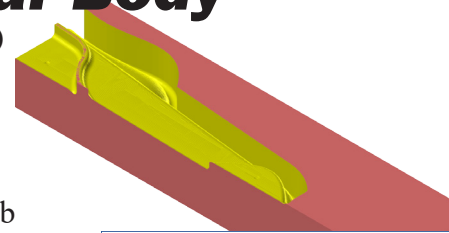


# Toolpaths for Rail Car Body

Cut Body (Equal Scallop)





## A. Machine Type and Stock Setup.

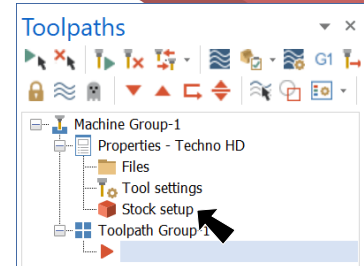
Step 1. If necessary, open your file from Chapter 19.

Step 2. If necessary, display Toolpaths Manager. On the View tab



Step 3. If Machine Group  is **not** displayed in the Toolpaths Man-

ager, **Fig. 1** on the Machine tab , click Mill  > **Default** from the menu.



**Fig. 1**

Step 4. Expand **Properties**  (click +) in Toolpaths Manager and click **Stock setup** , **Fig. 1**.

Step 5. In the Machine Group Setup on Stock Setup page set:  
under Selection, **Fig. 2**

click **Add two corners** 

sketch a **rectangular** in the graphics area

under Origin coordinates key-in:

**X 0**

**Y -35**

**Z -13**

under Anchor point

click **top left corner**

key-in X, Y and Z stock dimension:

**X 305**

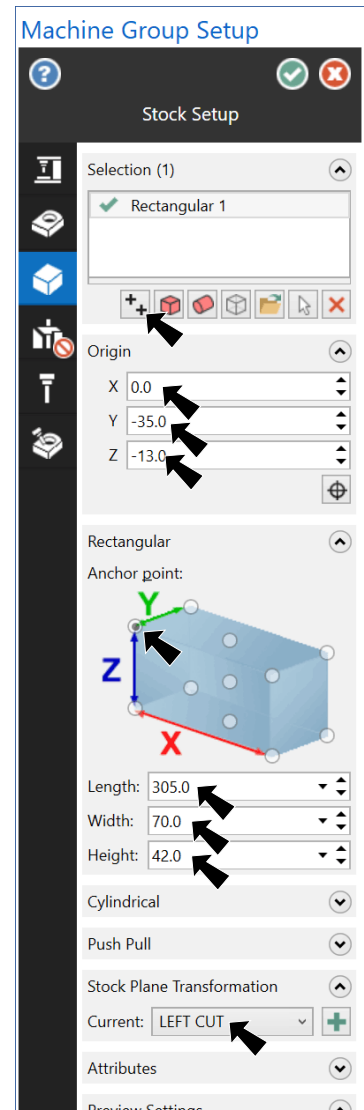
**Y 70**

**Z 42**

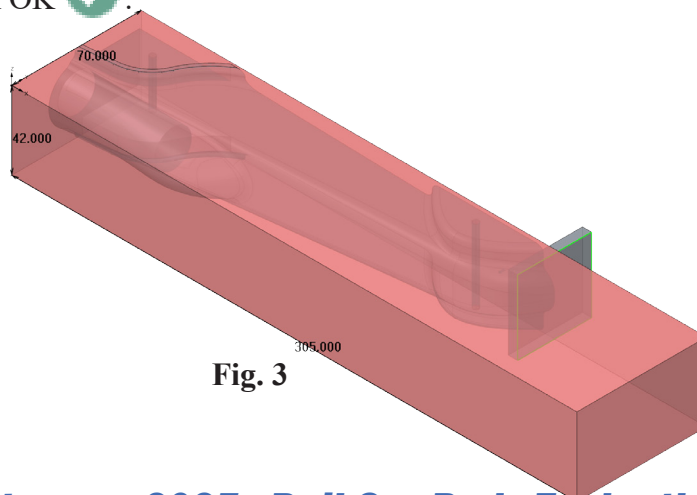
under Stock Plane Transformation

Current **LEFT CUT**

click OK .



**Fig. 2**



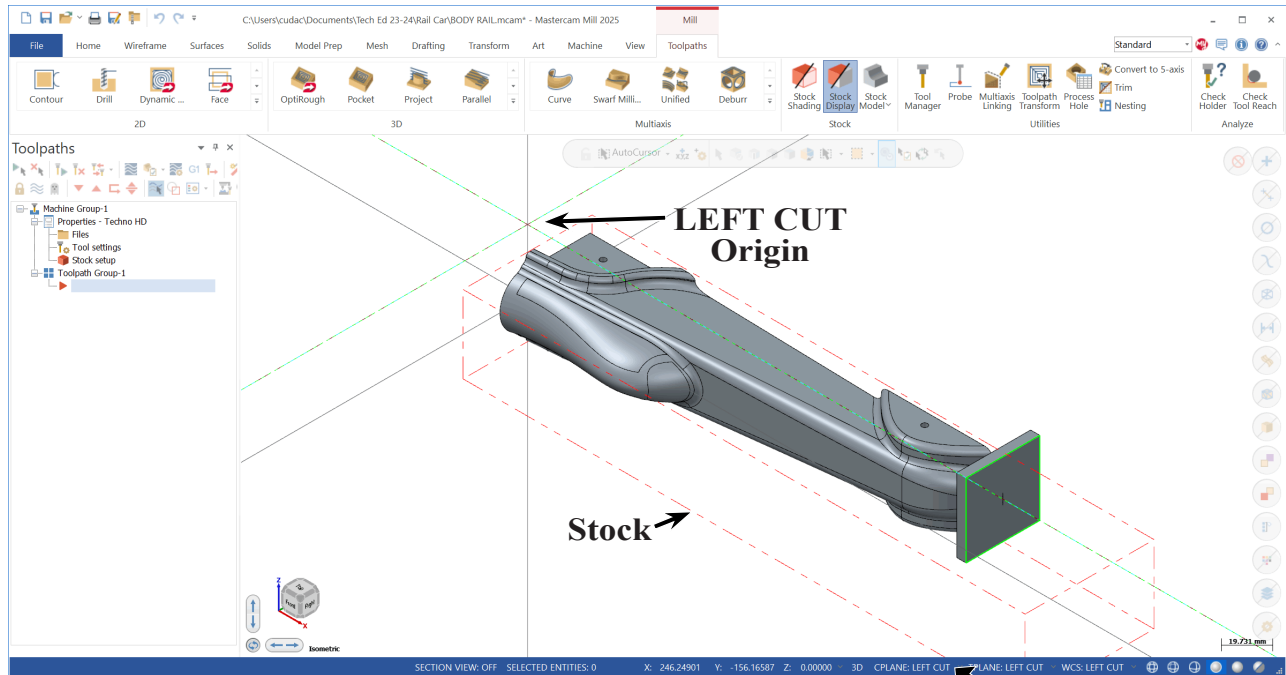
**Fig. 3**

## B. Confirm WCS LEFT CUT.

Step 1. On the Toolpaths tab  click **Stock Display**  and Stock is displayed as red wireframe, **Fig. 4**.



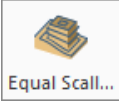
Step 2. In Status bar at bottom of display, confirm **CPLANE: LEFT CUT**, **Fig. 4**.

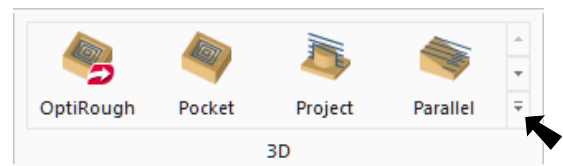
Step 3. Confirm **Left Cut Origin**. Use **F9** to toggle axes.



**Fig. 4**


## C. Left Cut Finish Equal Scallop Toolpath.

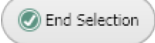
Step 1. On the Toolpaths tab  in the 3D group click **expand gallery** button  and click **Equal Scallop** , **Fig. 5**.

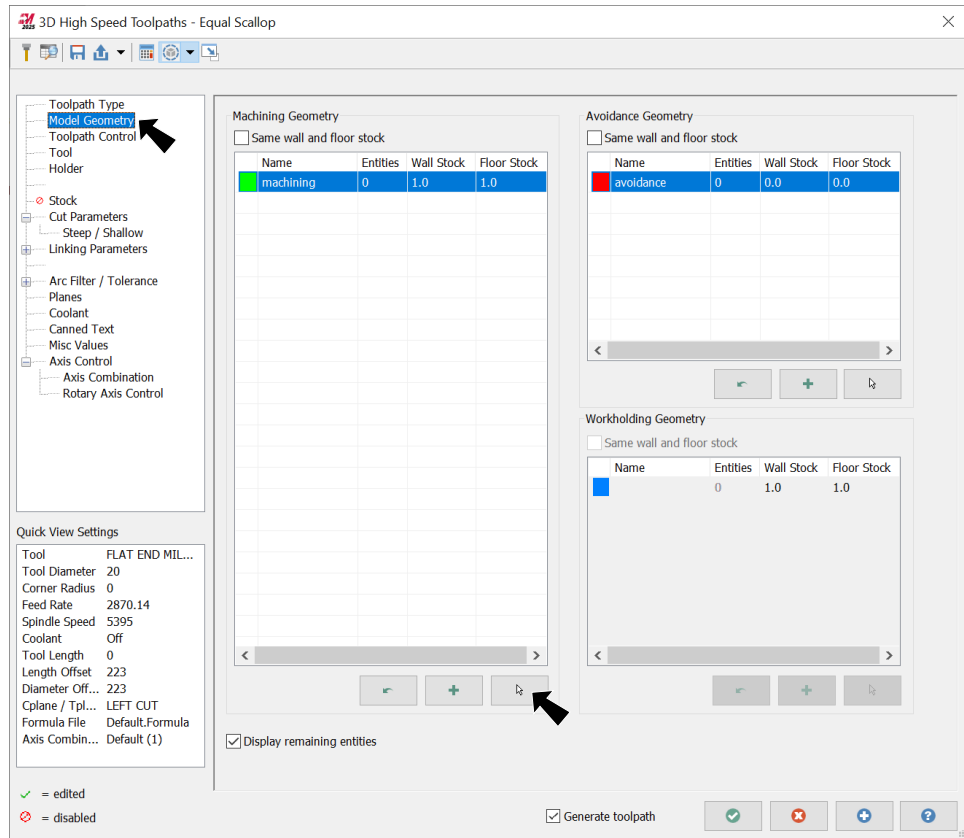


**Fig. 5**

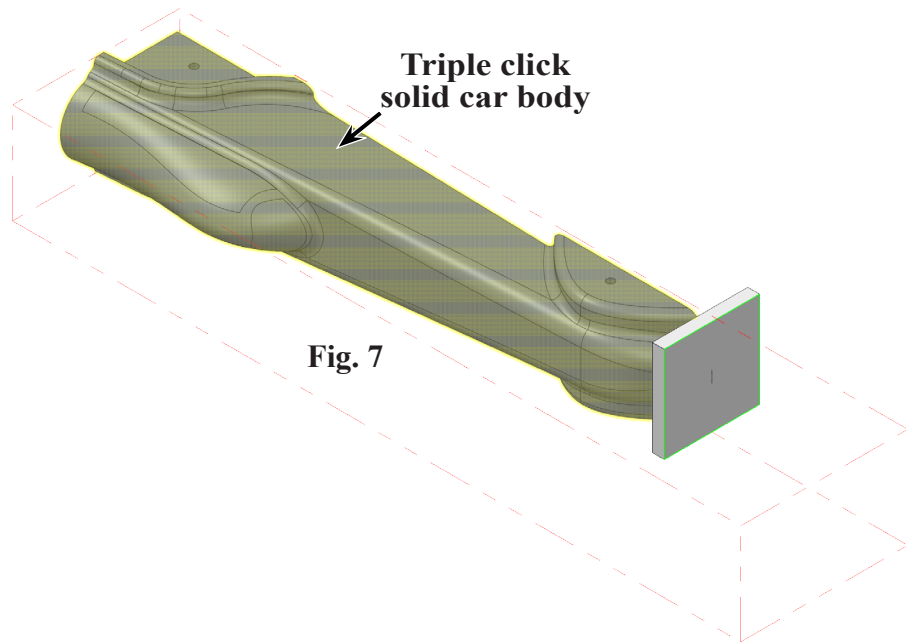
Step 2. Select **Model Geometry** from the tree control and set:

Under **Machining Geometry** click **Select entities** button  **Fig. 6.**

Step 3. Triple click the **solid car body** to select as machine geometry and click **End Selection**  **(ENTER), Fig 7.**



**Fig. 6**



**Fig. 7**

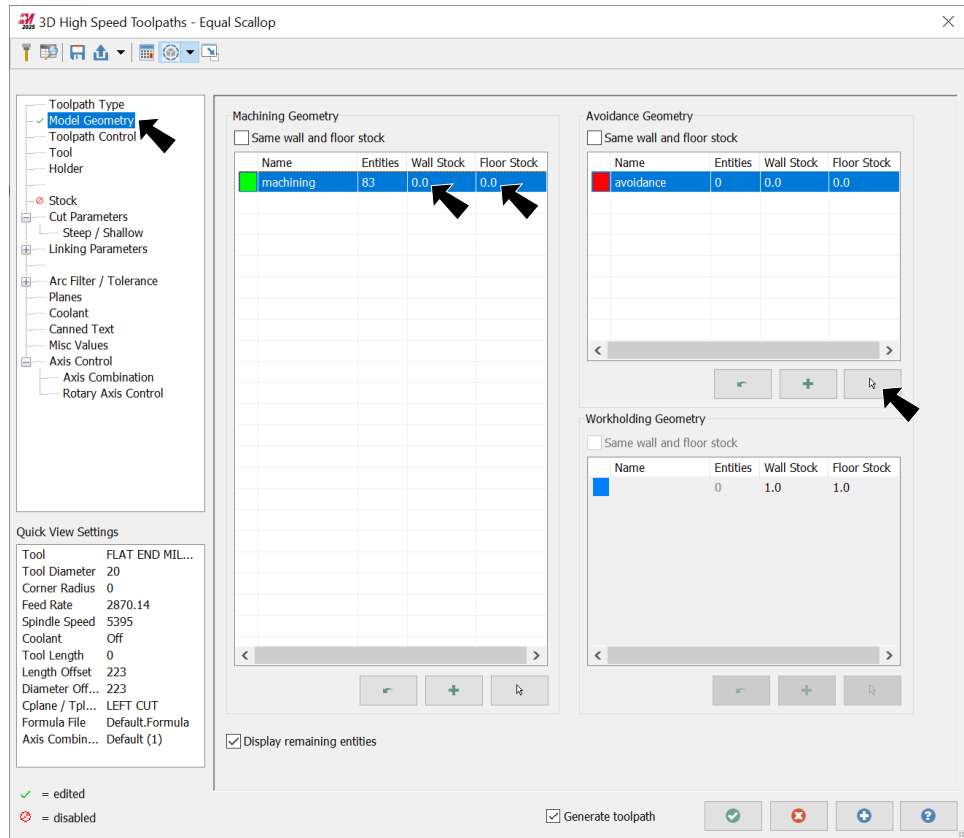
Step 4. Back in **Model Geometry** page set:

**Wall Stock 0**  
**Floor Stock 0**  
 To set, double click and key-in.

Under **Avoidance Geometry** click **Select entities**

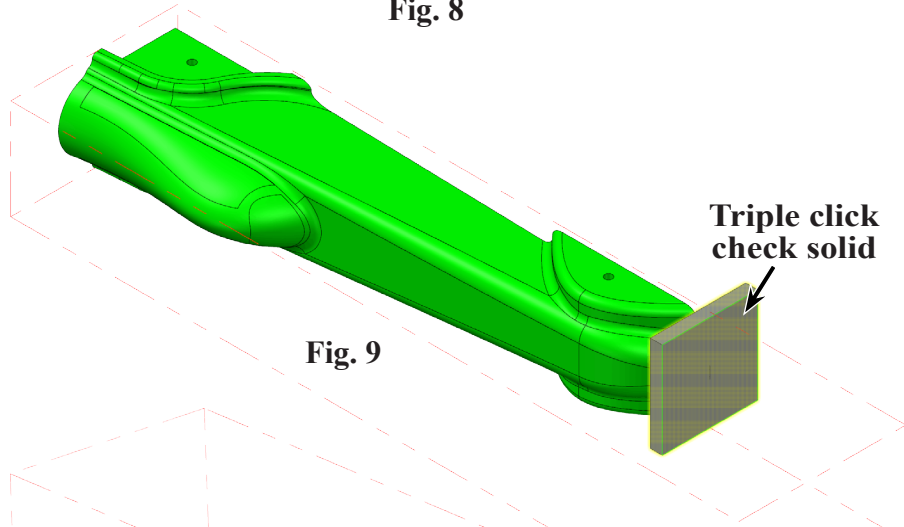


button  
**Fig. 8.**



**Fig. 8**

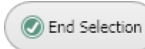
Step 5. **Triple click the check body** to select as avoidance geometry, **Fig 9.**



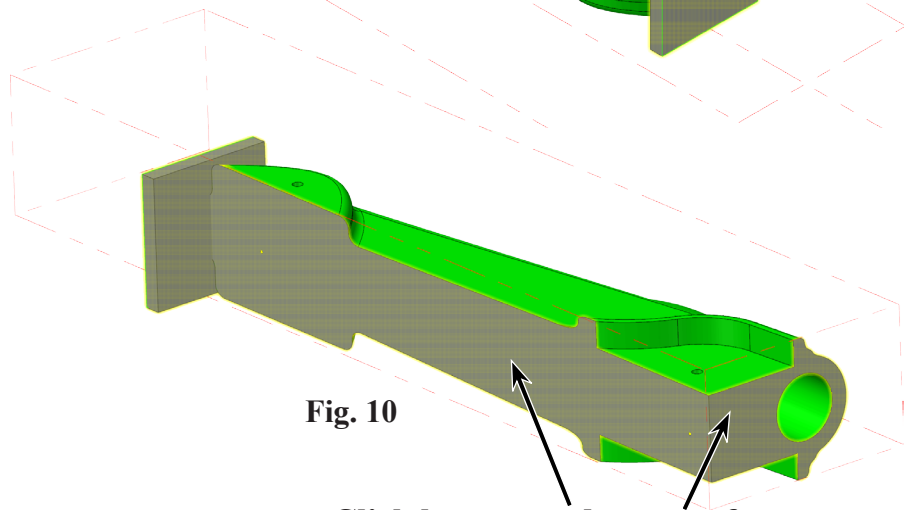
**Fig. 9**

Step 6. Rotate view to view **rear surface**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 10.**

Step 7. Click **rear surface** to select as avoidance geometry and click **End Selection** (ENTER), **Fig 10.**



(ENTER), **Fig 10.**



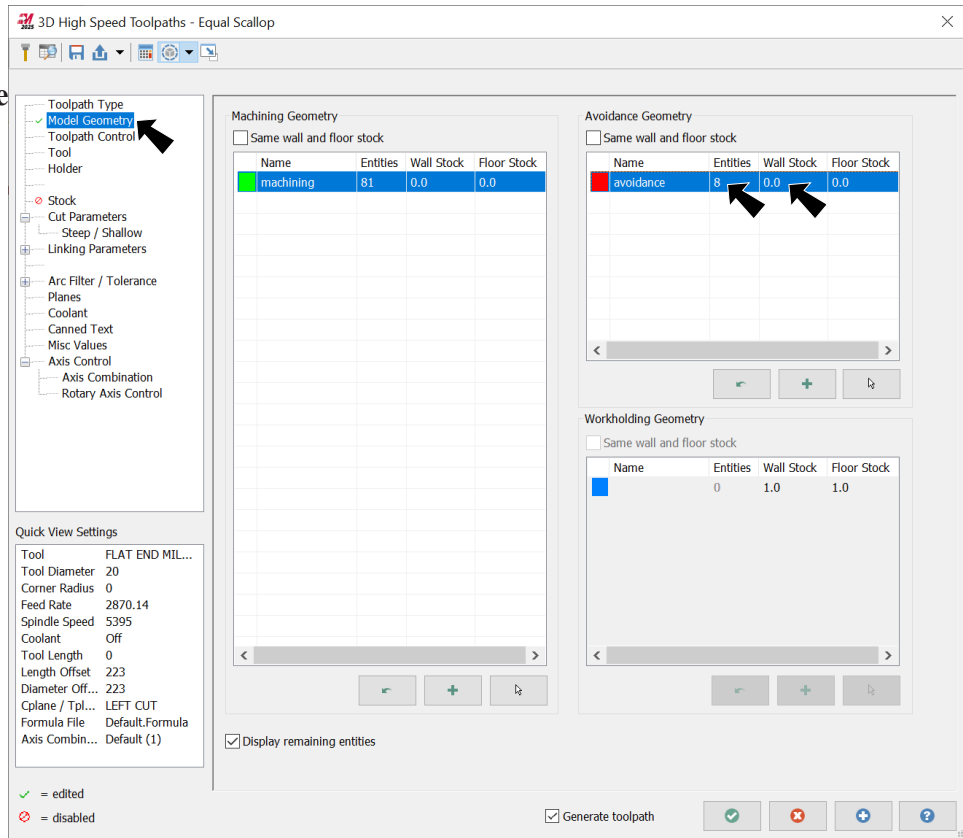
**Fig. 10**

**Click bottom and rear surface as avoidance geometry**

Step 8. Back in **Model Geometry** page under **Avoidance Geometry** set:

Confirm **8 Avoidance entities**

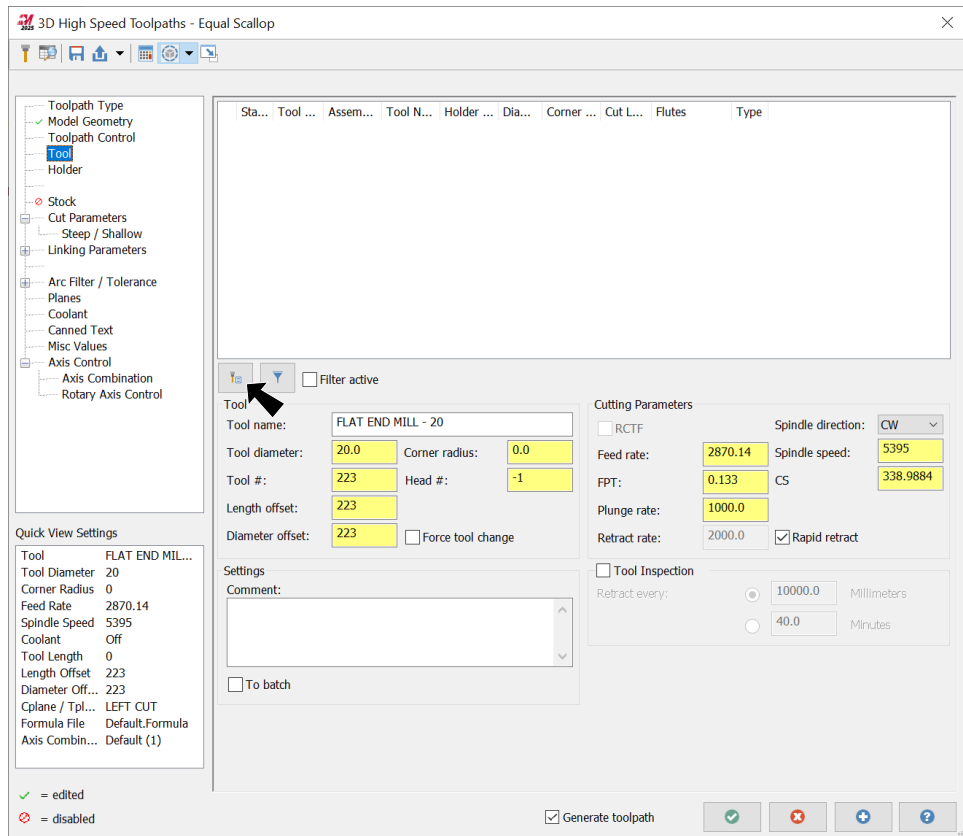
**Wall Stock 0**  
**Fig. 11.**



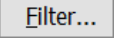
**Fig. 11**

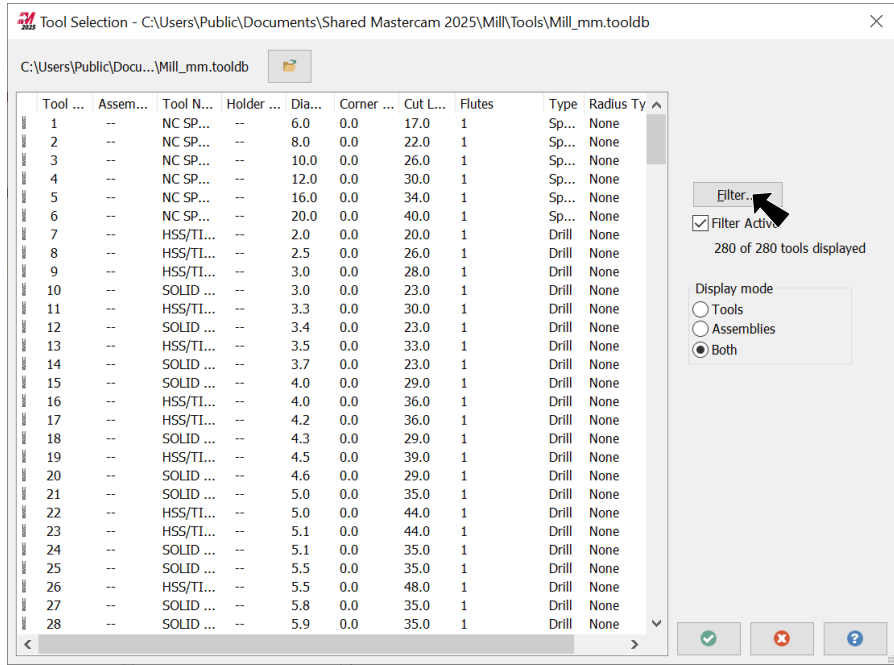
Step 9. Select **Tool** from the tree control and:

click **Select library tool** button   
**Fig. 12.**





**Fig. 12**

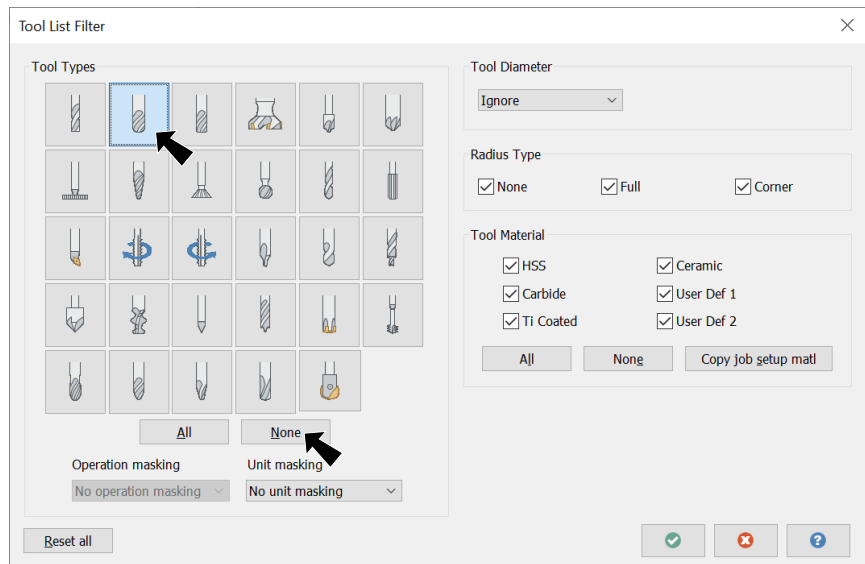
Step 10. Click the **Filter** button  
 button  
**Fig. 13.**




**Fig. 13**

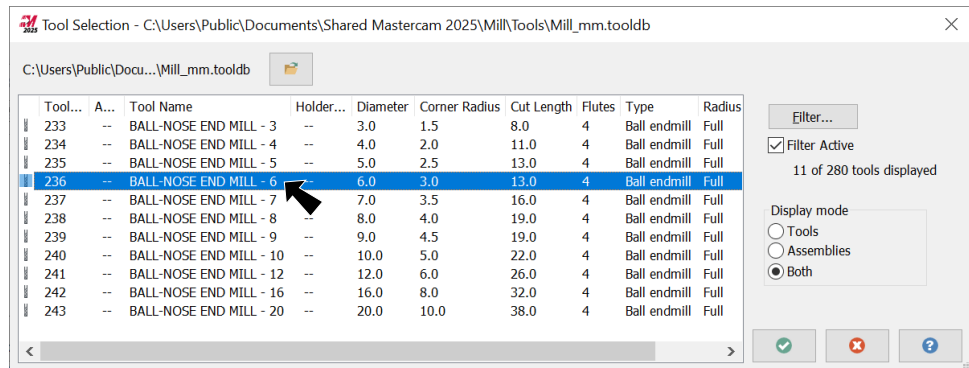
Step 11. Click **None** button under **Tool Types**  
**Fig. 14.**

Step 12. Click **Endmill2 Sphere** button  
  
 (second button top row)  
 and click **OK**  
  
**Fig. 14.**



**Fig. 14**

Step 13. Select **BALL-NOSE END-MILL 6.0 mm Diameter** and click **OK**  
  
**Fig. 15.**

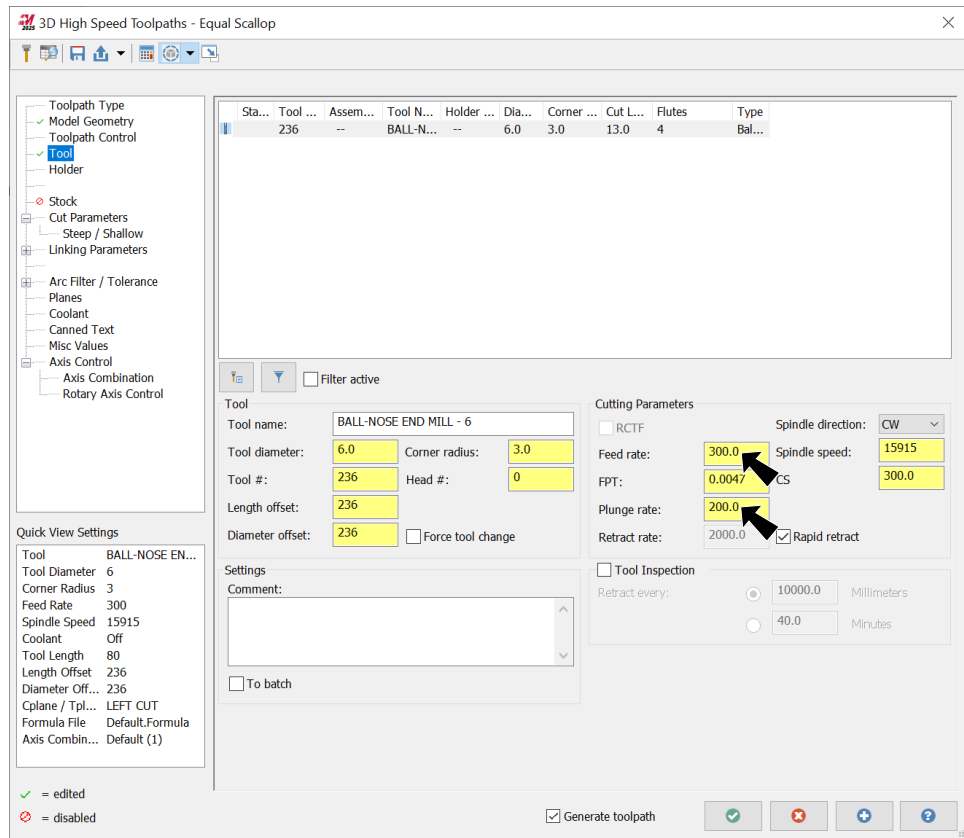


**Fig. 15**

Step 14. Back in Tool page set:

**Feed rate 300**

**Plunge rate 200**  
**Fig. 16.**



**Fig. 16**

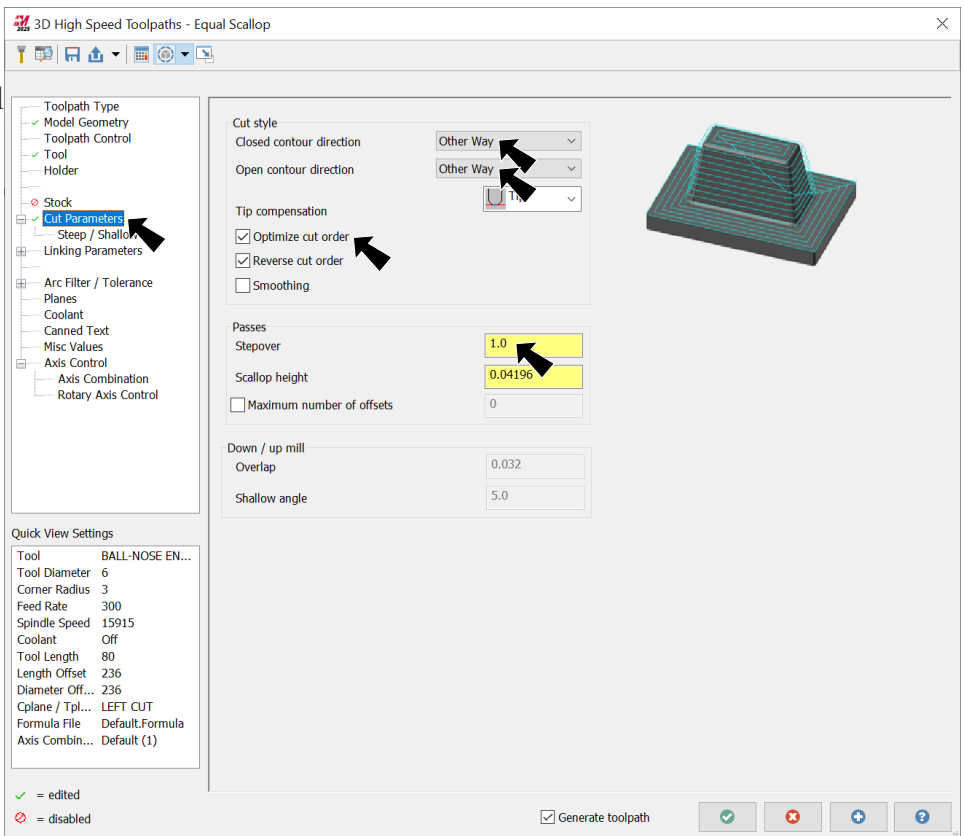
Step 15. Select Cut Parameters from tree control and set:

**Cut style**  
**Closed**  
**Other Way**

**Open**  
**Other Way**

**Check**  
**Optimize cut order**

**Stepover 1**  
**Fig. 17.**



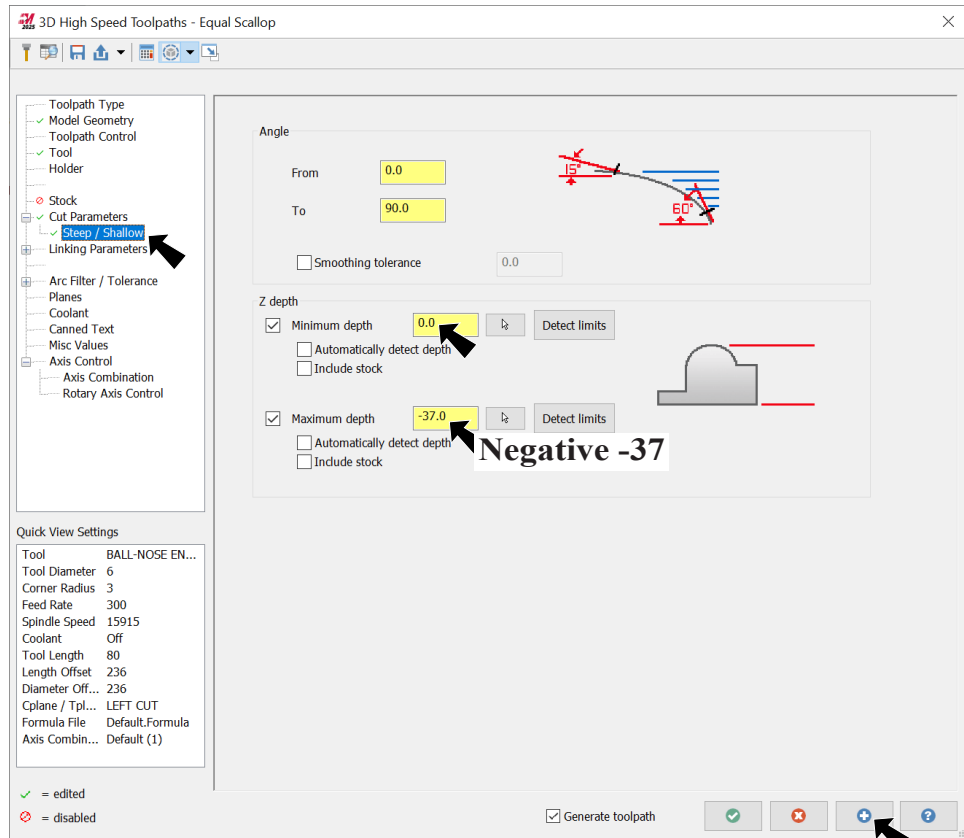
**Fig. 17**

Step 16. Select **Steep/ Shallow** from tree control and set:

Check **Minimum depth 0**

Check **Maximum depth -37**

Click **Apply**  
  
**Fig. 18.**



**Fig. 18**

Step 17. Select **Linking Parameters** from tree control and set:

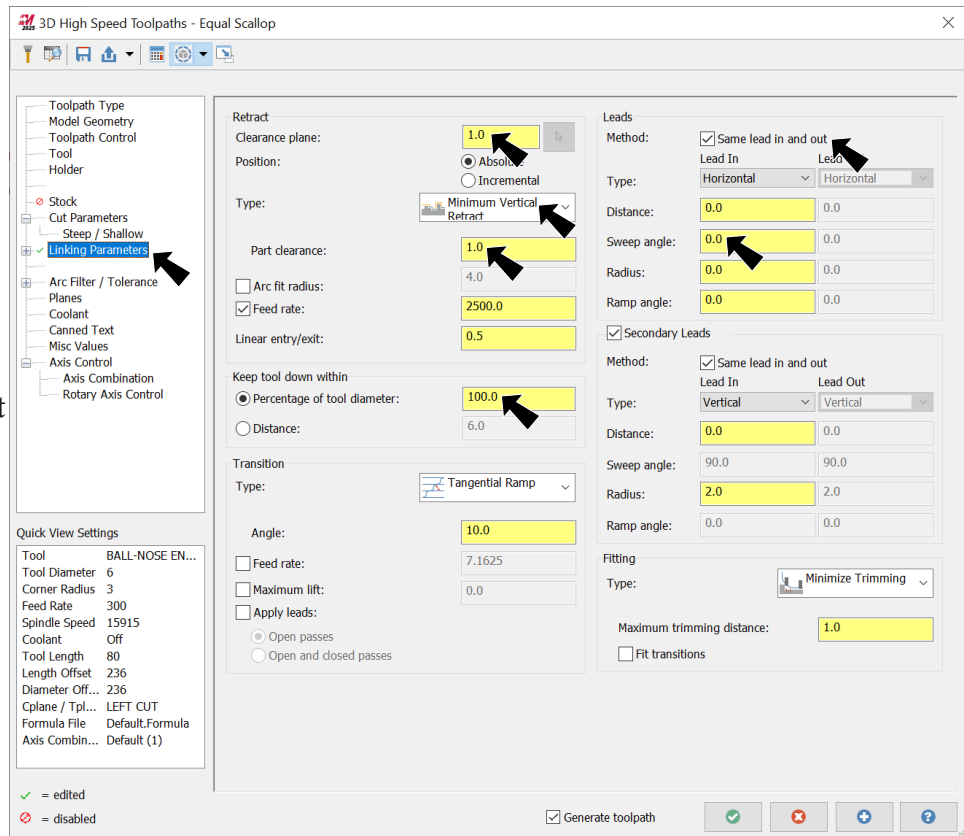
**Clearance plane 1**

Select **Minimum Vertical Retract**

**Part clearance 1**

**Keep tool down within 100%**

**All Leads 0**  
**Fig. 19.**



**Fig. 19**

Step 18. Select **Arc Filter/Tolerance** from tree control and set:

**Total tolerance .0625**

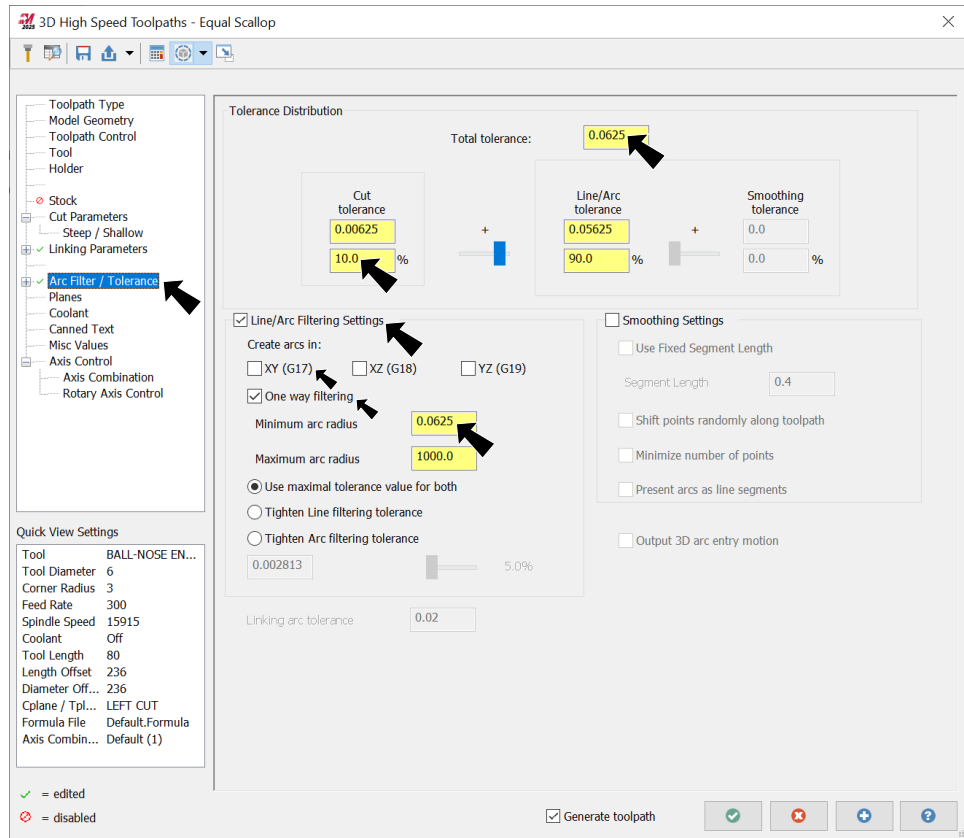
**Check Line/Arc Filtering Settings**

**Uncheck Create arcs in XY**

**Check One way filtering**

**Set Minimum arc radius .0625**

**Cut tolerance 10% Fig. 20.**



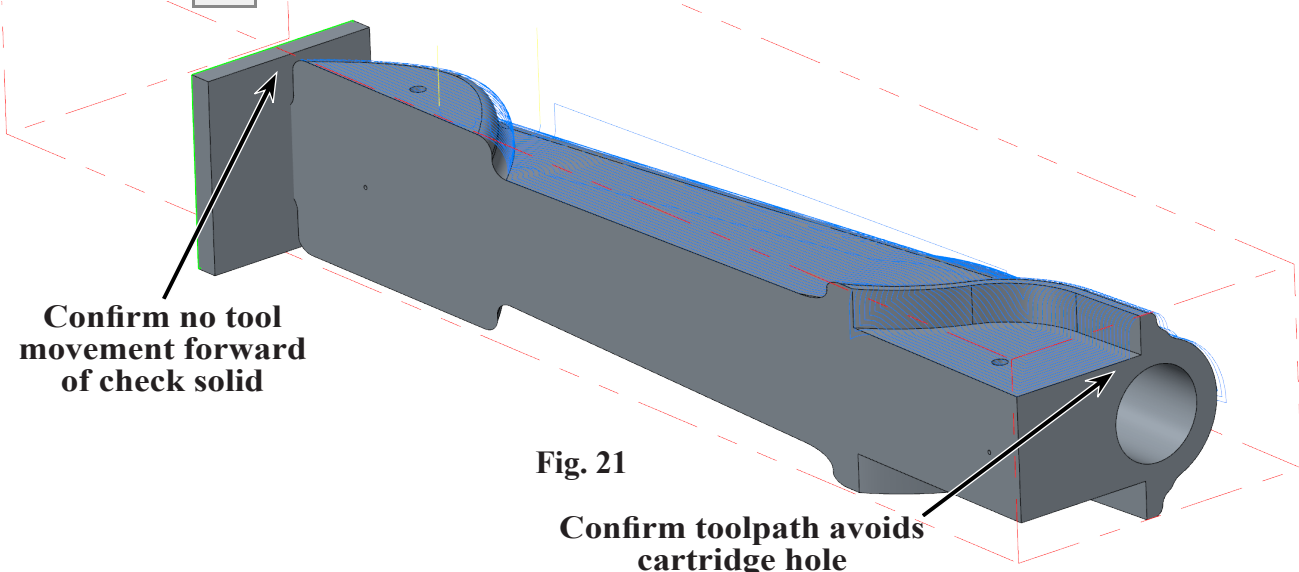
**Fig. 20**

Step 19. Click OK  in Equal Scallop dialog box.

Step 20. Confirm **toolpath avoids rear surface and doesn't pass across cartridge hole**, Fig. 20. Use **Alt-T** to toggle on toolpath display.


Distance is controlled in Model Geometry under Avoidance Geometry Wall Stock (**Fig. 11**).

Step 21. Save  (Ctrl-S).



**Fig. 21**

## D. Verify Left Cut.

Step 1. Change to the Isometric View. **Right click** in the graphics window and click  **Isometric** (Alt-7).

Step 2. In the Toolpaths Manager **Verify** , Fig. 22.

Step 3. We like to **uncheck Wireframe** in the Visibility group on the Home tab, Fig. 23.

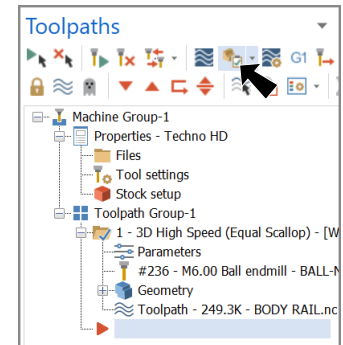



Fig. 22

Step 4. Click **Play**  (R) in playback bar along bottom of the window, Fig. 24.

Step 5. Note **Total Time** to run program under Toolpath Info in Move List panel (**40min 16.10s**), Fig. 26.

Step 6. Switch back to Mastercam (Alt-Tab).

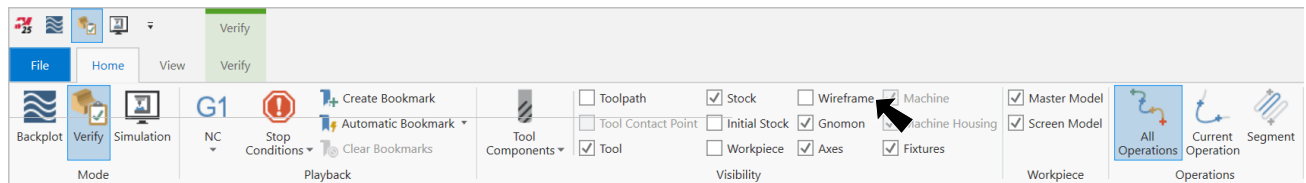


Fig. 23



Fig. 24

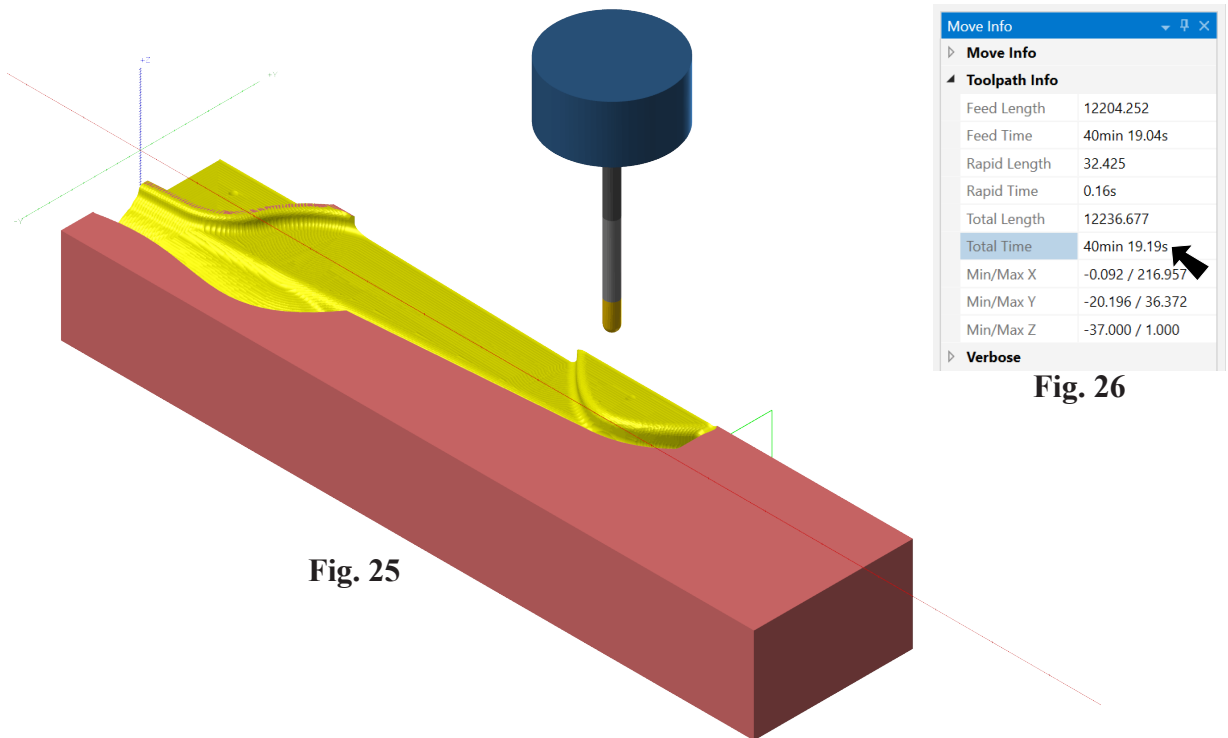
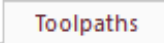
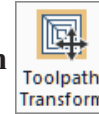


Fig. 26

Fig. 25



## E. Mirror LEFT CUT to RIGHT CUT Toolpath.

Step 1. On the Toolpaths tab  click **Toolpath Transform**



Step 2. In the Transform Operation Parameters dialog box:  
 under Type, **Fig. 27**  
 select **Mirror**  
 under Source  
 select **NCI**  
 under Source operations  
 select **Surface High Speed (Equal Scallop)**.

Step 3. Click the **Mirror tab** at top of dialog box, **Fig. 28**.

under Method  
 select **Mirror**  
**about X axis**   
 Click OK 

Step 4. Allow Mastercam to calculate toolpath.

Step 5. Save  (Ctrl-S).

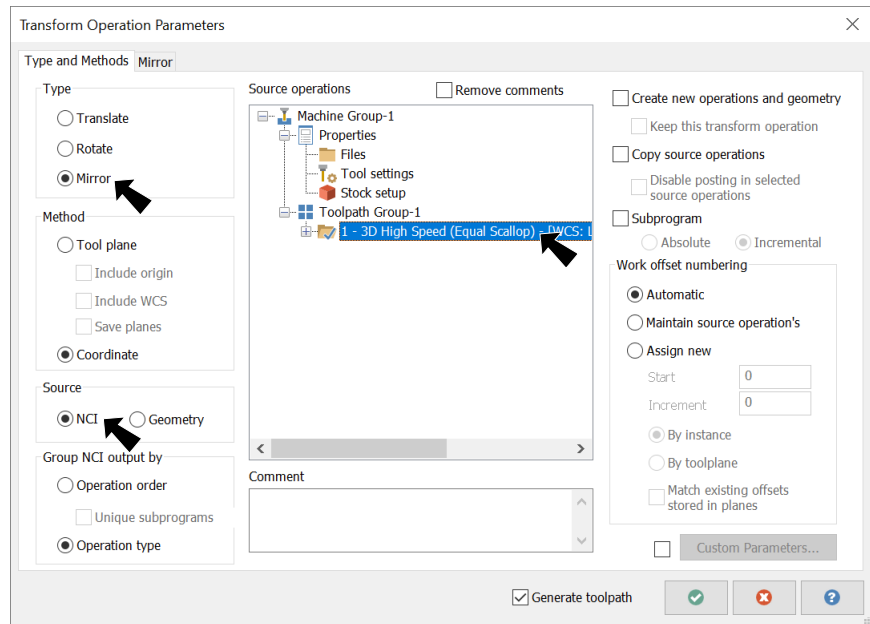


Fig. 27

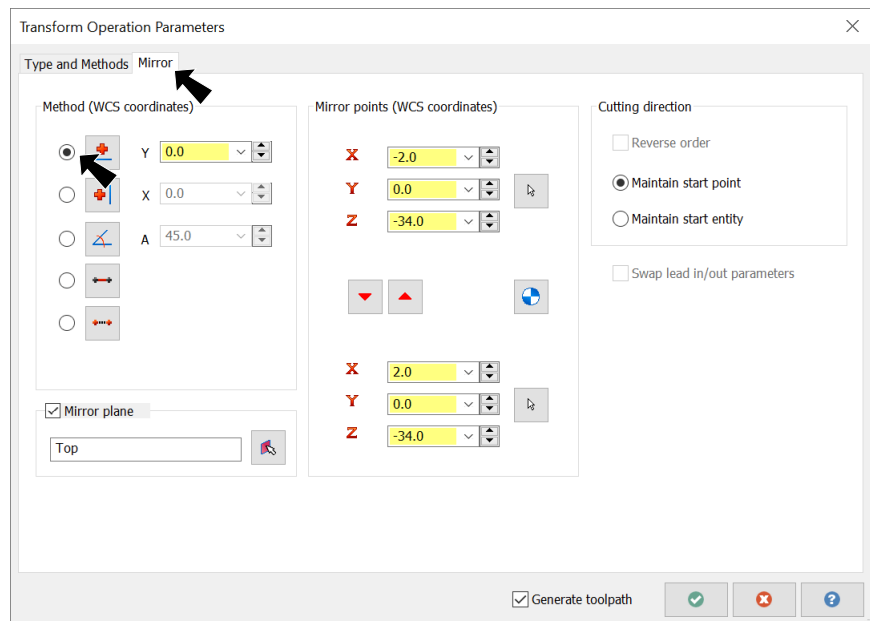



Fig. 28

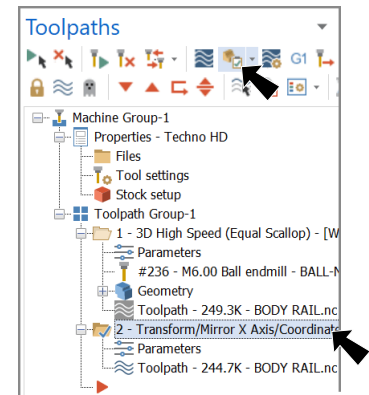
## F. Verify Right Cut.

Step 1. In Toolpaths Manager, click the **Transform/Mirror** toolpath, **Fig. 29**.

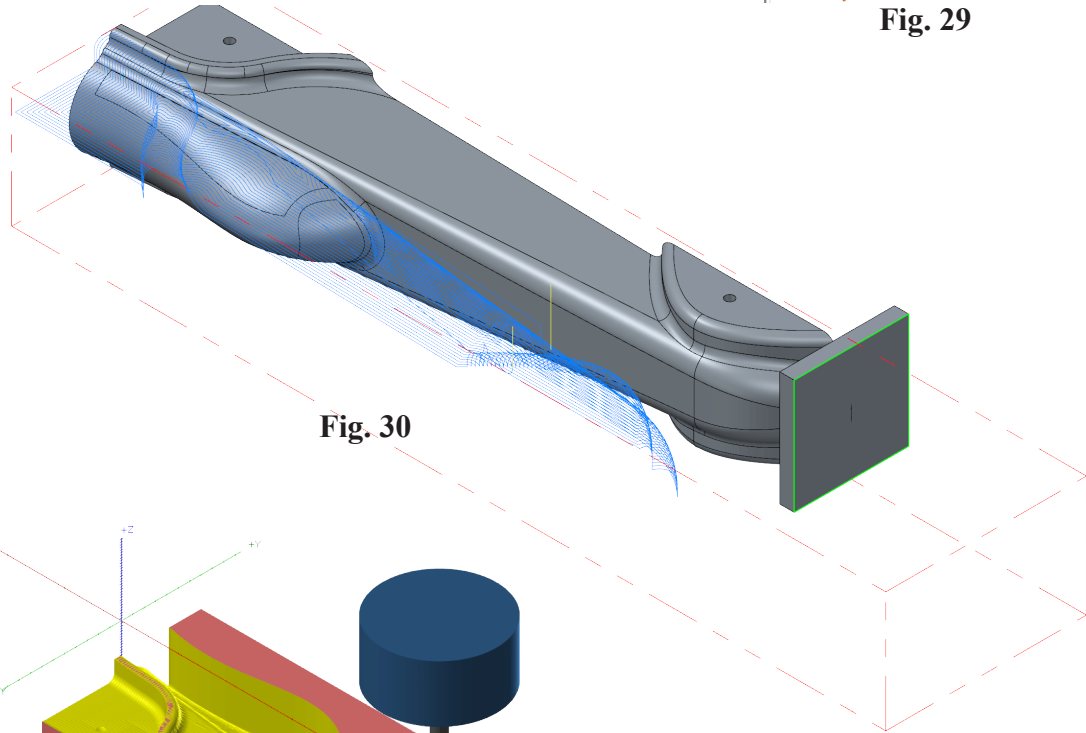
Step 2. Click **Verify**  in Toolpaths Manager.

Step 3. Click **Play**  (R) in playback bar.

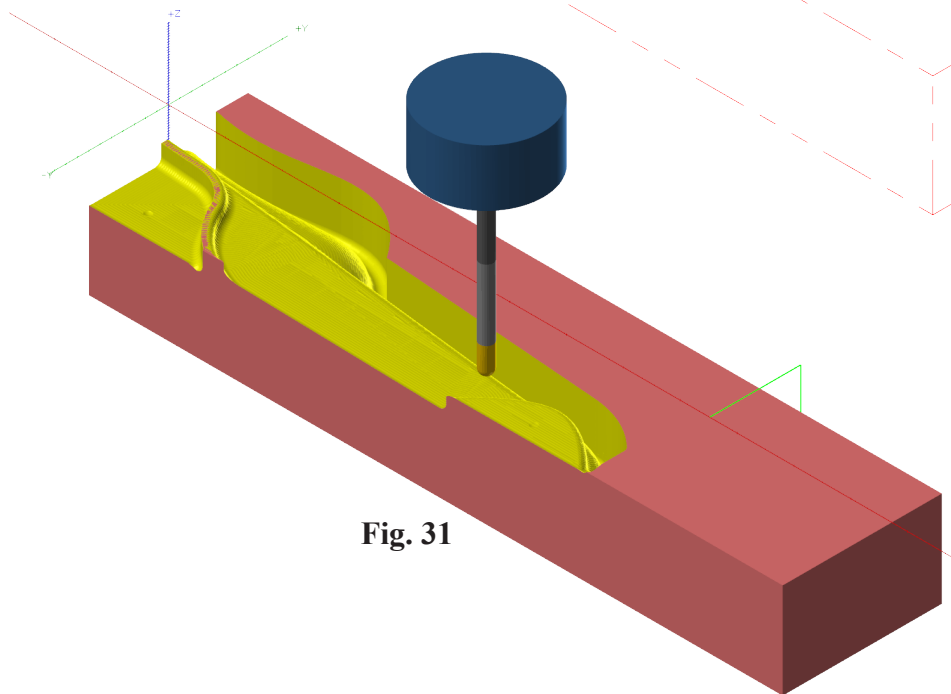
Step 4. Click **Close**  to close Mastercam Simulation.



**Fig. 29**



**Fig. 30**



**Fig. 31**