath settings for that group being overwritten.

- STEP 7:** Under the *Contour parameters* section, select a size from the *Contour width* drop-down menu (Figure 7); it should be equal to the value you made note of in Step 4. Alternatively you can type the value into the field. Click  to confirm your selection.

- STEP 8:** Select the desired curves using your cursor and click **Add** . All curves that are added to this group will have the toolpath parameters you defined.

TIP: Curves can be added to an already-defined custom group by selecting the **Group name** from the list, selecting the desired toolpaths and clicking **Add** .

- STEP 9:** Click  or  to regenerate the toolpaths for the layer or group.
- STEP 10:** From the *Toolpaths* menu select *Shade Toolpaths*.
- STEP 11:** Confirm that the gap between the contours has been eliminated, but the overlap between contours is less than 0.025 mm (0.001 in). If a gap still exists, modify the custom group values and regenerate toolpaths.

NOTE: Custom group settings can be modified by selecting the **Group name** from the list and clicking **Modify** .

- STEP 12:** Modifying Contour Widths procedure complete.

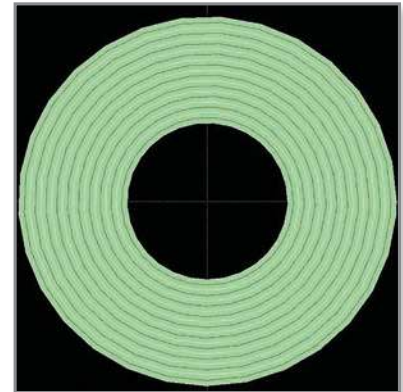


Figure 4: Adding multiple contours strengthens the boss by eliminating the porosity.

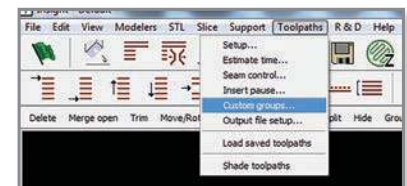


Figure 5: Custom groups are accessed from the Toolpaths menu.

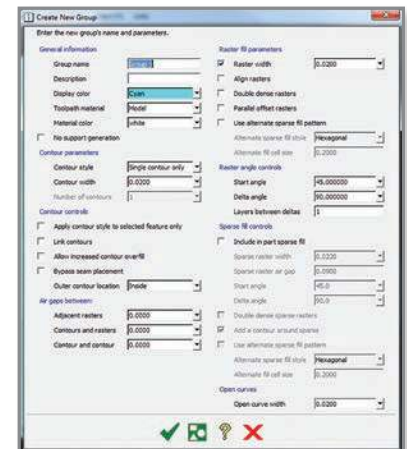


Figure 6: Toolpath options and parameters available when making or modifying a custom group.




Figure 7: Contour width can be selected using a drop-down menu found in the Contour parameters options.

2.2. Modifying Contour and Raster Width

STEP 1: Configure the modeler.

STEP 2: Open, orient and slice the STL file.

STEP 3: Click  to create toolpaths. View the toolpaths in top-down view.


STEP 4: Identify the area and layer(s) where a void exists between contours.

STEP 5: From the Toolpaths menu, select **Custom groups**.

STEP 6: Click **New** to create a new custom group. In the **Toolpath parameters** window, give the custom group a name.

NOTE: Give each new custom group a unique name. Reusing a name will result in the toolpath settings for that group being overwritten.

STEP 7: Under the **Contour parameters** section, select a smaller size from the **Contour width** drop-down menu. Alternatively, you can type the value in this field.

STEP 8: Under the **Raster fill parameters** section, select a size from the **Raster width** drop-down menu (Figure 8). Alternatively, you can type the value in this field. Click  to confirm both selections.

STEP 9: Select the desired curves using your cursor and click **Add**. All curves that are added to this group will have the toolpath parameters you defined.

TIP: Curves can be added to an already defined custom group by selecting the **Group name** from the list, selecting the desired toolpaths and clicking **Add**.

STEP 10: Click  or  to regenerate the toolpaths for the layer or group.

STEP 11: From the **Toolpaths** menu select **Shade Toolpaths**.

STEP 12: Confirm that the gap between the contours has been raster filled. If a gap exists, modify the custom group values and regenerate toolpaths.

NOTE: Custom group settings can be modified by selecting the **Group name** from the list and clicking **Modify**.

STEP 13: Modifying Contour and Raster Width procedure complete.

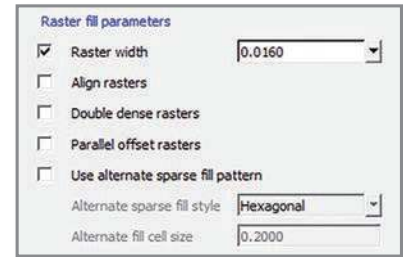


Figure 8: Raster width can be selected using a drop-down menu found in the Raster fill parameters.

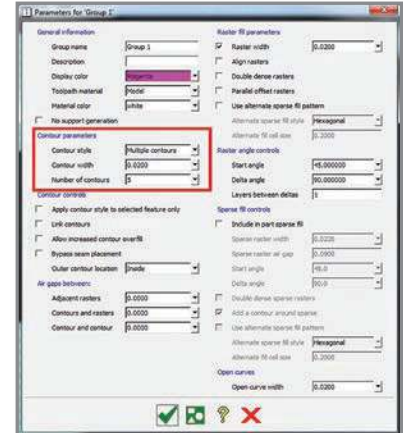


Figure 9: Multiple contours is enabled and additional contours are specified in the Contour parameters options.

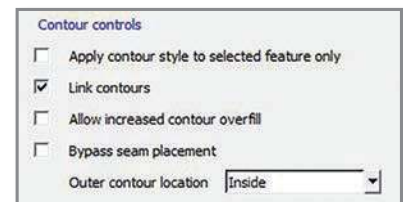



Figure 10: The option to Link contours is found in the Contour controls.

2.3. Strengthening Features with Additional Contours

STEP 1: Configure the modeler.

STEP 2: Open, orient and slice the STL file.

STEP 3: Click  to create toolpaths. View the toolpaths in top-down view.

STEP 4: Identify the area and layer(s) where additional contours are needed.

STEP 5: From the *Toolpaths* menu, select *Custom groups*.

STEP 6: Determine the desired number and width of contours.

TIP: For a hole that will be drilled or tapped, a combination of thicker contours and multiple contours around the feature should be used.

TIP: For a boss, choose a contour width value that is an even divisor of half the wall thickness of the boss. For example, if the boss wall thickness equals 10 mm, choose a contour width that is evenly divided into 5 (half of 10 mm).

STEP 7: Click **New** to create a new custom group. In the *Toolpath parameters* window, give the custom group a name.

NOTE: Give each new custom group a unique name. Reusing a name will result in the toolpath settings for that group being overwritten.

STEP 8: Under the *Contour parameters* section, select *Multiple contours* from the drop-down menu (Figure 9). You may change the contour width from the default value based on the calculation in Step 6. Select the *Number of contours* from the drop-down menu. This is the number of contours this group of curves will have.

STEP 9: (*Optional*) Under the *Contour controls*, select the checkbox for *Link contours* (Figure 10).

TIP: Selecting the checkbox to *Apply contour style to selected feature only* (Figure 11) will apply *Contour parameters* only to the selected part curve (feature-based contours) (Figure 12).

STEP 10: Click  to confirm your selections.

STEP 11: Select the desired curves using your cursor and click **Add**. All curves that are added to this group will have the toolpath parameters you defined.

TIP: Curves can be added to an already defined custom group by selecting the *Group name* from the list, selecting the desired toolpaths and clicking **Add**.

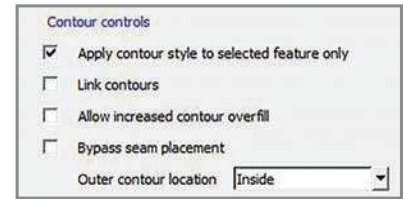


Figure 11: The option to apply contours only to selected features is found in the *Contour controls*.

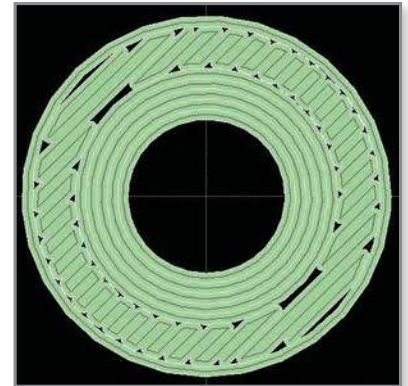


Figure 12: The *Apply contour only to selected feature* is enabled when the inside wall is selected.

STEP 12: Click  or  to regenerate the toolpaths for the layer or group.

STEP 13: From the *Toolpaths* menu select ***Shade Toolpaths***.

STEP 14: Strengthening Features with Additional Contours procedure complete.

3. TOOLS & SUPPLIES

3.1. Software:

- Insight software (document developed with Insight 9.0)

CONTACT:

To obtain more information on this application, contact:

Stratasys Application Engineering

1-855-693-0073 (U.S. toll-free)

+1 952-294-3888 (international)

ApplicationSupport@Stratasys.com

Stratasys | www.stratasys.com | info@stratasys.com

7665 Commerce Way
Eden Prairie, MN 55344
+1 888 480 3548 (US Toll Free)
+1 952 937 3000 (Intl)
+1 952 937 0070 (Fax)

2 Holtzman St.
Science Park, PO Box 2496
Rehovot 76124, Israel
+972 74 745-4000
+972 74 745-5000 (Fax)

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