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Mastercam 2020 Lathe Training Tutorial

Software: Mastercam 2020

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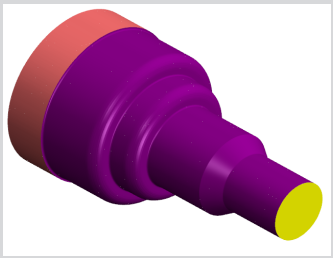
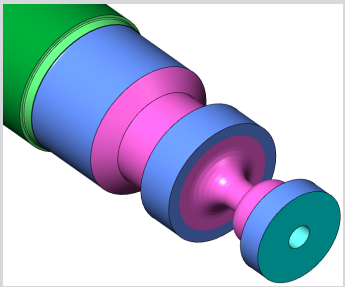
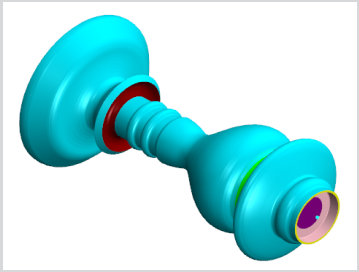
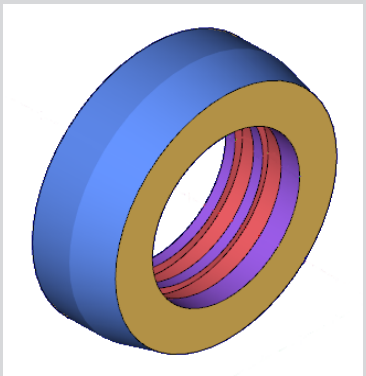
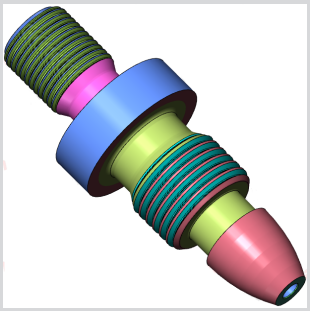
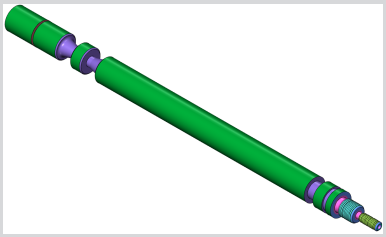
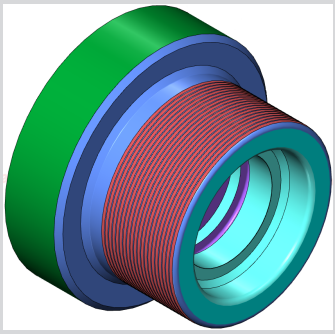
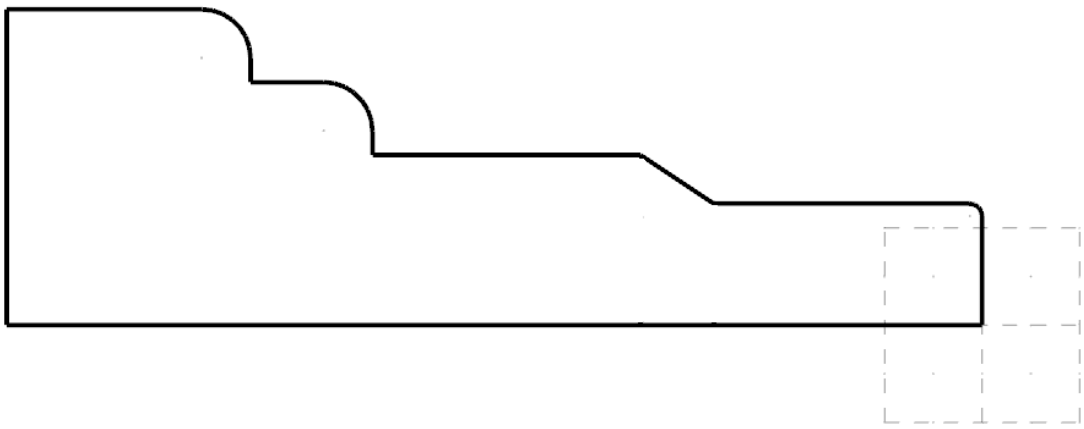
#1 	Rectangle Line Parallel Chamfer Entities Fillet Entities Trim Entities	Face Roughing Finish
#2 	Line Endpoints (Polar Line) Line Parallel Line Endpoints (Horizontal) Divide/delete Trim 2 Entities Fillet	Face Roughing Finish Groove - Multiple Chains Drilling
#3 	Import a Parasolid File Turn Profile	Face Drill Canned Rough ID Canned Finish ID Rough OD Finish OD Groove - Straight grooves Groove - Angled Grooves Cutoff
#4 	Rectangle Parallel Line Line Endpoints Trim Divide Trim 2 Entities	Face Roughing Finish Drill ID Rough ID Finish ID Groove - Multiple Chains Cutoff
#5	Line Endpoints Arc Tangent Dynamic	Face Rough OD

Tutorial	Geometry Functions	Toolpath Creation
	Relief Groove Chamfer	Finish OD Groove Thread Drill Stock Flip Face Rough OD Finish OD Groove Thread Drill
#6 	Rectangle Parallel Line Line Endpoints Fillet Trim Chamfer Relief Groove Line Tangent to Two Arcs Rotate Bolt Circle Translate Copy	Face Rough OD Finish OD Groove Thread Center Drill Stock Advance Lathe Tailstock Groove Cutoff
#7 	Import a SolidWorks File Turn Profile	Create standard toolpaths geared towards VTL machines. Face Rough OD Finish OD Drill Rough ID Finish ID Groove ID Change Tool Definitions Thread

Tutorial 1: Geometry Creation



OVERVIEW OF STEPS TAKEN TO CREATE THE PART GEOMETRY

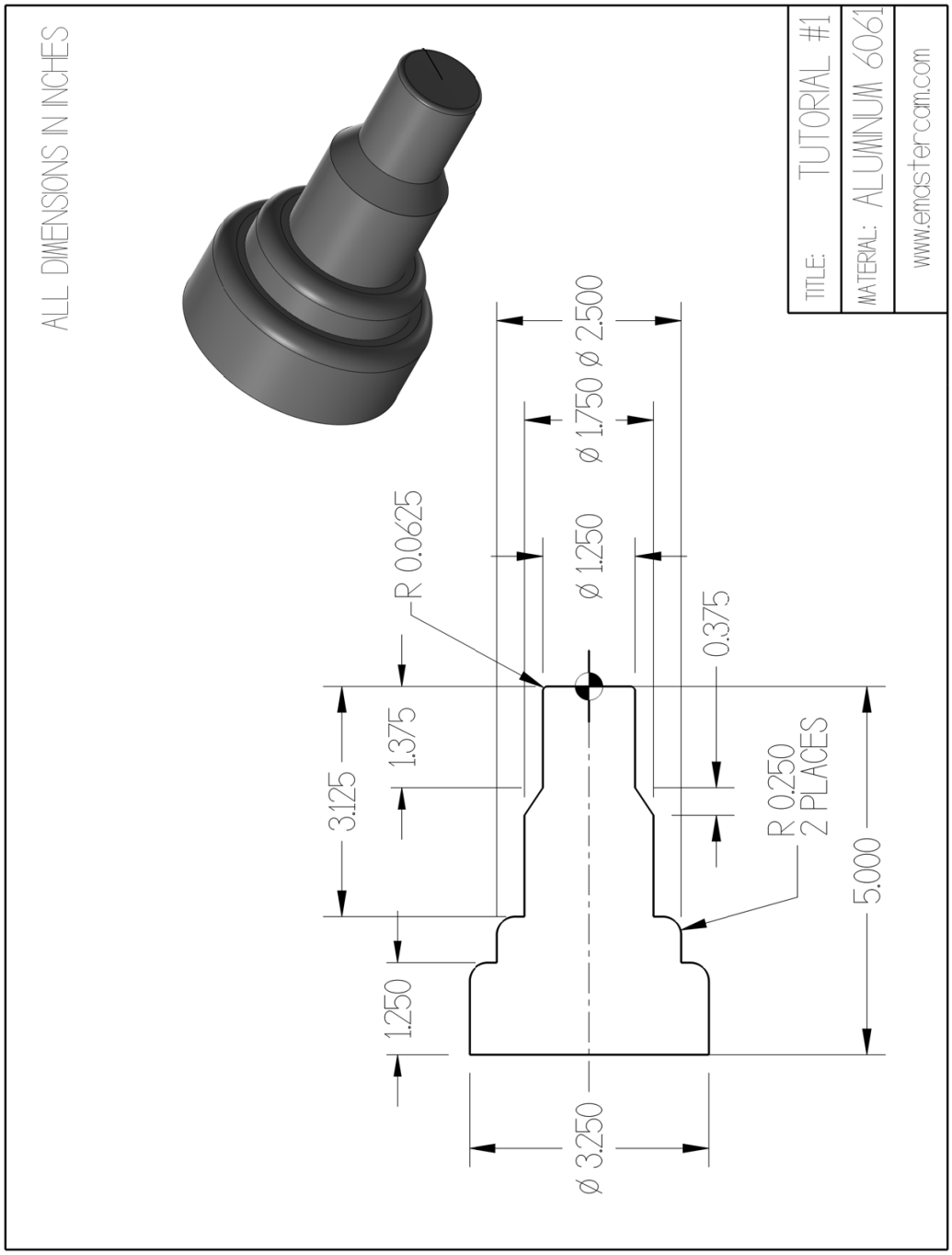
From Drawing to CAD Model:

- The student should examine the drawing on the following page to understand what part is being created in the tutorial.
- From the drawing we can decide how to create the geometry in Mastercam.

Create the 2D CAD Model:

- The student will create the upper profile of the part. Only half of the geometry is needed to create the necessary toolpaths to machine the part.
- Geometry creation commands such as Line Endpoints, Line Parallel, Rectangle, Fillet Entities, and Trim will be used.

TUTORIAL #1 DRAWING



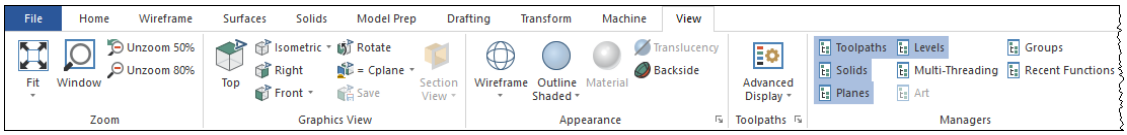
STEP 1: SETTING UP THE GRAPHICAL USER INTERFACE

Please refer to the **Getting Started** section for more info on how to set up the graphical user interface. In this step, you will learn how to hide the manager panels to gain more space in the graphics window.

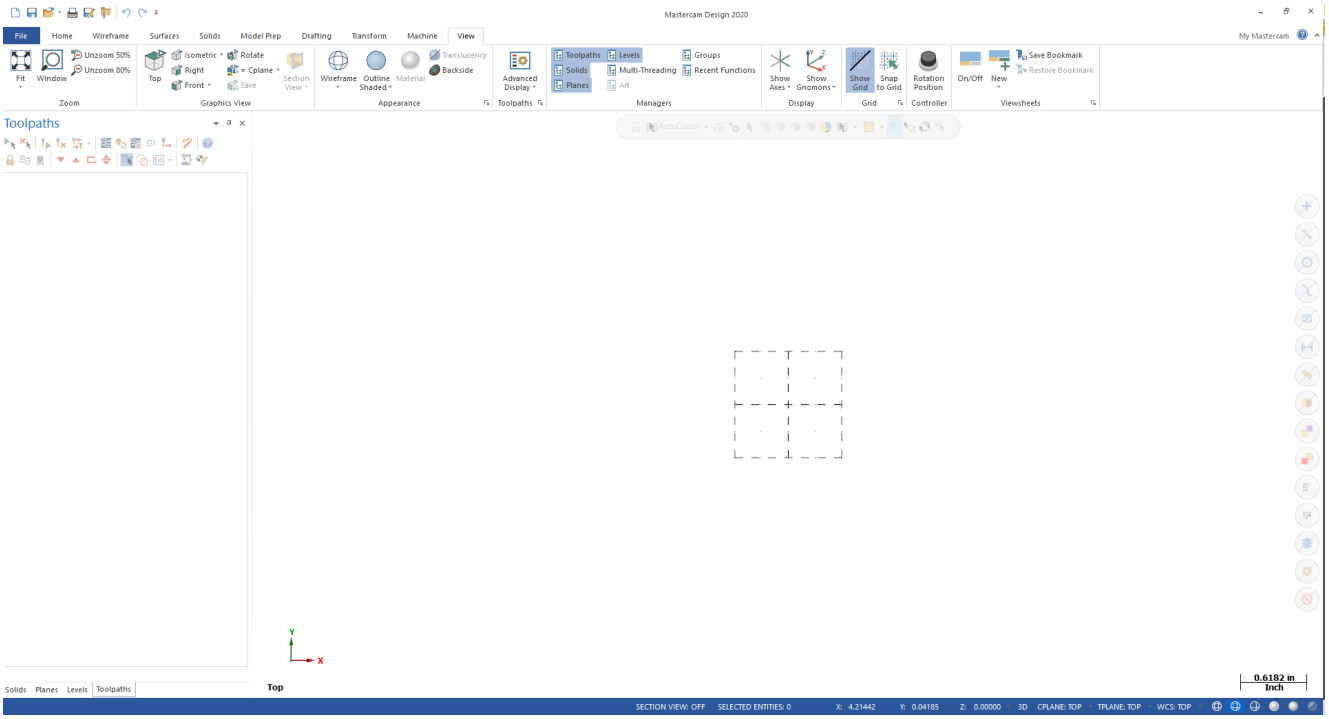
1.1 Hide the manager panels

View

- From the **Managers** group, enable all four managers as shown.

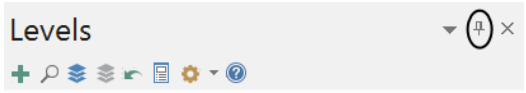


- The panels should be on the left side of the graphics window as shown.

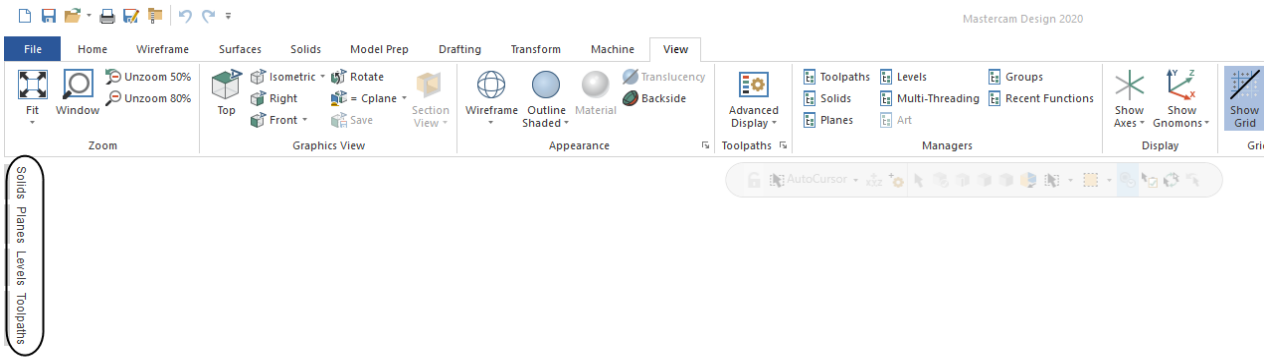


*Note: It does not matter which panel is currently opened. It could be the **Toolpaths**, the **Solids**, the **Planes** or the **Levels** panel as shown.*

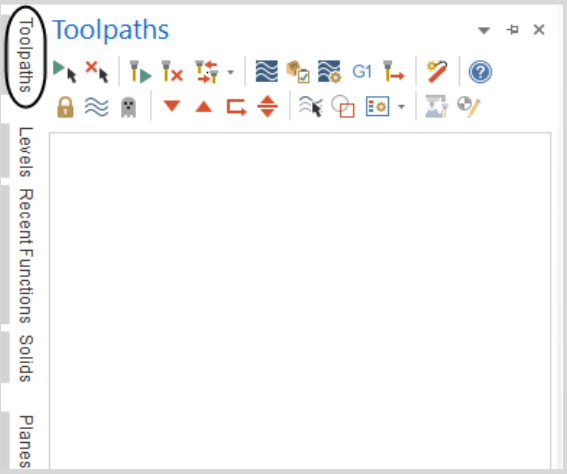
- To hide all panels, click on the **Auto Hide** icon as shown.



- The panels will be hidden to the left of the graphics window as shown.



*Note: To un-hide them temporally, you can click on one of the **Managers** to open it as shown.*

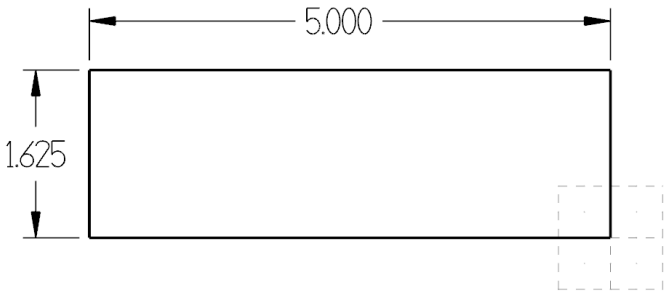


*While creating the geometry, keep the **Manager** panels hidden. This ensures more space in the graphics window for the geometry.*

STEP 2: CREATE A RECTANGLE

In this step you will learn how to create a rectangle given the width, the height, and the anchor position.

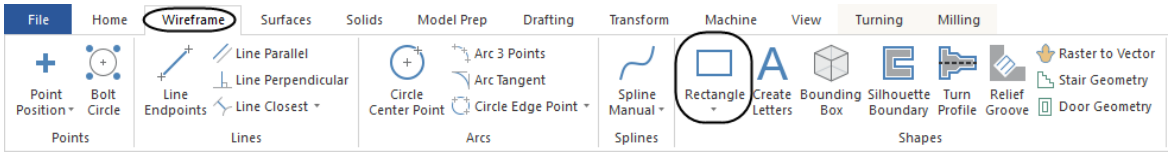
Step Preview:



2.1 Create the 5" by 1.625" rectangle

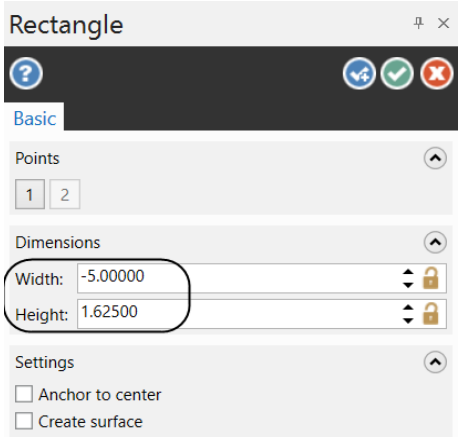
Wireframe

- From the **Shapes** group, select Rectangle.



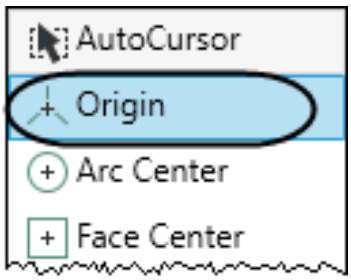
Note: Select the rectangle icon as shown. If you click too close to the drop down arrow, a fly-out list of commands appears and you can select the top Rectangle command.

- Enter the **Width** of **-5.0** and the **Height** of **1.625** and press Enter.



- To select the position of the base point, from the **General Selection** toolbar, click on the drop down arrow next to **AutoCursor** as shown.

- From the fly-out menu select Origin.



- To see the entire rectangle, right mouse click in the graphics window and select **Fit** as shown.

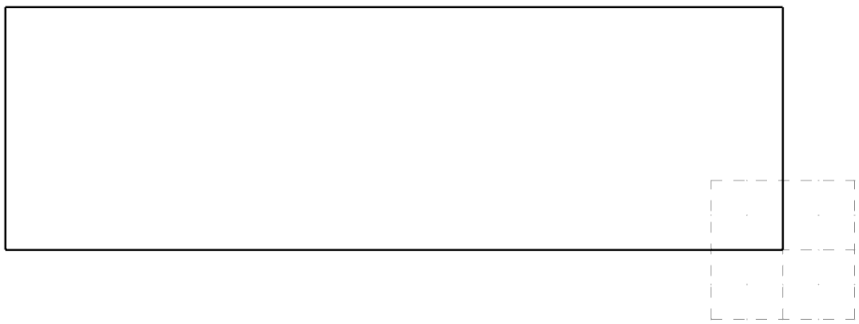
*Note: To fit the geometry to the screen you can also press **Alt + F1**.*

- A preview of the geometry should look as shown.

Note: The geometry should appear in a cyan blue color which is the color for live entities.

While the rectangle is live you can adjust the dimensions or select a new base point.

- Select the **OK** button to exit the **Rectangle** command. 
- The geometry should look as shown.



*Note: While creating geometry for this tutorial, if you make a mistake, you can undo the last step using the **Undo** icon or by pressing **Ctrl + Z**. You can undo as many steps as needed. If you delete or undo a step by mistake, just use the **Redo** icon or press **Ctrl + Y**.*

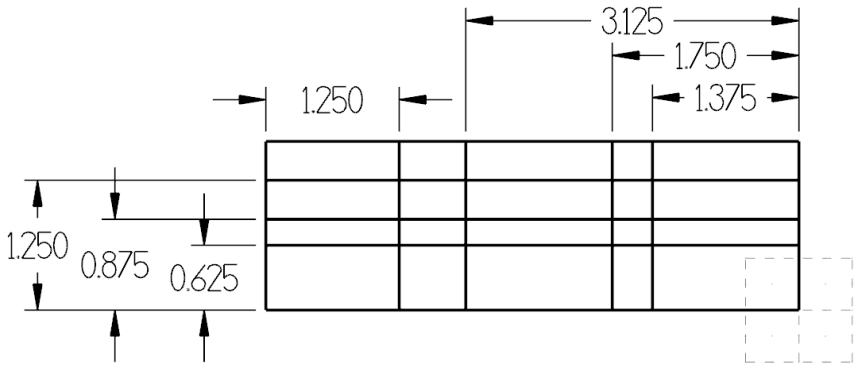
*To delete unwanted geometry, select the geometry first and then press **Delete** from the keyboard.*

To zoom tor unzoom, move the cursor to the center of the geometry and scroll up or down on the mouse wheel.

STEP 3: CREATE THE PARALLEL LINES

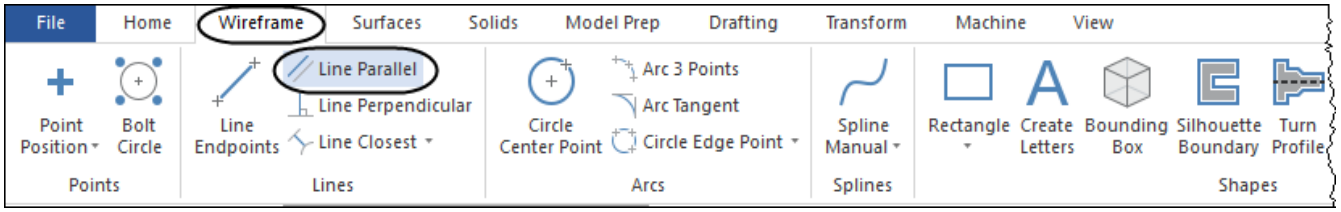
In this step you will learn how to create parallel lines to existing lines given the distance between the lines. We are creating the lines to use as part of the geometry as well as the construction lines.

Step Preview:

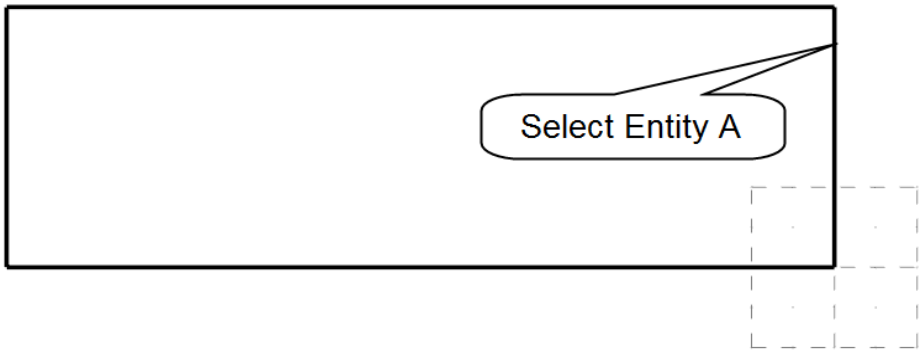


Wireframe

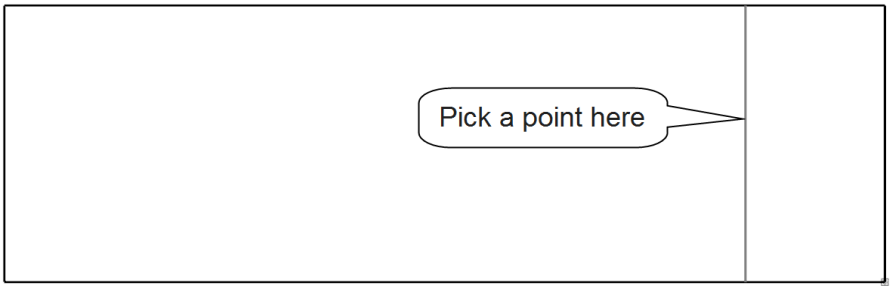
- From the **Lines** group, select **Line Parallel**.



- [Select a line]: Select **Entity A** as shown.

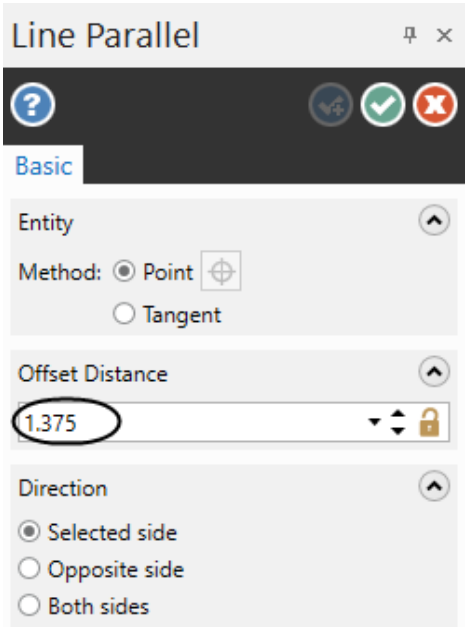


- [Select the point to place a parallel line through]: Pick a point to the left of the selected line.



Note: The color of the geometry is cyan which means that the entity is "live" and you can still change the line parameters if needed.

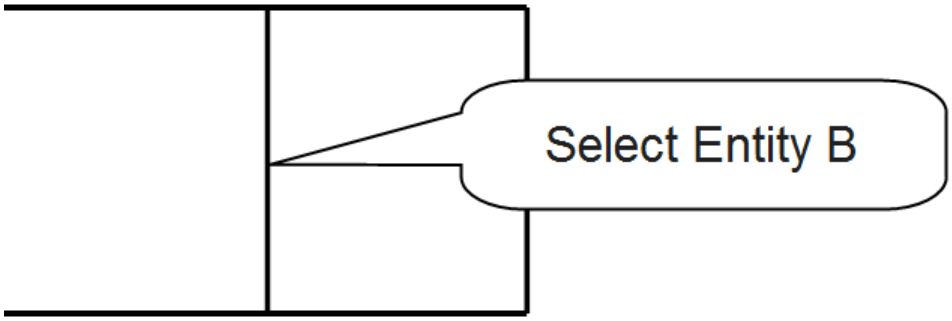
- In the **Line Parallel** panel, enter the **Distance 1.375**.
- Press **Enter** to move the line to the proper distance.



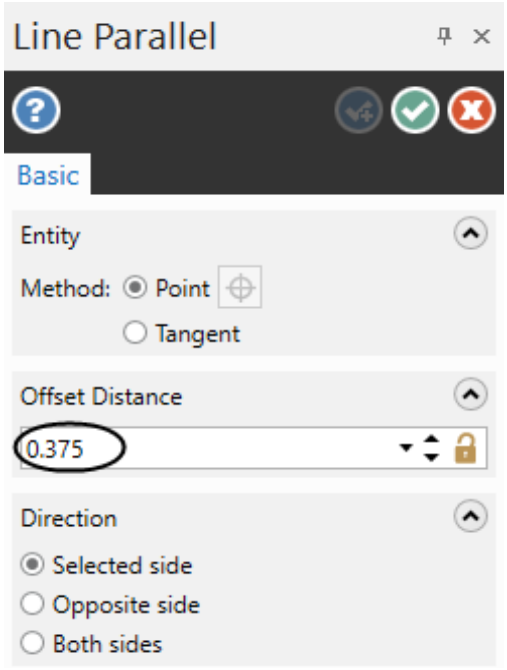
*Note: To continue using the same command you can either select the **OK and Create New Operation** button*  *or press **Enter**. To exit the command you can either start a new command or select the **OK** button.*

- Press **Enter** to continue.

- [Select a line]: Select **Entity B** as shown.



- [Select the point to place a parallel line through]: Pick a point to the left of the selected line.
- Enter the **Distance 0.375**.



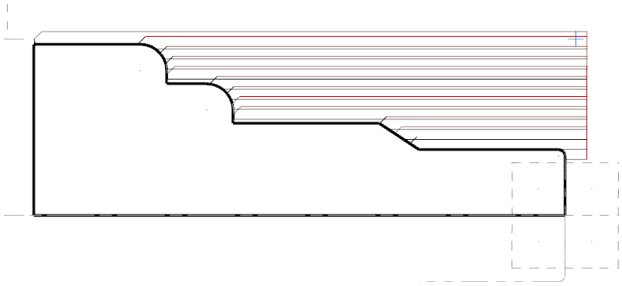
- Press **Enter** to move the line to the proper distance.

- Press **Enter** to continue or select the **OK and Create New Operation** button  .

STEP 5: ROUGH OUT THE PART

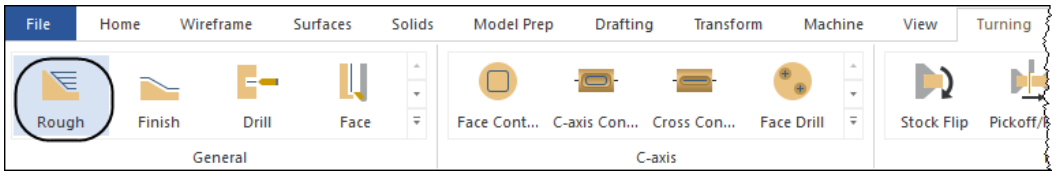
Rough toolpaths quickly remove large amounts of stock in preparation for a finish pass. Roughing passes are typically straight cuts parallel to the **Z axis**.

Toolpath Preview:



Turning

- From the **General** group, select **Rough**.

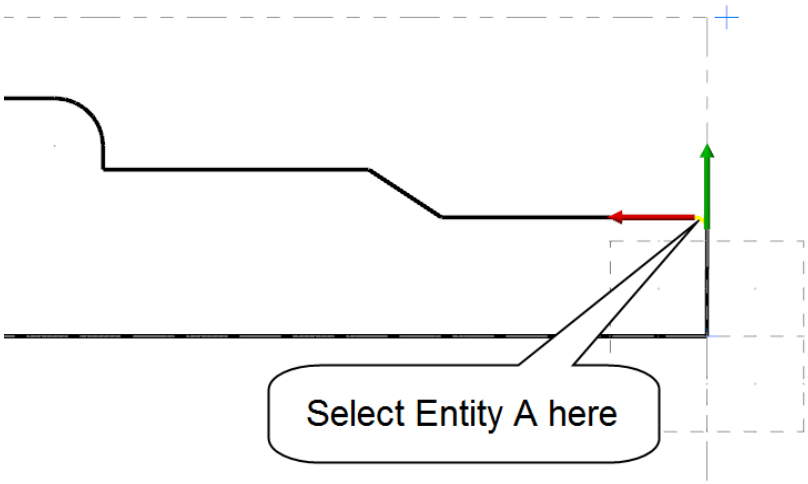


- Leave the default settings in the **Chaining** dialog box.

The chaining mode is **Partial** by default. You will have to select the first entity and the last entity of the contour.

♦ Select Entity A (the fillet) as shown in Figure: 5.0.1.

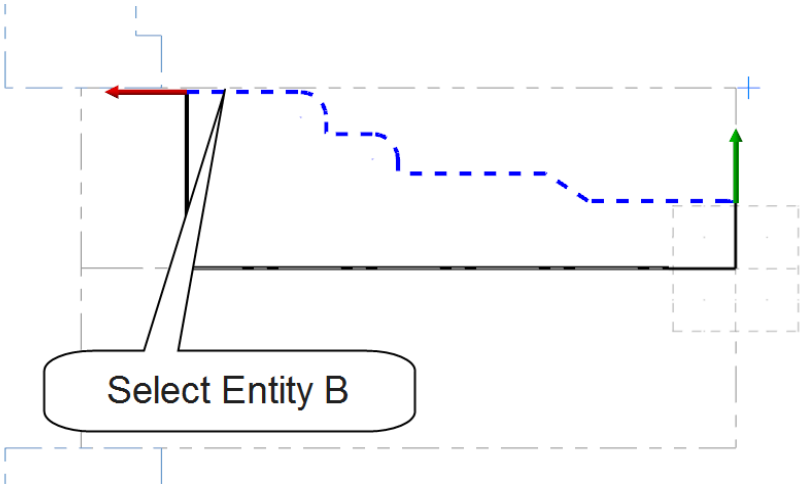
Figure: 5.0.1



*Note: Make sure that the chaining direction is **CCW**, otherwise select the **Reverse** button in the **Chaining** dialog box.*

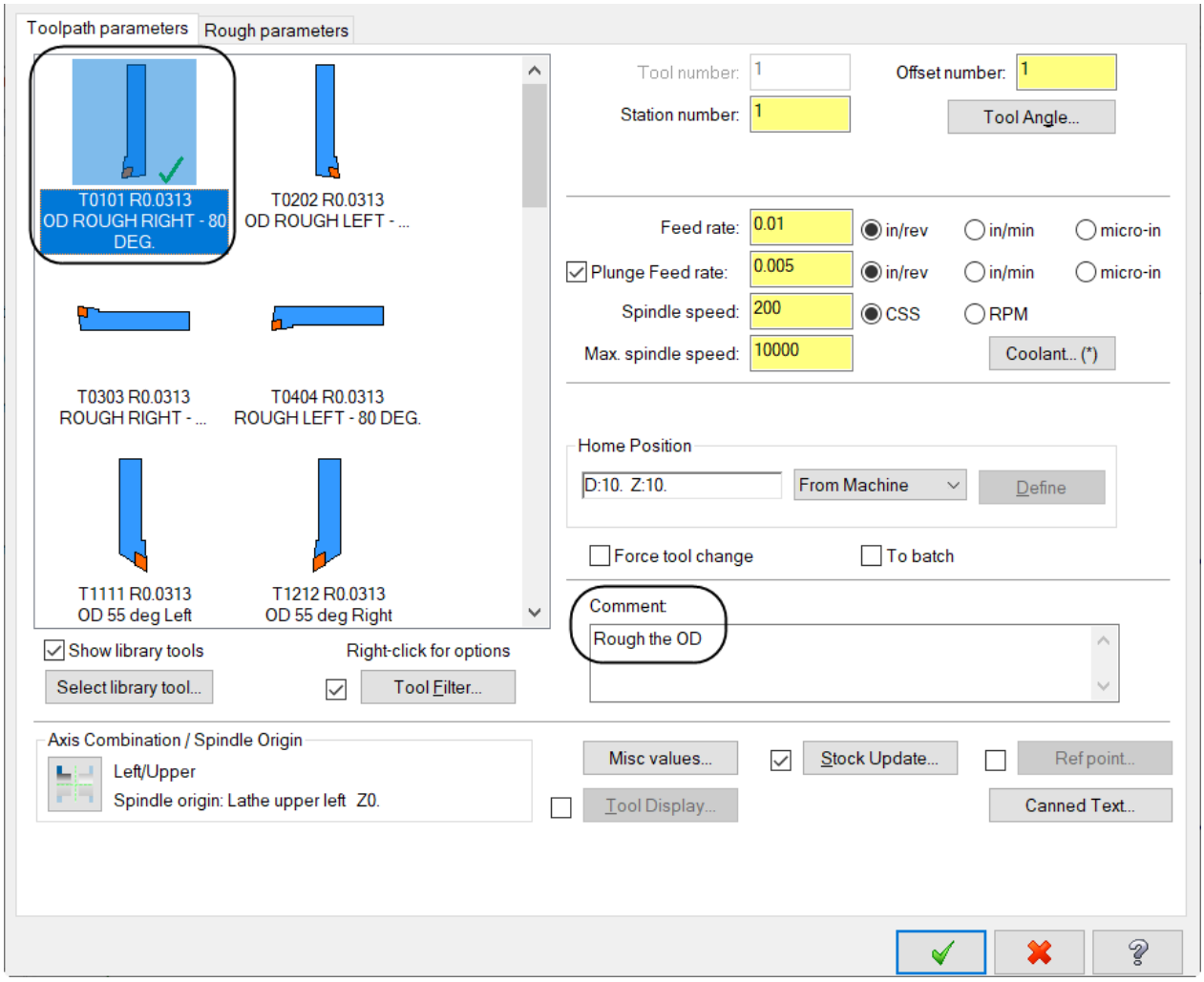
♦ Select **Entity B** as shown Figure: 5.0.2.

Figure: 5.0.2

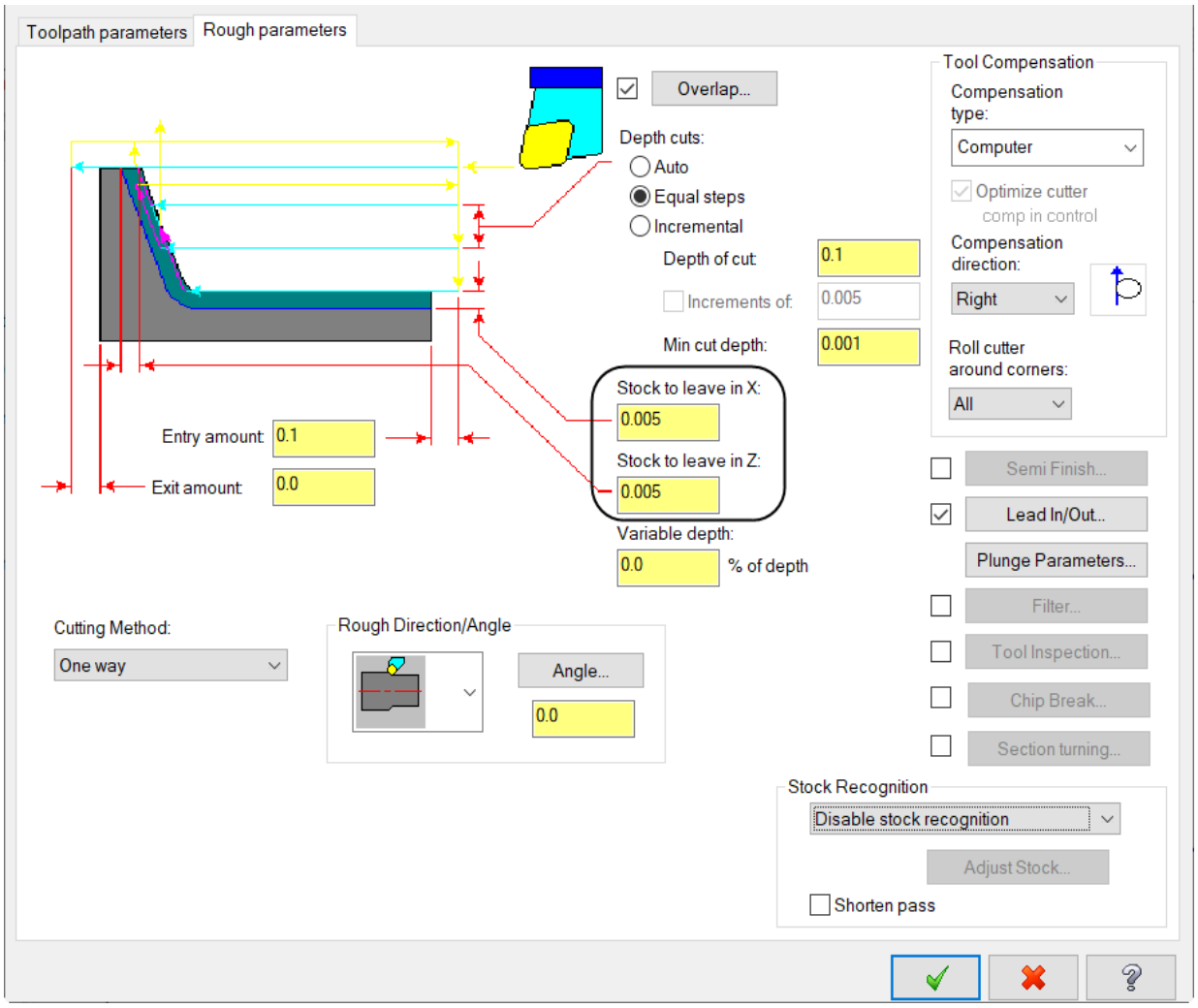


♦ Select the **OK** button to exit the **Chaining** dialog box. 

- In the **Toolpath parameters** tab, select the same tool that we used in the facing operation and make all of the necessary changes as shown.



♦ Select the **Rough parameters** tab and make any necessary changes as shown.



Depth of cut sets the amount of material to be removed during each pass.

Equal steps sets the **Depth of cut** value to the maximum amount of material that the tool can remove at each pass to ensure equal passes.

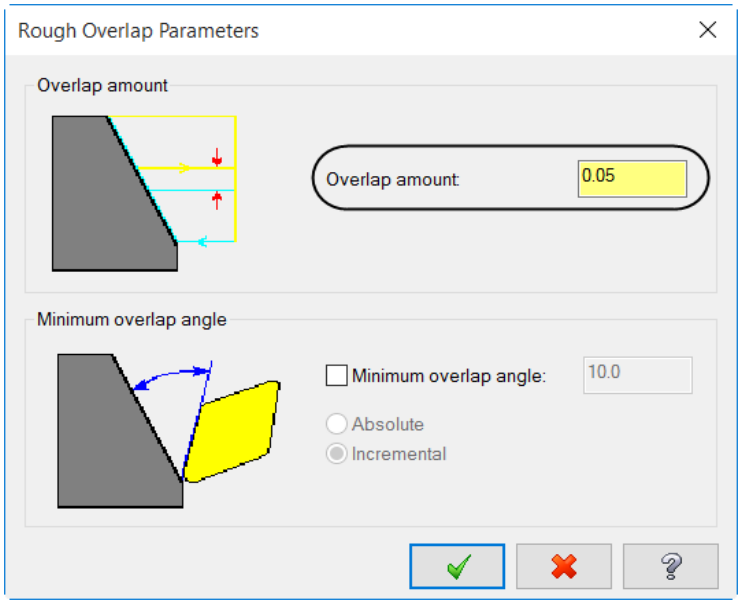
Minimum cut depth sets the minimum cut that can be taken per pass.

Stock to leave in X sets the remaining stock in the X axis after the tool completes all passes.

Stock to leave in Z sets the remaining stock in the Z axis after the tool completes all passes.

Entry amount sets the height at which the tool rapids to or from the part.

♦ Select the **Overlap** button to establish how much the tool overlaps the previous cut. Specify an **Overlap amount** of **0.05** as shown.



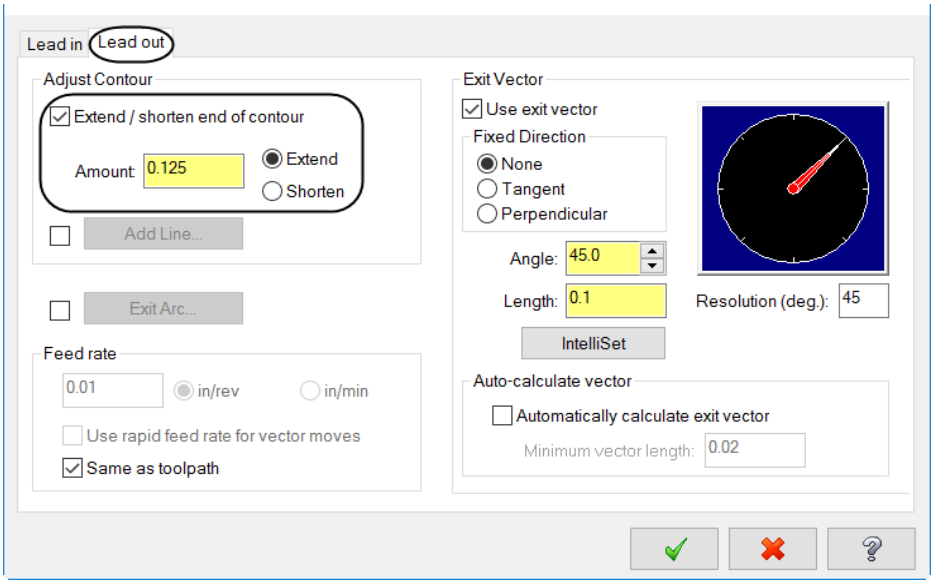
Rough Overlap Parameters lets you select options to determine how much the tool overlaps the previous cut before making the next cut.

Overlap amount sets the overlap amount as a distance.

Minimum overlap angle sets the angle at which Mastercam will start overlapping cuts.

♦ Select the **OK** button to exit the **Rough Overlap Parameters** dialog box. 

♦ Select the **Lead In/Out** button and choose the **Lead out** tab to extend the end of the contour as shown.



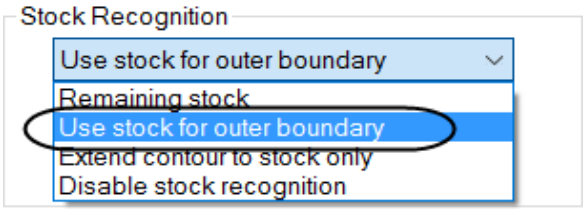
Adjust Contour allows you to extend or shorten the contour by an amount or by adding a line. We are extending the lead out to ensure that the part is completely machined.

Feed rate allows you to specify a custom feed rate for the Lead In/Out.

Exit Vector allows you to create a tangent arc move or perpendicular move to start the toolpath. You can also manually define an entry/exit vector or let the system automatically calculate a vector for you.

♦ Select the **OK** button to exit the **Lead In/Out** dialog box. 

♦ In the **Rough parameters** tab, change the **Stock Recognition** to **Use stock for outer boundary** as shown.

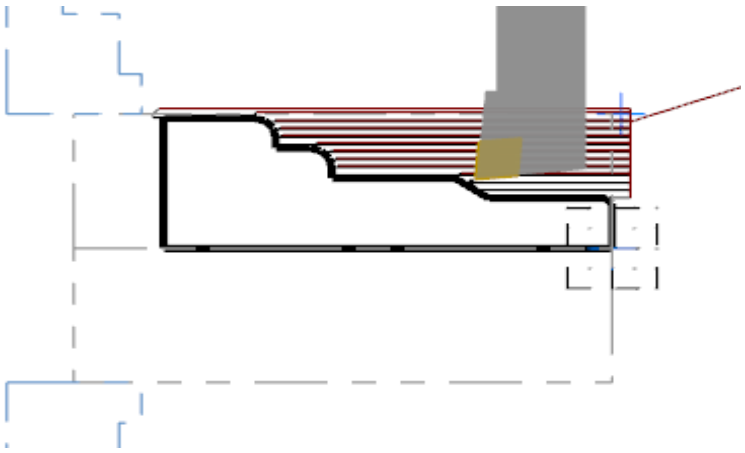


♦ Select the **OK** button to exit the **Lathe Rough** dialog box. 

5.1 Backplot the toolpath

- Once the operation has been regenerated, **Backplot** the toolpath.
- See **Page 69** to review the procedure. The toolpath should look as shown in Figure: 5.1.1

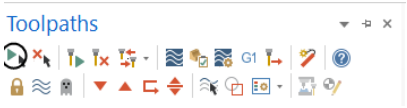
Figure: 5.1.1



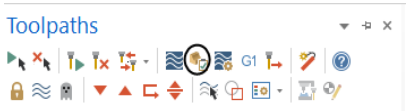
- Select the **OK** button to exit **Backplot**.

5.2 Verify the toolpaths

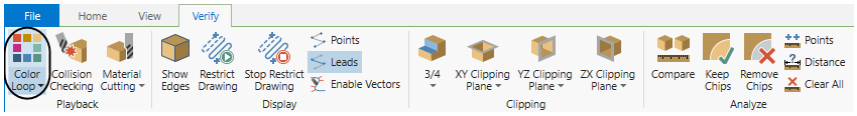
- To verify all toolpaths, from the **Toolpaths Manager**, choose the **Select all operations** icon.



- Select the **Verify selected operations** icon.

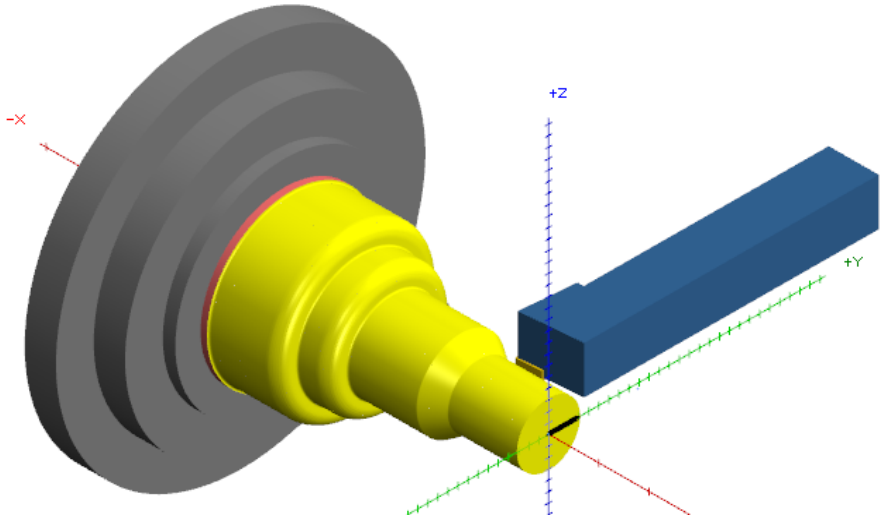


- Select the Verify tab, and enable Color Loop as shown.



Note: This option will change the material removal color. This can be set based on the operation or on the tool number used to machine the part. This makes it easier to spot if you forgot to leave the stock on in the finish operations.

♦ See **Page 71** to review the procedure.

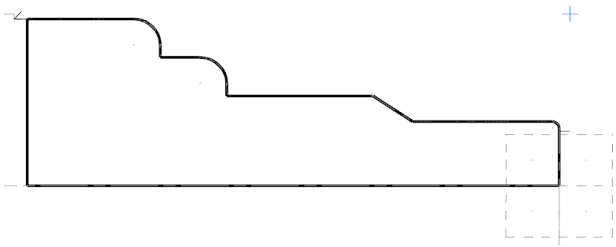


♦ To return to the Mastercam window, minimize the **Mastercam Simulator** window as shown. 

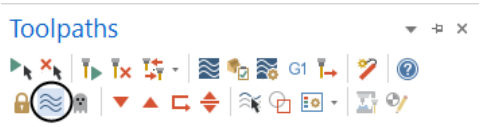
STEP 6: FINISH THE PART

The **Finish Toolpath** follows the contour of the chained geometry. Typically a finish toolpath follows a roughing toolpath.

Toolpath Preview:



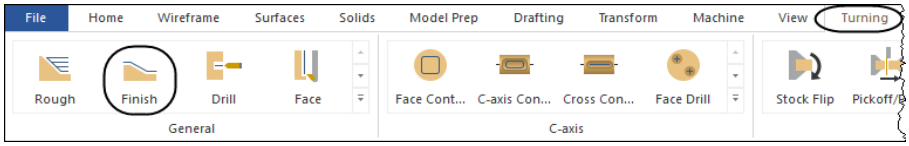
♦ Select **Toggle display** on **selected operations** to turn the toolpath display off.



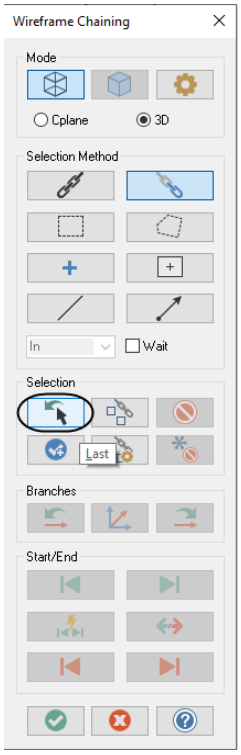
*Note: You can also use **Alt + T** to toggle the toolpath display on or off.*

Turning

- From the **General** group, select **Finish**.

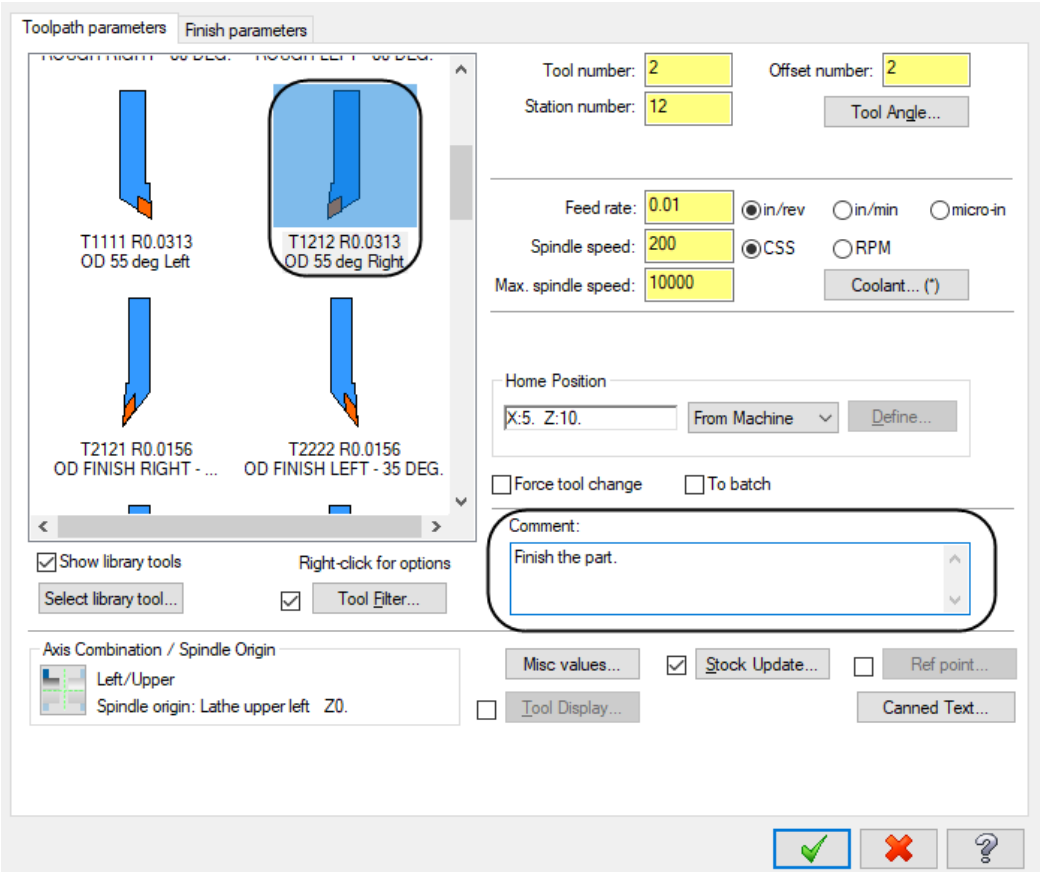


- Select the **Last** button in the **Chaining** dialog box as shown.



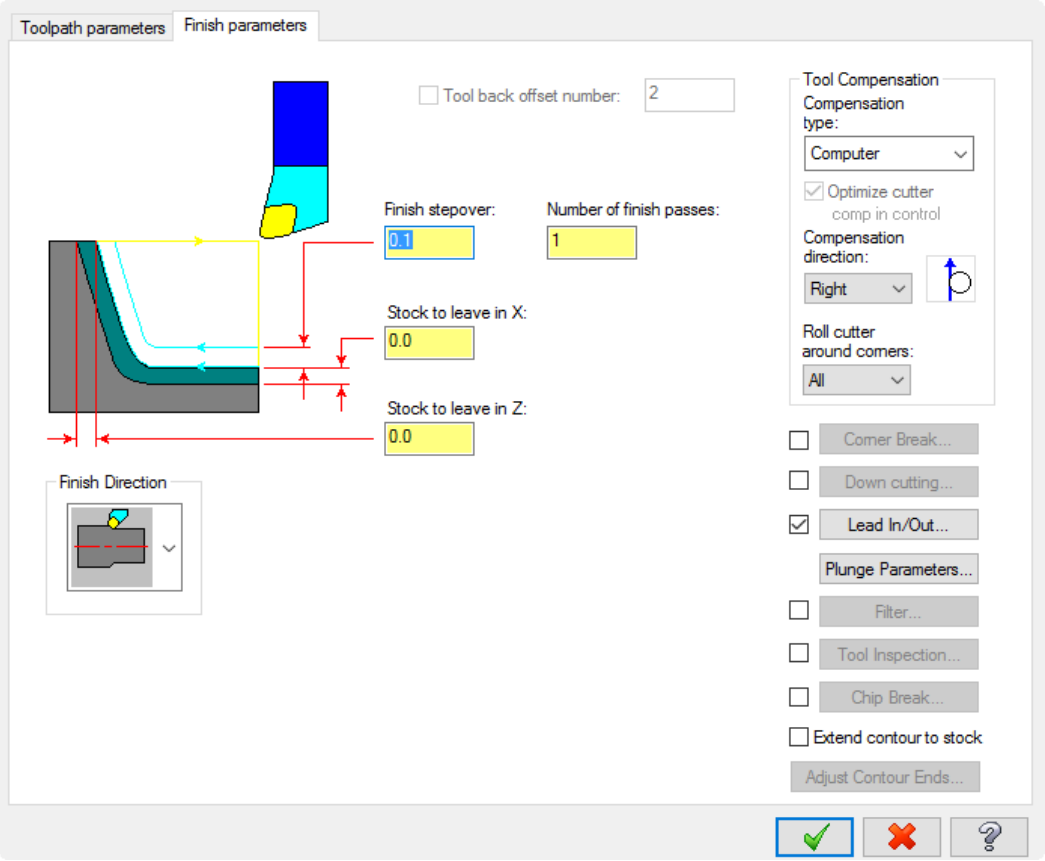
The Last button will automatically select the last chain that we used in the roughing toolpath.

- Select the **OK** button to exit the **Chaining** dialog box. 
- Select the **OD 55 Degree Right** tool from the tool list and enter the comment as shown.

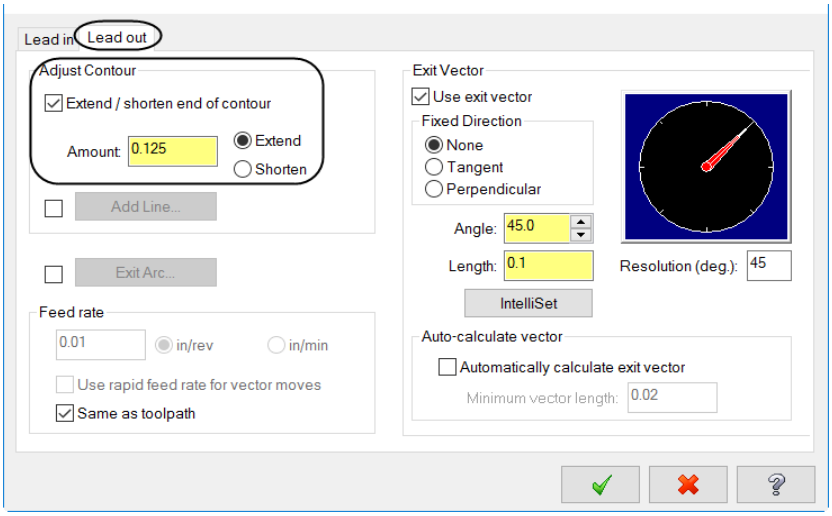


*Note: The **Feed rate** and **Spindle speed** are based on the **Mastercam Tool Definition**.*

♦ Select the **Finish parameters** tab and make sure the parameters match the screenshot below.



♦ Select the **Lead In/Out** button, choose the **Lead out** tab, and extend the end of the contour by **0.125**.



♦ Select the **OK** button to exit the **Lead In/Out** dialog box.

♦ Select the **OK** button to exit the **Lathe Finish** dialog box.

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