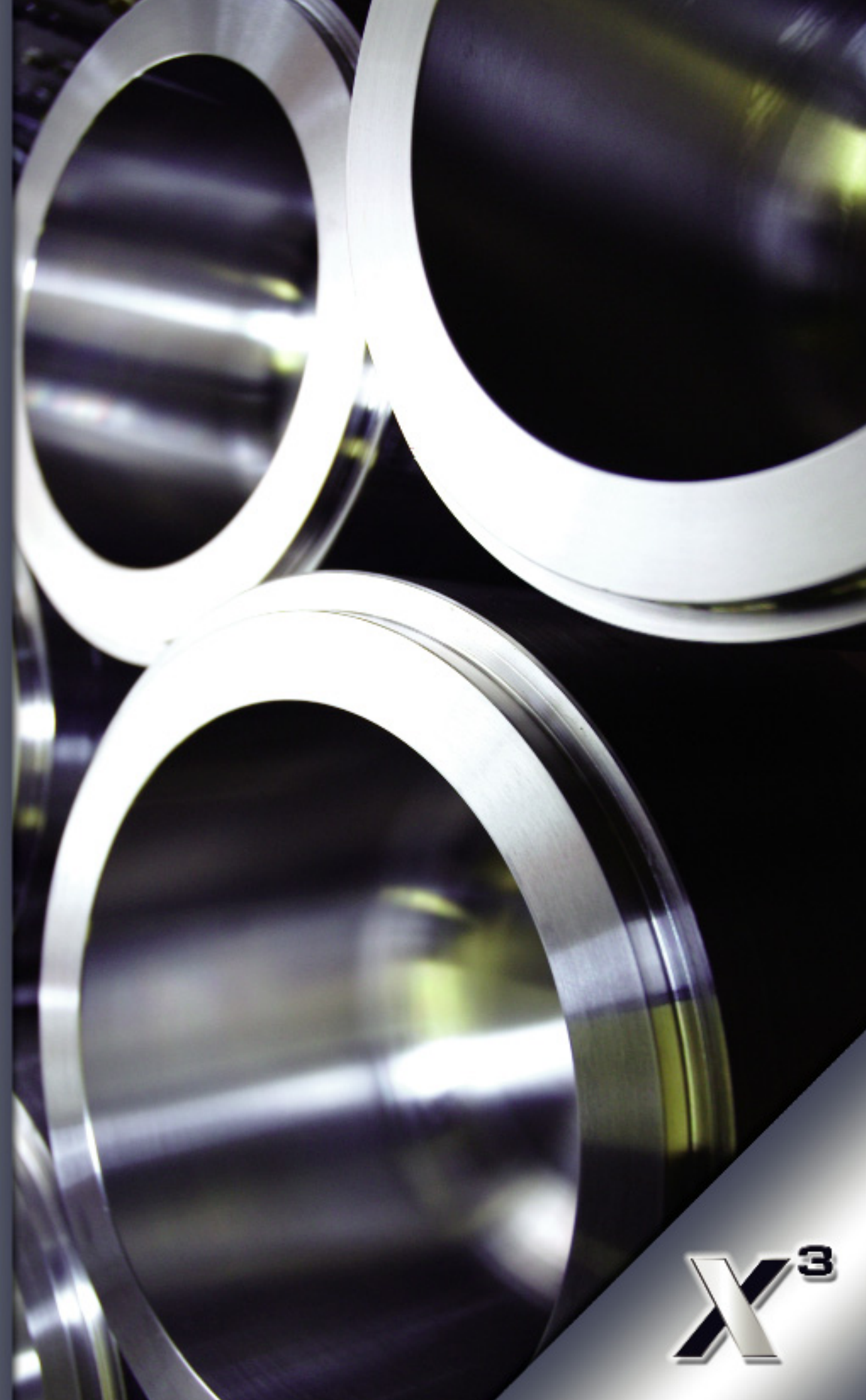


***Mastercam***<sup>®</sup>

**Lathe  
Training Tutorial**

**X<sup>3</sup>**



***Mastercam***® **X<sup>3</sup>**

**Lathe Training Tutorials**

To order more books:  
Call 1-800-529-5517 or  
Visit [www.inhousesolutions.com](http://www.inhousesolutions.com) or  
Contact your Mastercam Dealer

---

# TABLE OF CONTENTS

<b>Getting Started</b>	<b>A-1</b>
Graphic User Interface .....	A-1
Navigate Through Mastercam .....	A- 2
Setting the Toolbar States .....	A- 4
Setting the Grid .....	A- 5
Setting the Construction And The Tool Plane .....	A- 6
<b>Tutorials</b>	
Tutorial #1, 2D Geometry, Face, Rough and Finish .....	1-1
Tutorial #2, 2D Geometry, Face, Rough, Finish, Grooving and Drilling .....	2-1
Tutorial #3, 2D Geometry, Quick Rough and Finish; Inside Rough and Finish; Cutoff .....	3-1
Tutorial #4, 2D Geometry, Rough and Finish Canned; Cycles; Grooving-Plunge Rough .....	4-1
Tutorial #5, 2D Geometry, Face, Rough, Finish and Threading, Flip the Stock .....	5-1
Tutorial #6, 2D Geometry, Facing, Center Drilling, Stock Advanced, Roughing, Finishing, Grooving – 1 Point, Cut off .....	6-1
Tutorial #7, 3D Geometry, Face, Rough and Finish; Face Contour; Cross Contour; C-Axis Contour; Face Drill; Cross Drill; Cut off .....	7-1
<b>General Notes</b>	<b>B-1</b>
Default Key Assignments .....	B- 2
Customizing Toolbars .....	B- 3
Customizing Drop Down/Right Mouse Button Menu .....	B- 4
Key Mapping .....	B- 6
Data Entry Shortcuts .....	B- 8
Creating Geometry In 3D.....	B- 9
Lead In/Out Parameters .....	B- 12
Cutter Compensation .....	B- 13
Chaining.....	B- 14
Toolpath Manager.....	B- 18
About Right–Mouse Click In Toolpaths Manager Area .....	B- 21
<b>Creating Lathe Tool Library</b>	<b>C-1</b>
Creating New Tool .....	C- 1
<b>Edit a Lathe Tool Library</b>	<b>D-1</b>
Edit Tool.....	D- 1
<b>Lathe Tutorial Quiz Answers</b>	<b>E-1</b>
Quiz Answers .....	E- 1
<b>Index</b>	

# TUTORIAL SERIES FOR

*Mastercam X<sup>3</sup>*

## HOW TO USE THIS BOOK


This book provides a comprehensive step by step approach to learning Mastercam Lathe. It contains pages of projects, helpful hints, as well as tool and material library instructions. The book covers seven part projects in all and an additional 14 exercises.

The tutorials start with 2D geometry creating for lathe projects and dive into Mastercam Lathe toolpaths such as, face, rough, finish, drilling, inside boring, cutoff and threads. The book also covers canned cycles for rough and finish.

These tutorials include a C-Axis tutorial which deals with 3D geometry creation and C-Axis toolpaths such as face, cross contouring, C-Axis drilling and C-Axis contouring.

This is an intuitive, hands-on training manual with sample screen shots as well as tool parameters, face parameters, rough parameters, finish parameters and much more. This is a very important resource for Mastercam Lathe training.

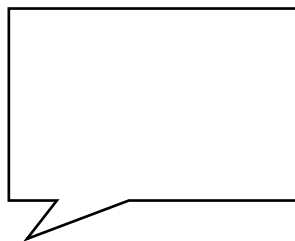
### LEGEND:

 Step to follow to complete the tutorial

 Additional explanation for the current step



Callouts that give direction on how to complete the task



Callouts that describe the parameters used in the current step

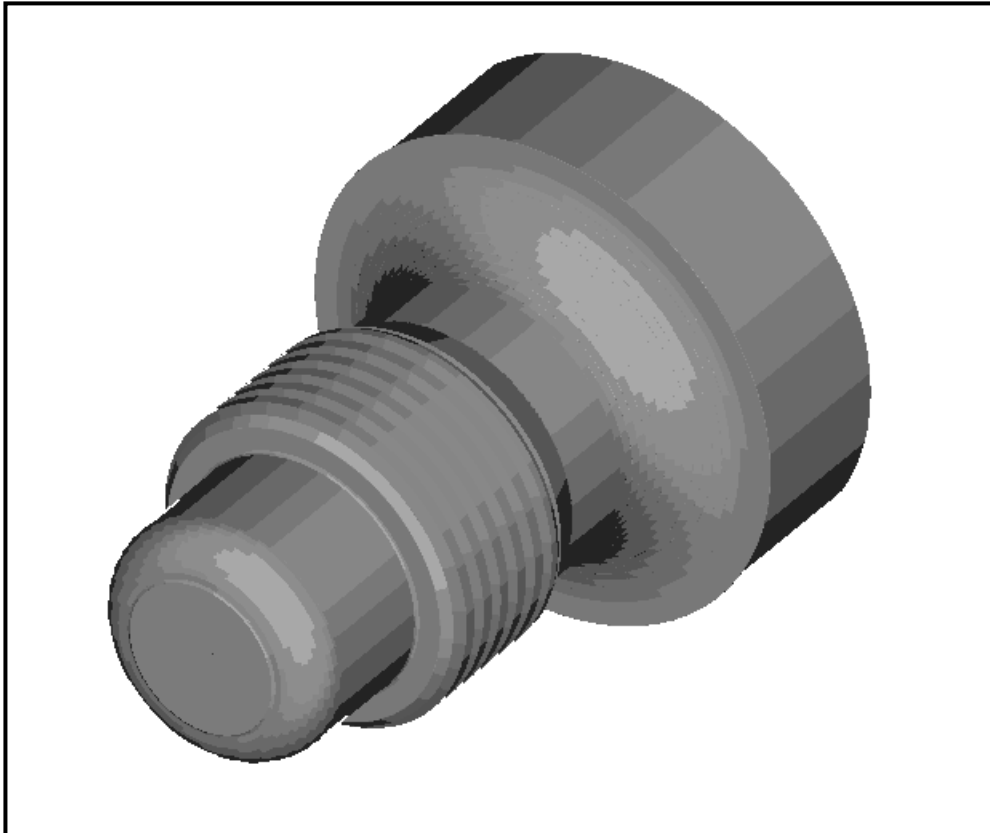
**Bold** text (usually) represents Mastercam terminology

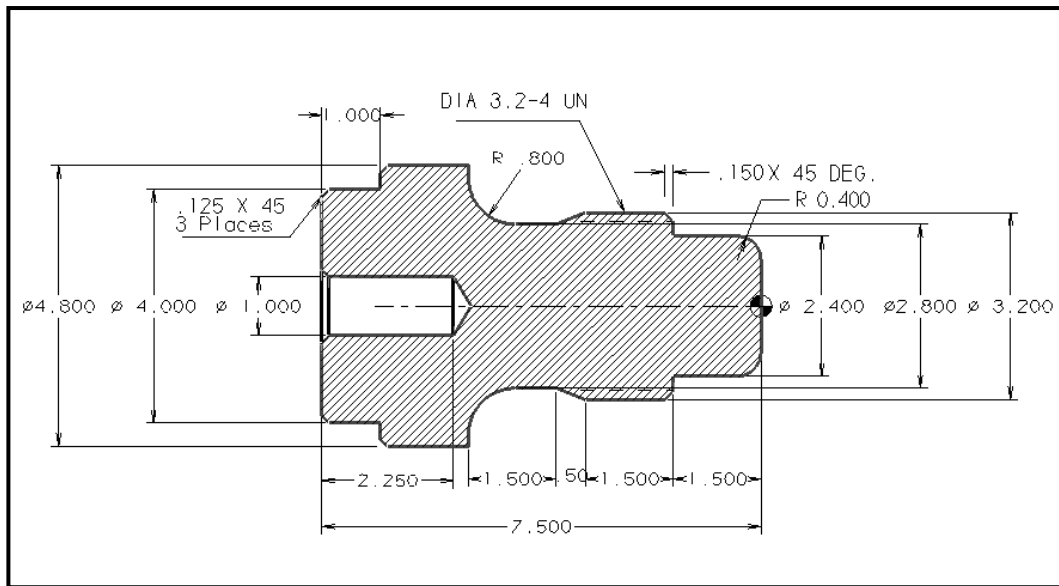
## TUTORIAL SERIES FOR

*Mastercam X<sup>3</sup>*

### TUTORIAL #5

LATHE - 2D GEOMETRY; FACE, ROUGH, FINISH & THREADING THE  
RIGHT SIDE GEOMETRY; FLIP THE STOCK;  
FACE, ROUGH, FINISH & DRILLING THE LEFT SIDE GEOMETRY





### Objectives:

#### To design a 2-dimensional drawing by:

- Creating lines using polar positioning.
- Creating lines using parallel command.
- Modifying the geometry using trim command.
- Modifying the geometry using fillet command.
- Creating a chamfer.

#### To establish Job Setup settings:

- Stock size.
- Chuck size and location.
- Tool offsets.
- Tool clearance.
- Material of the part.
- Feed calculation.

#### To create a 2-dimensional Lathe toolpath consisting of:

- Face cutting the right side of the part.
- Rough machining the right side of the part.
- Finish machining the right side of the part.
- Threading the part.
- Stock flip
- Face cutting the left side of the part.
- Rough machining the left side of the part.
- Finish machining the left side of the part.
- Drill the hole

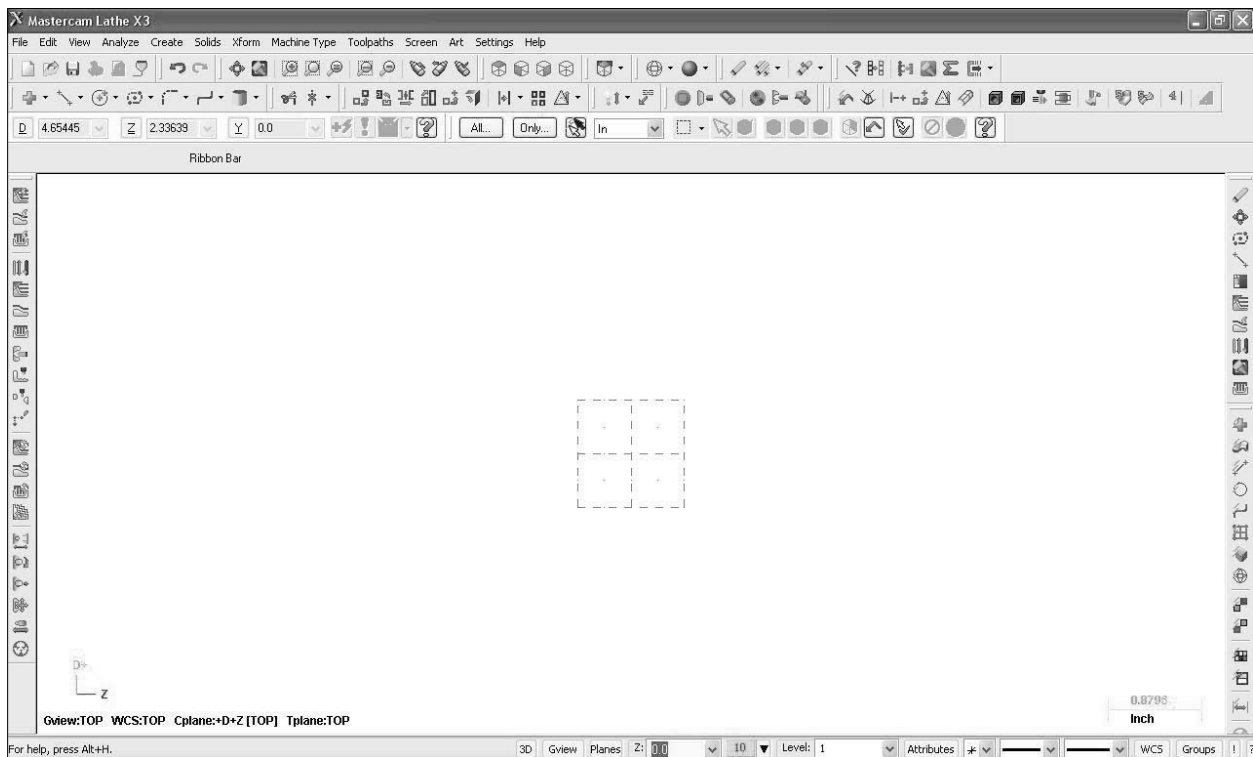
#### To check the toolpath using Mastercam's Verify verification module by:

- Running the Verify function to machine the part on the screen.
- Generate the NC- code:
- Running the post processor.

## GEOMETRY CREATION

### Setting the toolbar states

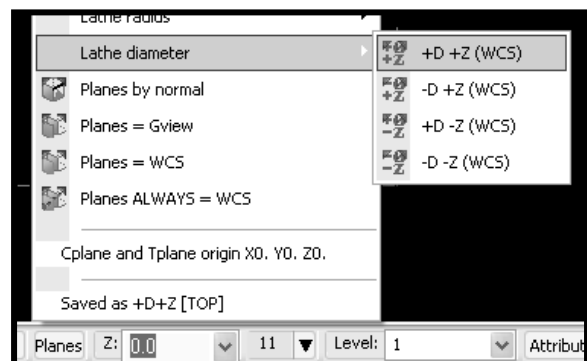
- Before starting the geometry creation we should customize the toolbars to see **Setting the Toolbar States** to create the geometry and machine a 2D part. on page A-4 in the **User Notes**.
- Make sure that the **Grid** is enabled. It will show you at each moment where the part origin is. See **Setting the Grid** on page A-5
- **Operations Manager** to the left of the screen can be hidden to gain more space in the graphic area for design. Press **Alt + O** to remove it.



- Due to the fact that this drawing is symmetrical in the **Z**-axis, you will only draw 1/2 of the total part.

### Change the Cplane to +D +Z

- See **Setting the Construction and Tool Plane to DZ** on page A-6 in the user notes.
- Select **Planes** from the Status Bar
- Select **Lathe Diameter +D +Z**




**STEP 1: LINES KNOWING ENDPOINTS**

**Create**

➤ **Line**

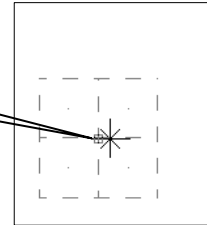
➤ **Endpoint** 


➤ Enter the line **Length**  **1.2** (Tab)

➤ Enter the **Angle** in degrees  **90** (Enter)

➤ [Specify the first endpoint]: Select the **Origin** as shown to the right.


Select the Origin



◆ Note that the color of the geometry is cyan. This means that the entity is “alive” and you can still change the line parameters. To exit the command you can either start a new command or select the **OK** button. 


➤ Select **Apply** button to continue. 

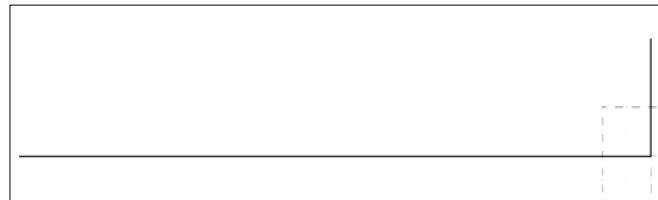
➤ Enter the line **Length**  **6.5** (Tab)



➤ Enter the **Angle** in degrees  **180** (Enter)

➤ [Specify the first endpoint]: Select the **Origin**.

➤ Select the **OK** button to exit the command. 

➤ Use **Fit** icon to fit the drawing to the screen. 



◆ During the geometry creation of this tutorial, if you make a mistake, to undo the last step please use **Undo** icon. You can undo as many steps as needed.  If you delete or undo a step by mistake, please use **Redo** icon. 

**STEP 2: CREATE PARALLEL LINES**

**Create**

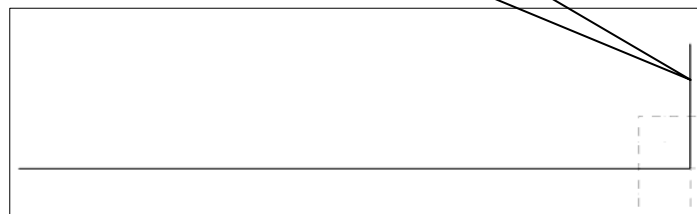
➤ **Line**

➤ **Parallel** 















➤ [Select a line]: Select **Entity 1**

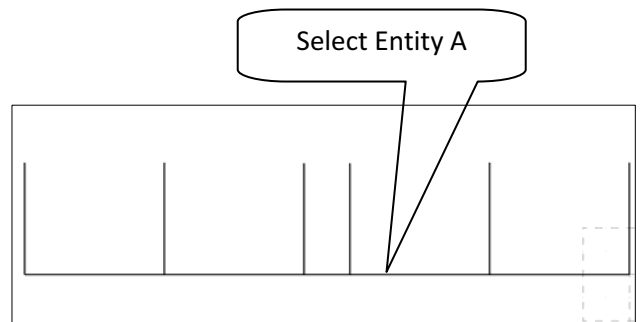
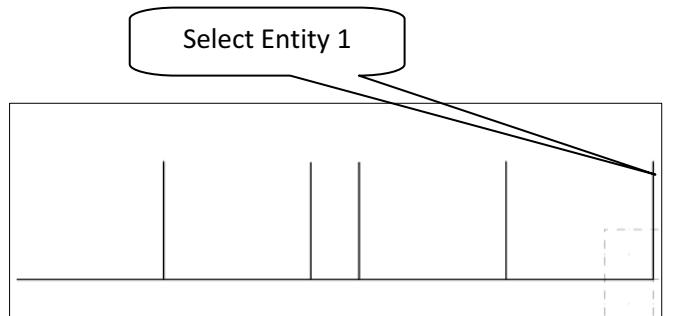
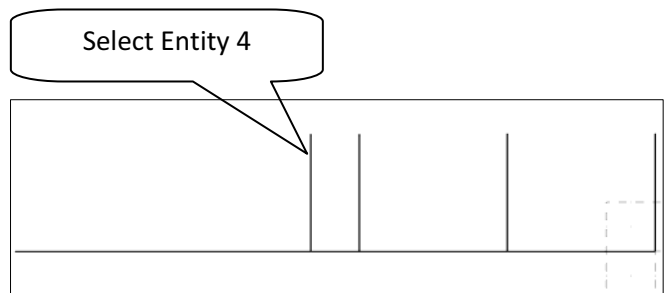
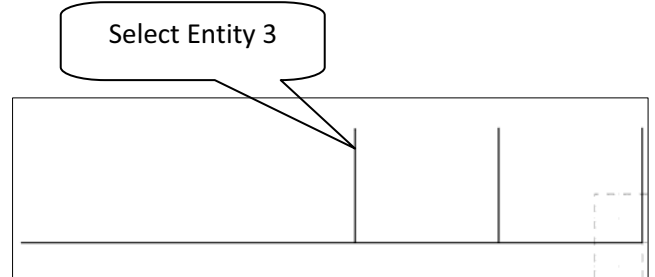
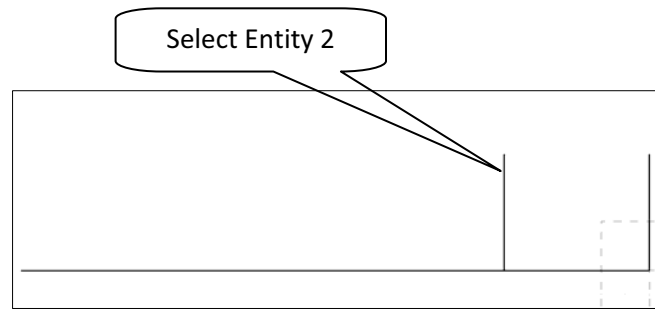
➤ [Indicate the offset direction]: Pick a point to the left of the selected line.





Select Entity 1



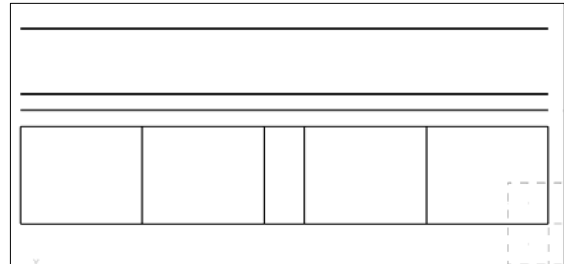


- Enter the **Distance**  **1.5** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity 2**
- [Indicate the offset direction]: Pick a point to the left of the selected line.
- Enter the **Distance**  **1.5** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity 3**
- [Indicate the offset direction]: Pick a point to the left of the selected line.
- Enter the **Distance**  **0.5** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity 4**
- [Indicate the offset direction]: Pick a point to the left of the selected line.
- Enter the **Distance**  **1.5** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity 1**
- [Indicate the offset direction]: Pick a point to the left of the selected line.
- Enter the **Distance**  **6.5** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity A**
- [Indicate the offset direction]: Pick a point above the selected line.
- Enter the **Distance**  **2.4/2** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity A**
- [Indicate the offset direction]: Pick a point above the selected line.
- Enter the **Distance**  **3.2/2** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity A**



- [Indicate the offset direction]: Pick a point above the selected line.
- Enter the **Distance**  **2.8/2** (Enter)
- Select **Apply** button to continue. 
- [Select a line]: Select **Entity A**
- [Indicate the offset direction]: Pick a point above the selected line.
- Enter the **Distance**  **4.8/2** (Enter)
- Select the **OK** button to exit the command. 

The geometry should look as shown to the right.



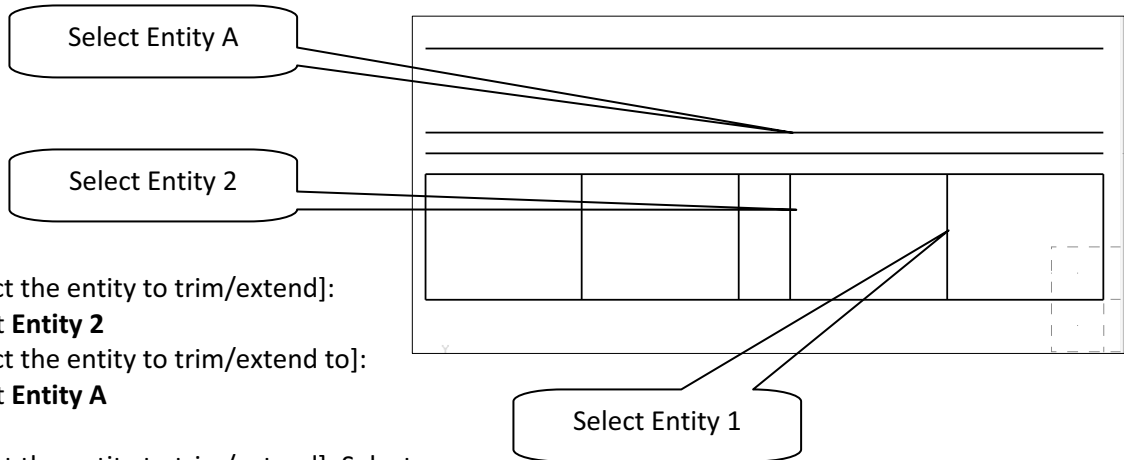
**STEP 3: TRIMMING 1 ENTITY.**

**Edit**

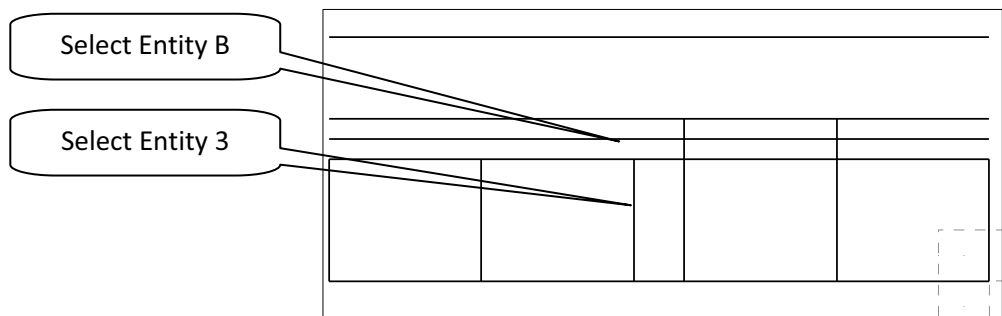
➤ **Trim/Break**

➤ **Trim/Break.Extend** 

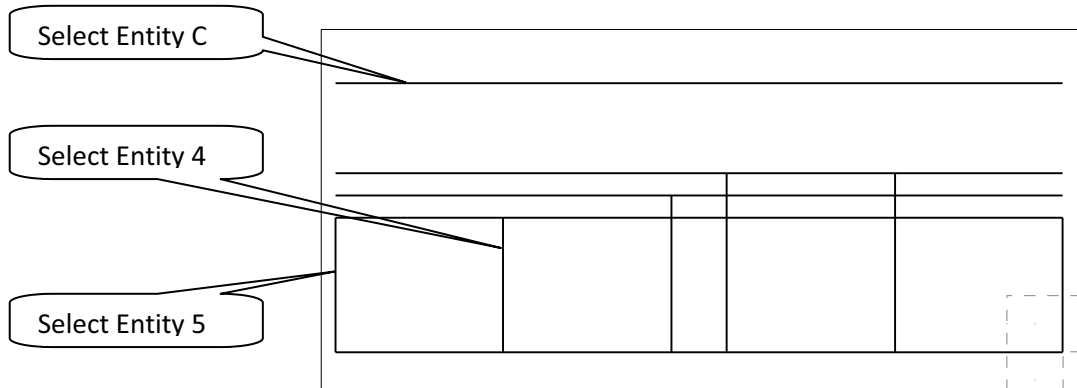
- Select **Trim 1 Entity** 
- [Select the entity to trim/extend]: Select **Entity 1**
- [Select the entity to trim/extend to]: Select **Entity A**



- [Select the entity to trim/extend]:  
Select **Entity 2**
- [Select the entity to trim/extend to]:  
Select **Entity A**
- [Select the entity to trim/extend]: Select  
**Entity 3**
- [Select the entity to trim/extend to]: Select **Entity B**








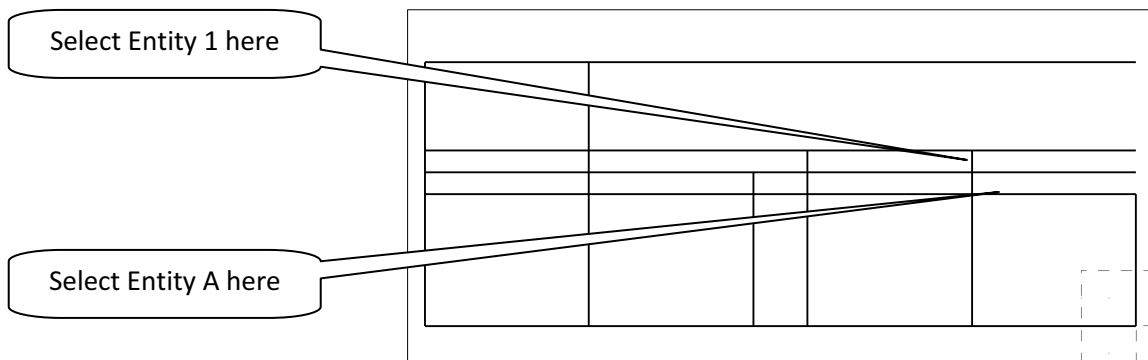
- [Select the entity to trim/extend]: Select **Entity 4**
- [Select the entity to trim/extend to]: Select **Entity C**




- [Select the entity to trim/extend]: Select **Entity 5**
- [Select the entity to trim/extend to]: Select **Entity C**

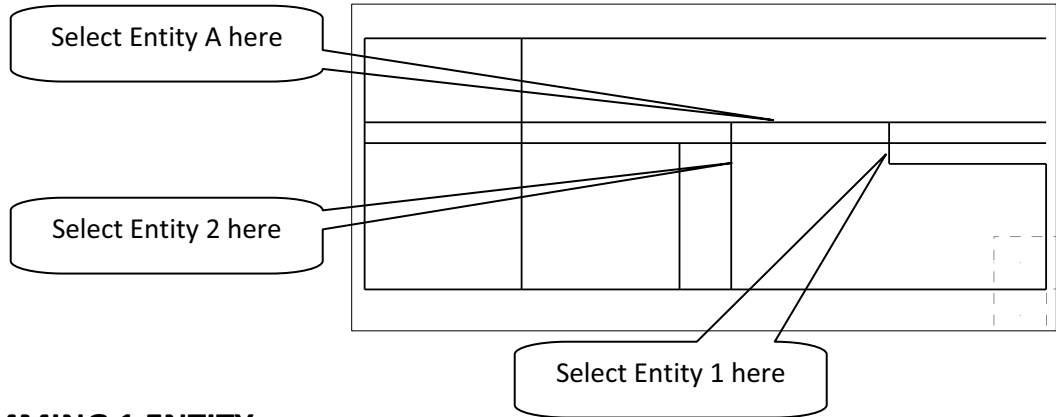
**STEP 4: TRIMMING 2 ENTITIES.**

- Select **Trim 2 Entities**     
- [Select the entity to trim/extend]: Select **Entity 1**
- [Select the entity to trim/extend to]: Select **Entity A**




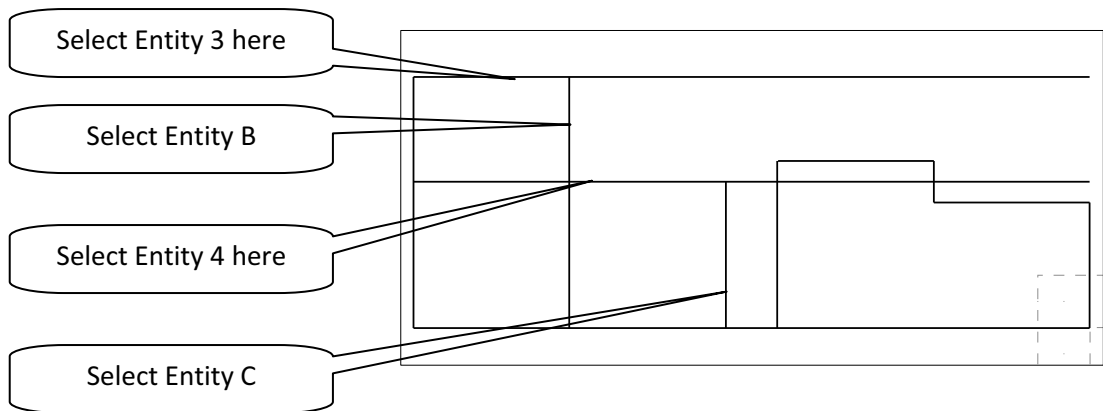
**STEP 5: TRIMMING 3 ENTITIES**


- Select **Trim 3 Entities** icon. 
- [Select the first entity to trim/extend]: Select **Entity 1**
- [Select the second entity to trim/extend]: Select **Entity 2**
- [Select the entity to trim/extend to]: Select **Entity A**



**STEP 6: TRIMMING 1 ENTITY**

- Select **Trim 1 Entity** 
- [Select the entity to trim/extend]: Select **Entity 3**
- [Select the entity to trim/extend to]: Select **Entity B**
- [Select the entity to trim/extend]: Select **Entity 4**
- [Select the entity to trim/extend to]: Select **Entity C**



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

**STEP 7: CREATE A LINE KNOWING THE TWO ENDPOINT COORDINATES**

**Create**

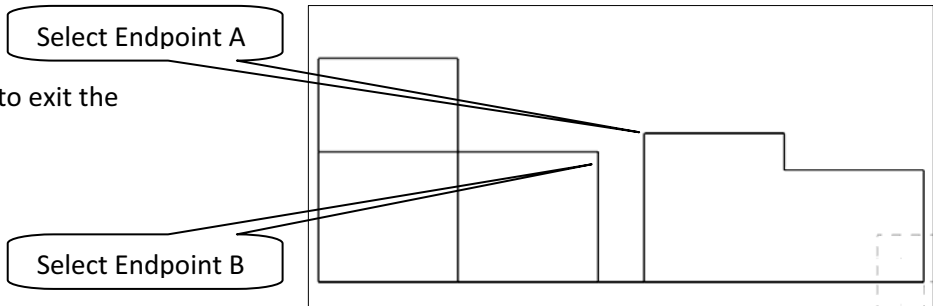
➤ **Line**



➤ **Endpoint**

- [Specify the first endpoint]: Select **Endpoint A**
- [Specify the second endpoint]: Select **Endpoint B**

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



**STEP 8: CREATE THE FILLETS AT THE CORNERS**

**Create**

➤ **Fillet**

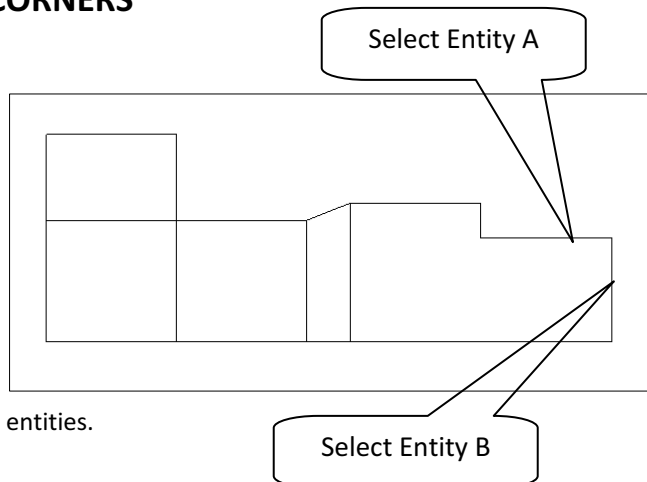


➤ **Entities**

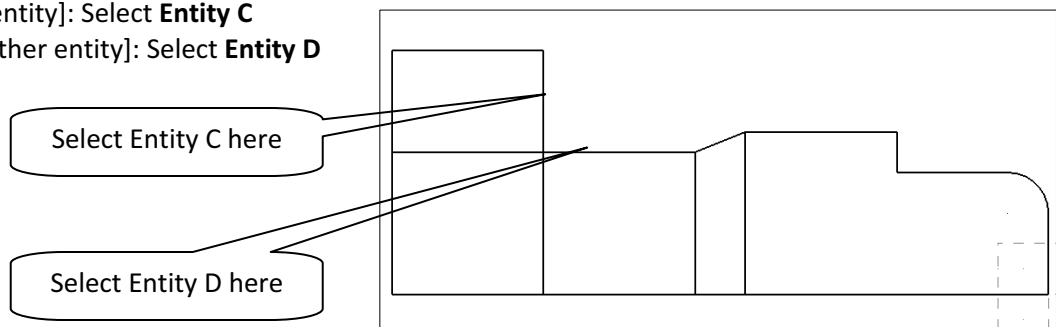
- Enter the fillet **Radius** **0.4**
- [Select an entity]: Select **Entity A**
- [Select another entity]: Select **Entity B**


➤ Note that a fillet option would be automatically drawn depending on where you move the cursor around the entities.

- Select the **Apply** button to continue.




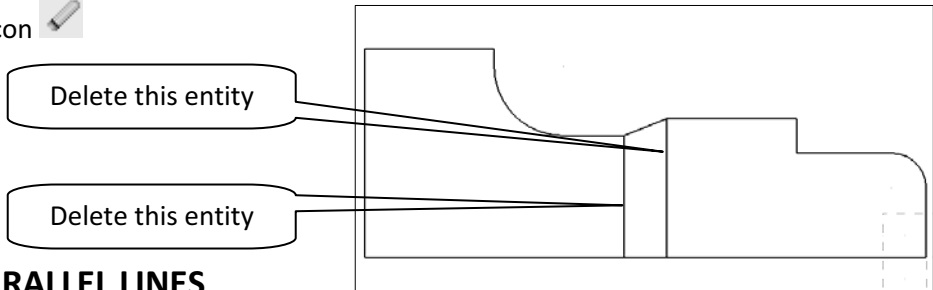
- Enter the fillet **Radius** **0.8**
- [Select an entity]: Select **Entity C**
- [Select another entity]: Select **Entity D**



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

**STEP 9: DELETE THE CONSTRUCTION LINES.**

- Select the lines as shown to the right.
- Select **Delete** entity icon 




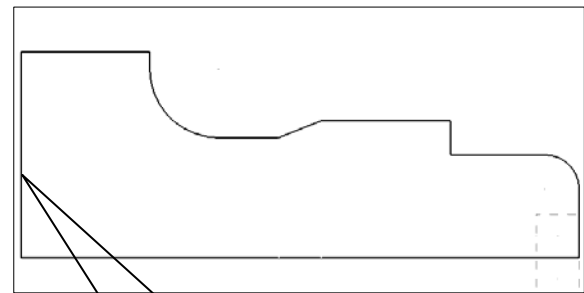
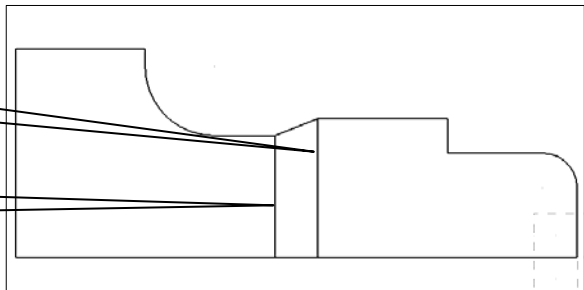
**STEP 10: CREATE PARALLEL LINES.**

**Create**



- **Line**


- **Parallel** 

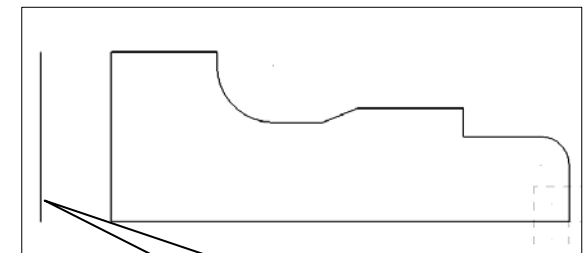
- [Select a line]: Select **Entity A**
- [Indicate the offset direction]: Pick a point to the left of the selected line.
- Enter the **Distance**  **1.0** (Enter)



Select Entity A


- Use **Fit** icon to fit the drawing to the screen. 
- Select **Apply** button to continue. 

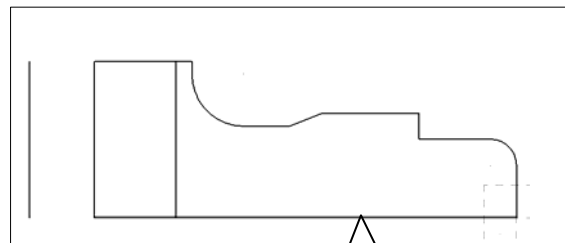
- [Select a line]: Select **Entity B**.
- [Indicate the offset direction]: Pick a point to the right of the selected line.
- Enter the **Distance**  **2.25** (Enter)



Select Entity B

- Select **Apply** button to continue. 



- [Select a line]: Select **Entity C**
- [Indicate the offset direction]: Pick a point above the selected line.
- Enter the **Distance**  **0.5** (Enter)



Select Entity C

- Select **Apply** button to continue. 

- [Select a line]: Select **Entity C**
- [Indicate the offset direction]: Pick a point above the selected line.






- Enter the **Distance**  **2.0** (Enter)
- Select the **OK** button to exit the command. 

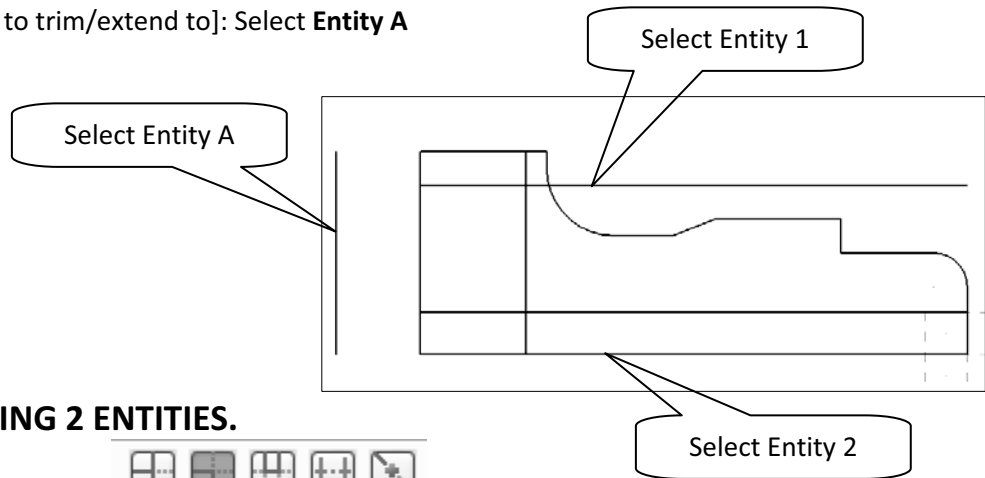
**STEP 11: TRIMMING 3 ENTITIES.**

**Edit**






➤ **Trim/Break**

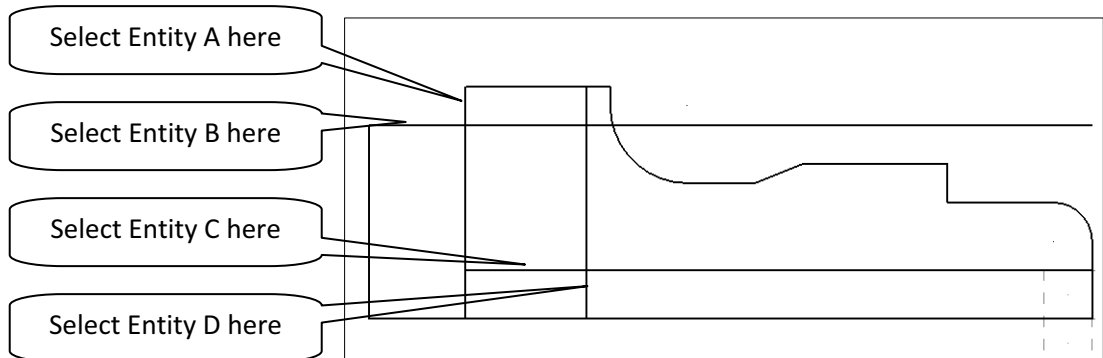
➤ **Trim/Break/Extend** 


- Select **Trim 3 Entities** icon.     
- [Select the first entity to trim/extend]: Select **Entity 1**
- [Select the second entity to trim/extend]: Select **Entity 2**
- [Select the entity to trim/extend to]: Select **Entity A**



**STEP 12: TRIMMING 2 ENTITIES.**

- Select **Trim 2 Entities** icon.     
- [Select the entity to trim/extend]: Select **Entity A**
- [Select the entity to trim/extend to]: Select **Entity B**




- [Select the entity to trim/extend]: Select **Entity C**
- [Select the entity to trim/extend to]: Select **Entity D**
- Select the **OK** button to exit the command. 

**STEP 13 CREATE THE 0.15 X 45 DEGREES CHAMFERS.**

**Create**

➤ **Chamfer**

➤ **Entities**

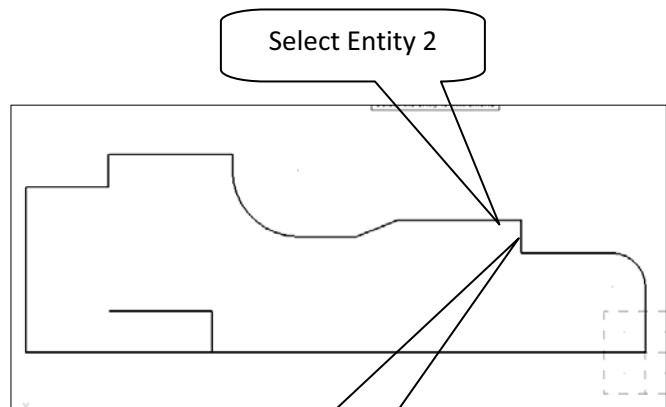
➤ Enter the **Distance 1** value  **0.15** (Enter)



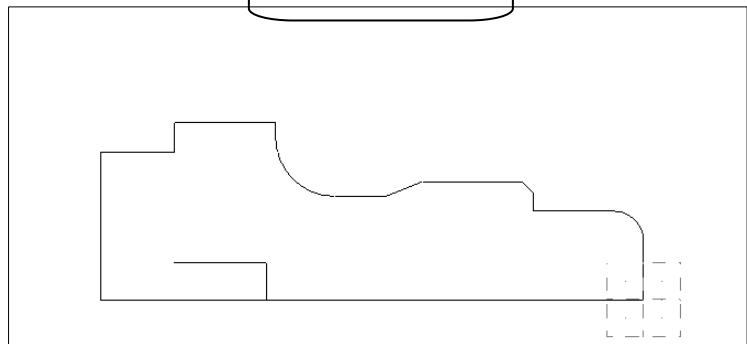
➤ Note that the default chamfer options in the **Ribbon bar** are set to: **1 Distance; Trim icon on.**

➤ [Select line or arc]: Select **Entity 1**

➤ [Select line or arc]: Select **Entity 2**




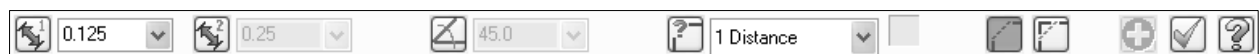
➤ Select **Apply** button to continue. 



*The geometry should look as shown to the right*

**STEP 14: CREATE THE 0.125 X 45 DEGREES CHAMFERS.**

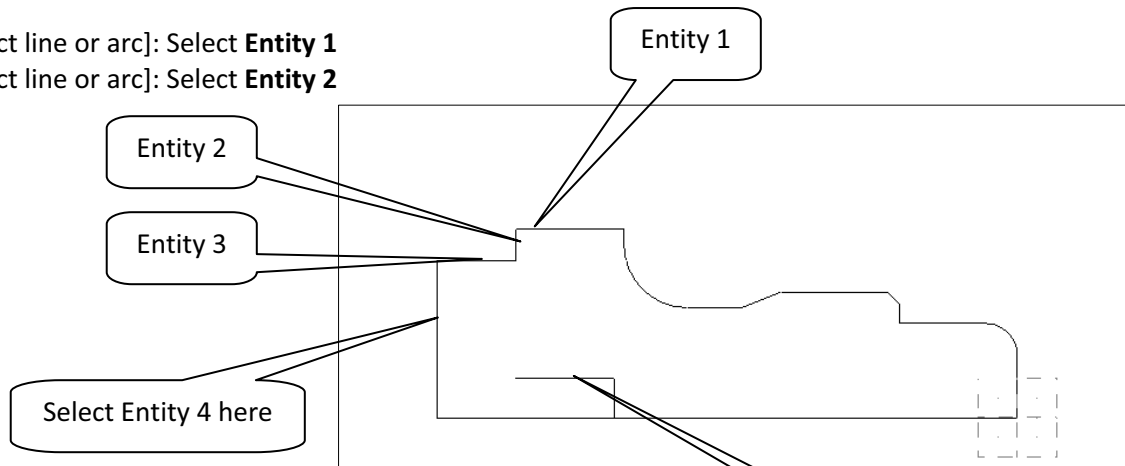
➤ Enter the **Distance 1** value  **0.125** (Enter)



➤ Note that the default chamfer options in the **Ribbon bar** are set to: **1 Distance; Trim icon on.**



- [Select line or arc]: Select **Entity 1**
- [Select line or arc]: Select **Entity 2**

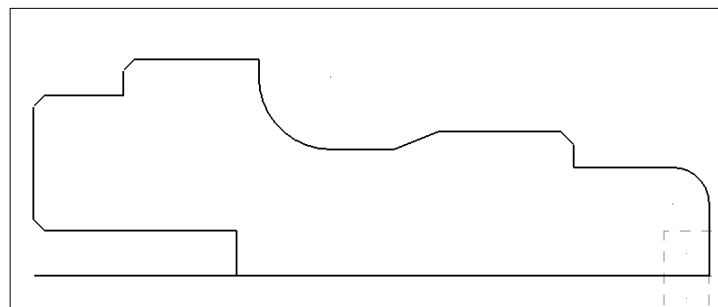


- [Select line or arc]: Select **Entity 3**
- [Select line or arc]: Select **Entity 4**

- [Select line or arc]: Select **Entity 4**
- [Select line or arc]: Select **Entity 5**

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

*The geometry should look as shown to the right.*



**STEP 15: CREATE A POLAR LINE.**

**Create**

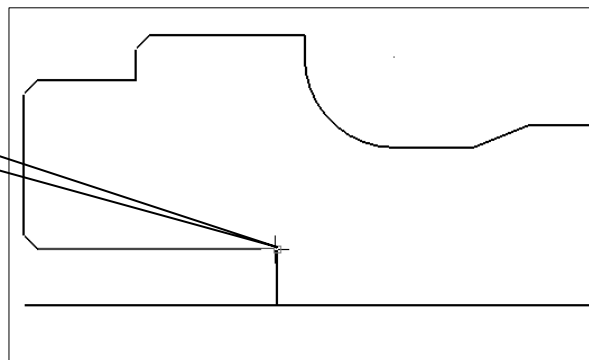
- **Line**



- **Endpoints**
- Enter the line **Length**  **1.0** (Tab)
- Enter the **Angle** in degrees  **-59** (Enter)
- [Specify the first endpoint]: Select **Endpoint A.**

Select Endpoint A

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



**STEP 16: TRIMMING 1 ENTITY.**

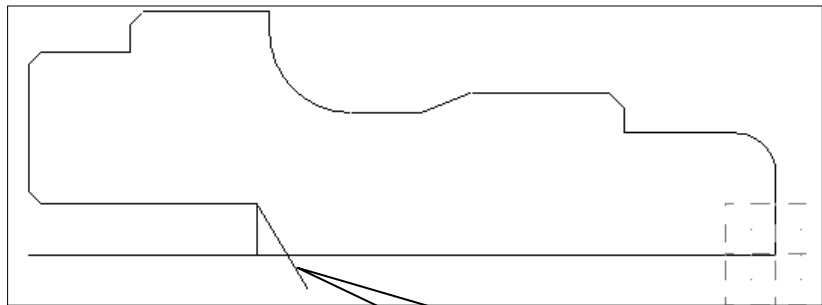
**Edit**


➤ Trim/Break

➤ Trim/Break/Extend 

➤ Select **Divide**     

➤ [Select the curve to divide]: Select **Entity A**

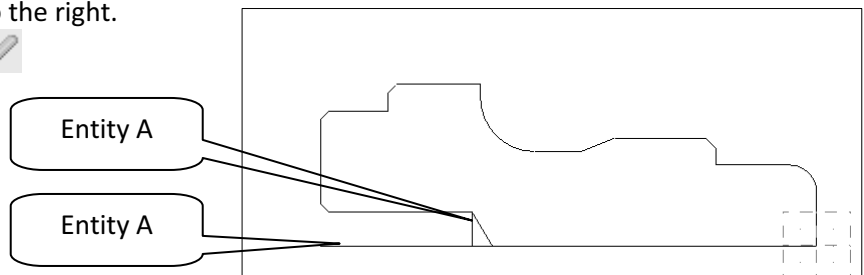


➤ Select the **OK** button to exit the command. 

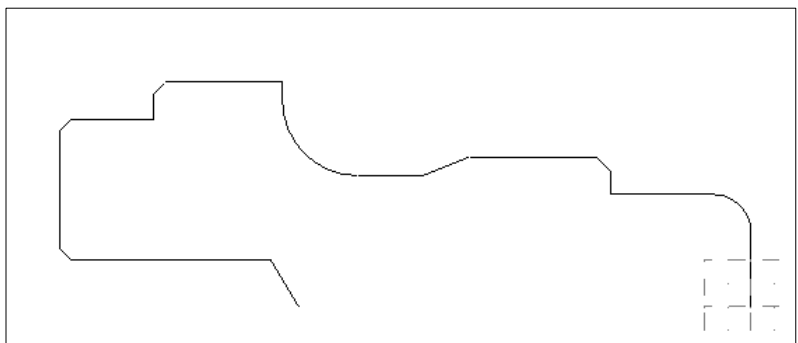
**STEP 17: DELETE THE CONSTRUCTION LINES.**

➤ Select the lines as shown to the right.

➤ Select **Delete** entity icon. 




*The final part will look like the following picture.*



◆ For machining purposes we did not need to draw the hole.

**STEP 18: SAVE THE FILE.**

**File**

- Save as
  - File name: "Your Name\_5"
  - Select Save icon. 

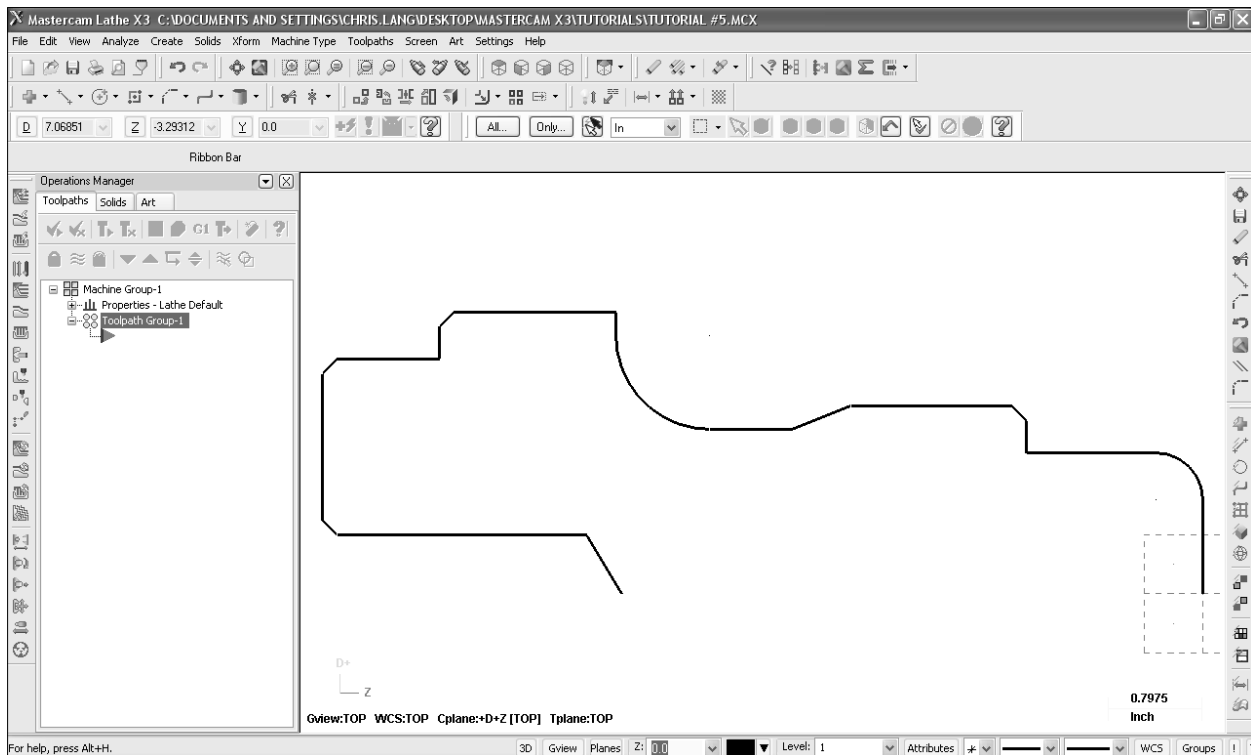
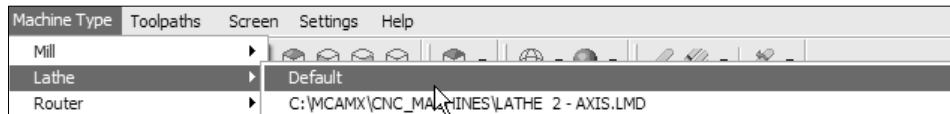
**TOOLPATH CREATION**

**STEP 19: SET UP THE STOCK TO BE MACHINED.**

- To display the Toolpaths Manager press **Alt + O**.

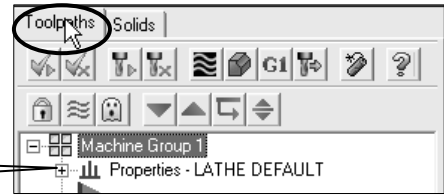
**Machine type**

- Select **Lathe**
- Select **Default**



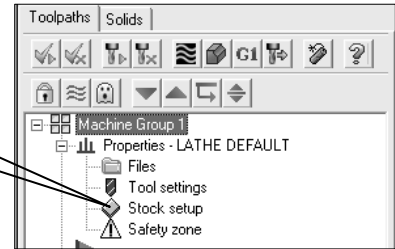
- Select the **Toolpaths Manager** tab to make it active.
- Select the plus in front of **Properties** to expand the **Toolpaths Group Properties**.

Select the Plus



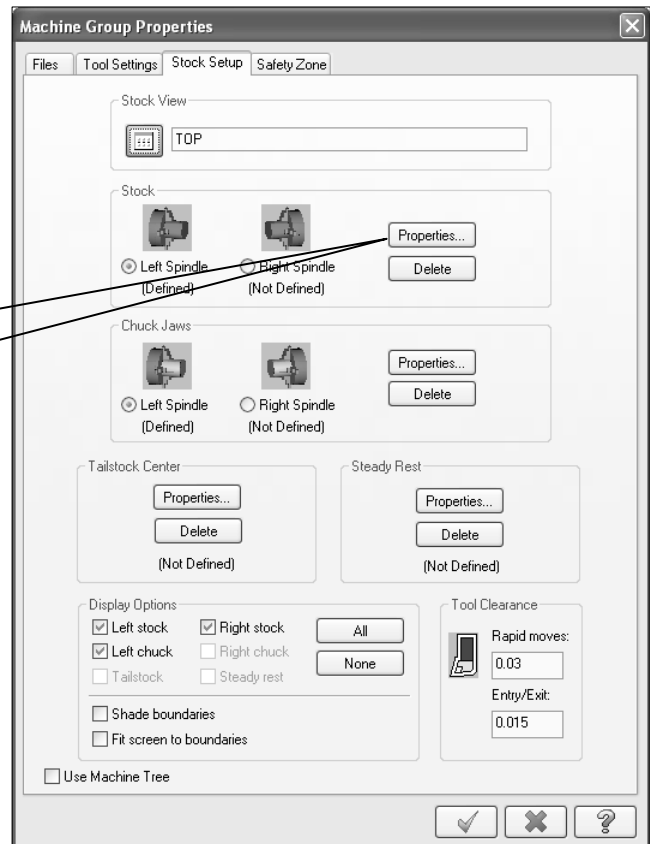
- Select **Stock setup**.

Select Stock Setup



- Change the parameters to match the following screenshot.
- In the **Stock Setup** dialog box you can setup the stock, the chuck, and if necessary a tailstock and a steady rest.

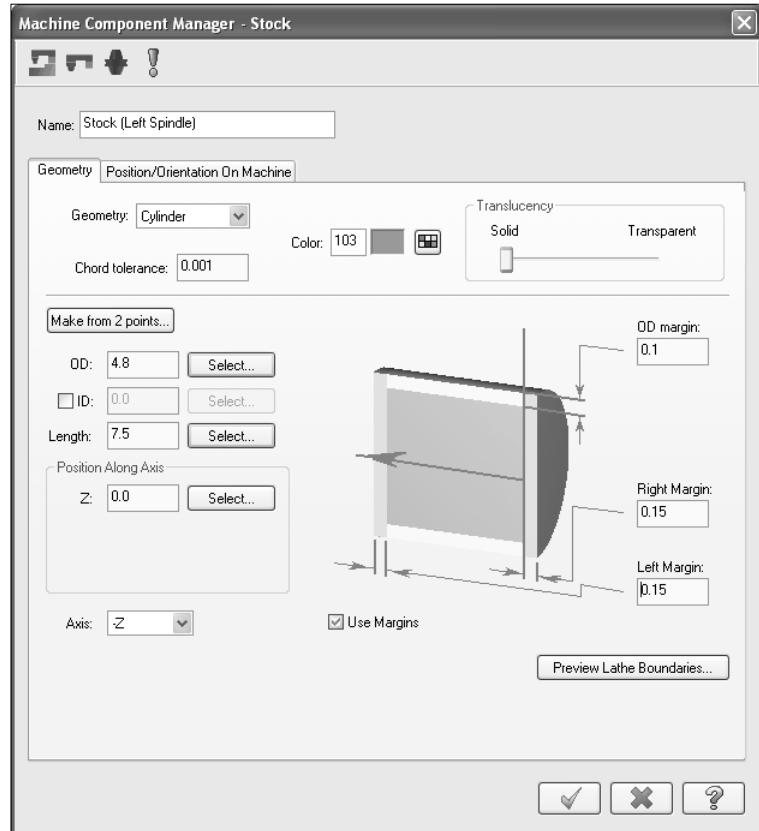
Select Properties button to define the Stock




- Select the **Parameters** button in the **Stock** area to establish to stock size and made the changes as shown.

- Enable **Use Margins** to be able to set the following parameters; extra stock to the OD, face and back of the stock. You can check the stock size by selecting the **Preview** button.

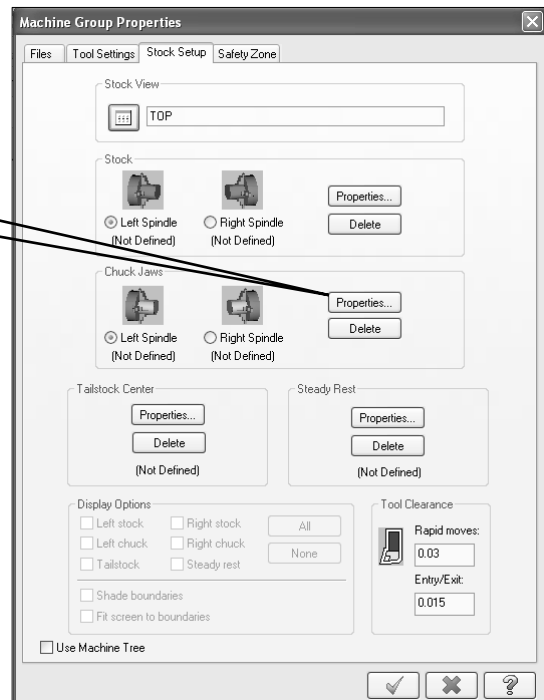
- To return from the graphic mode to the **Bar Stock** dialog box select press **Enter** to continue.



- Select the **OK** button to exit the **Bar Stock** dialog box. 

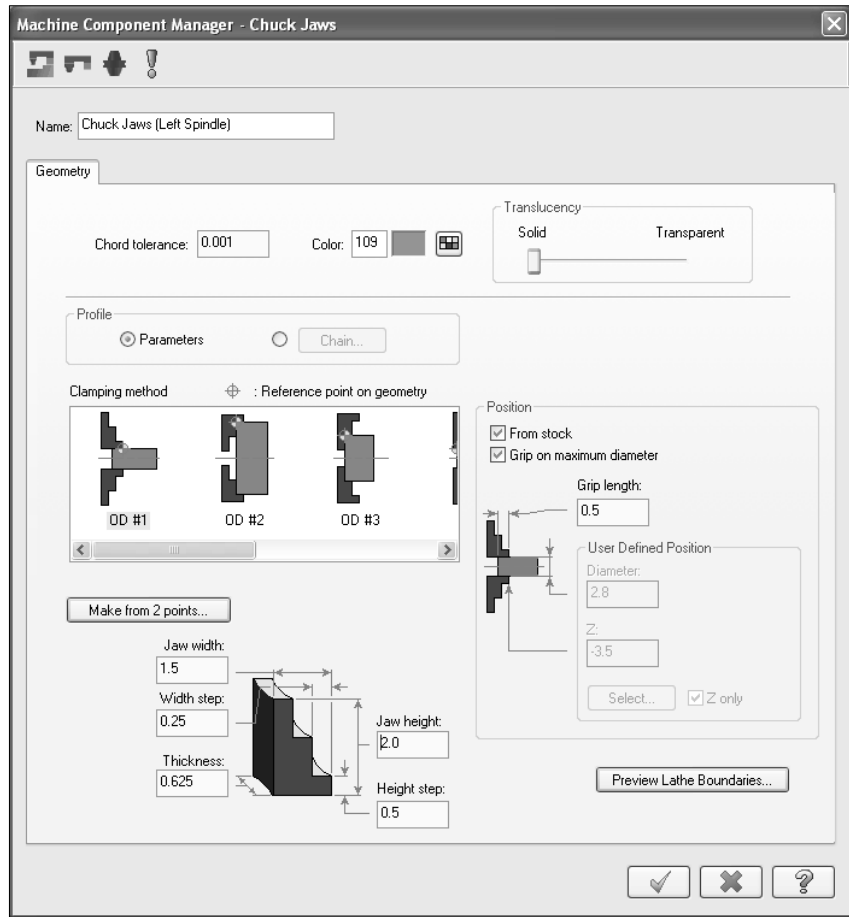
- Select the **Properties** button in the **Chuck** area.

Select the Properties button to define the chuck

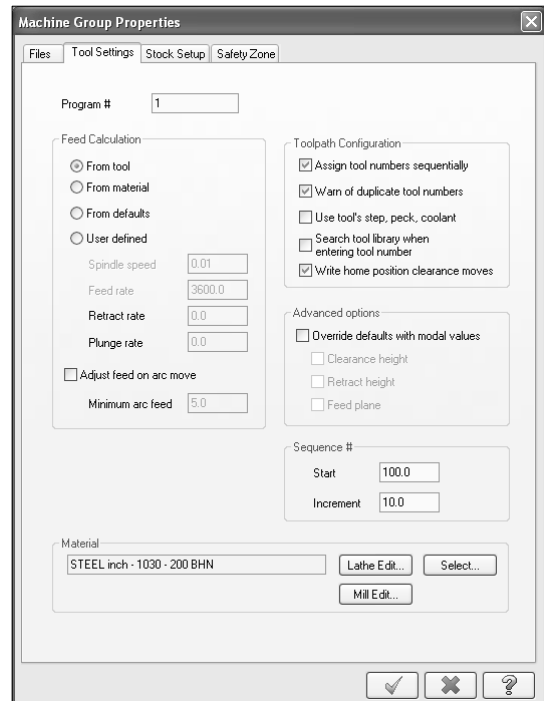


- Make the necessary changes to define the chuck size, clamping method and the stock position.

- Select the **OK** button to exit the **Machine Component Manager Chuck Jaws** dialog box.



- In the Tool Settings dialog box you can setup the Toolpath configuration, Feed calculations, etc.



**Lathe X<sup>3</sup>**

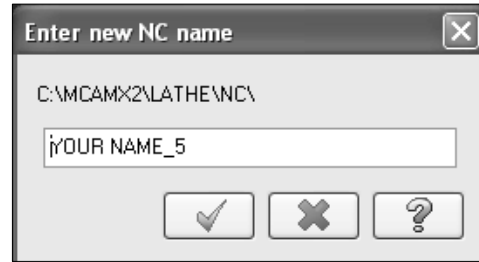
**STEP 20: FACE THE PART**

**Toolpaths**

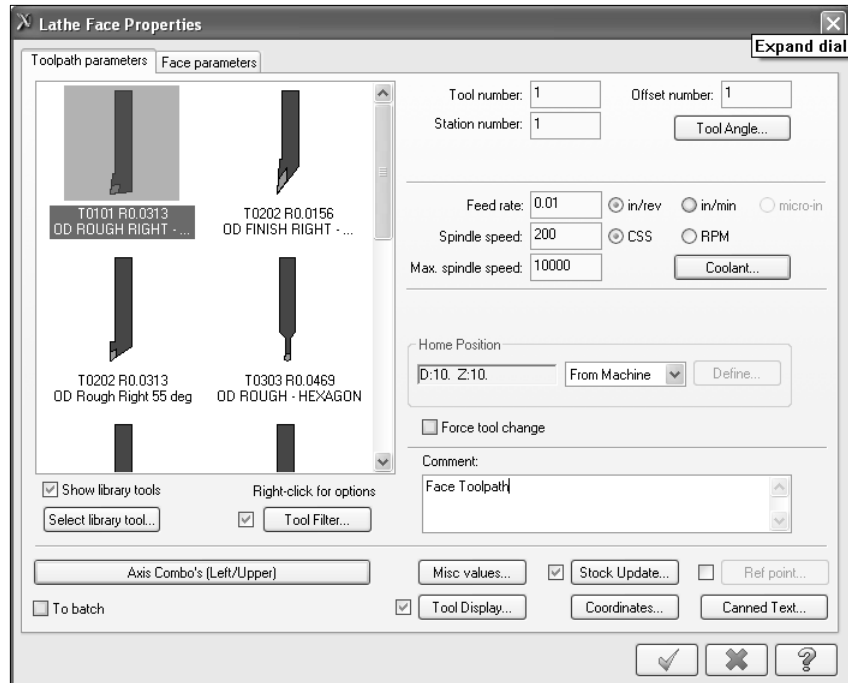


**Face**

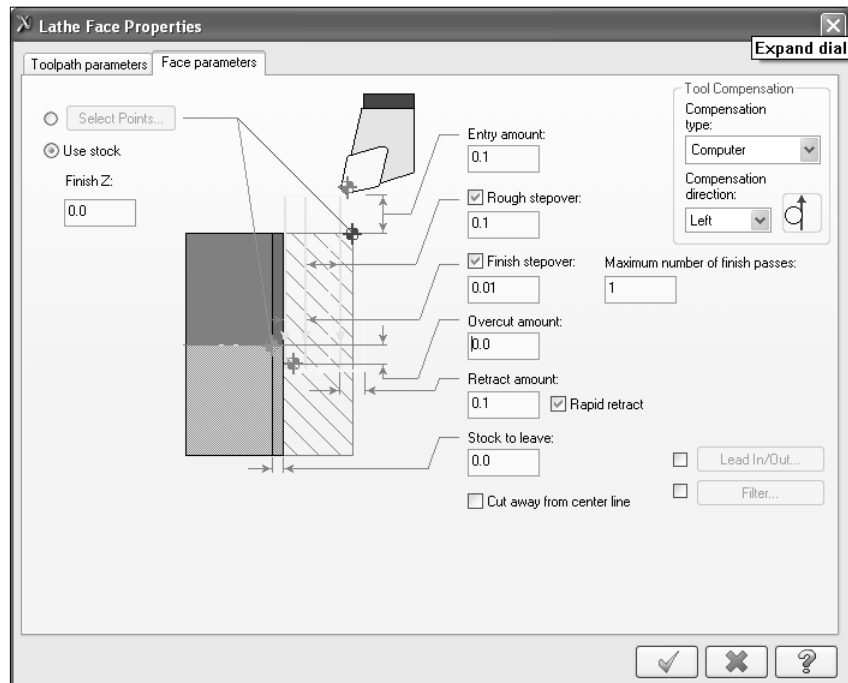
- Select **OK** to accept NC name
- Select the **OD Rough Right -80deg** cutter from the tool list.



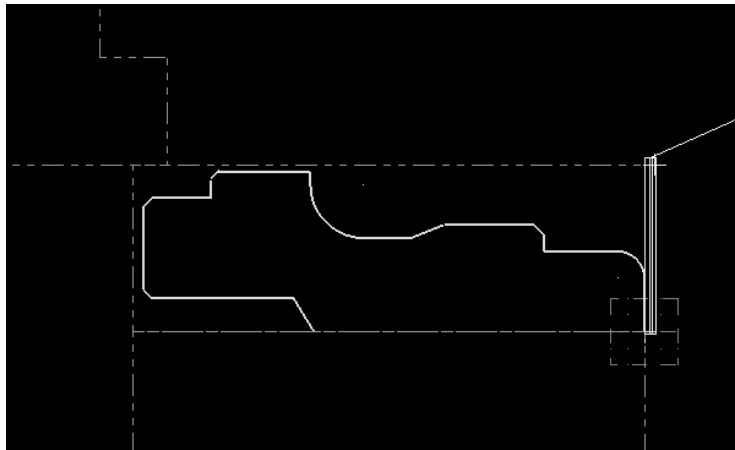
➤ The **Feed rate** and the **Spindle speed** are based on **Mastercam Tool** definition. Change them as desired.



➤ Select the **Face parameters** page and make all the necessary changes as shown in the following screenshot.



- Select the **OK** button to exit **Lathe Face** parameters.



**STEP 21: ROUGH THE PART.**

**Toolpaths**

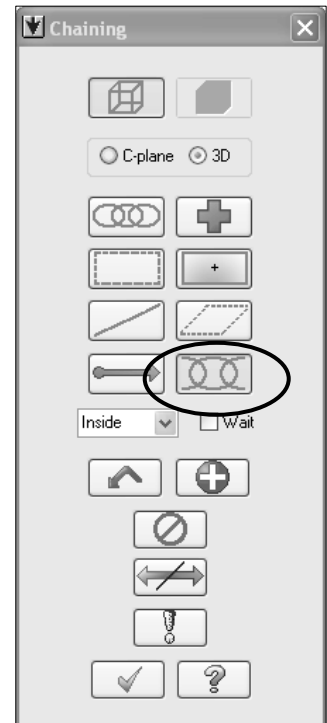
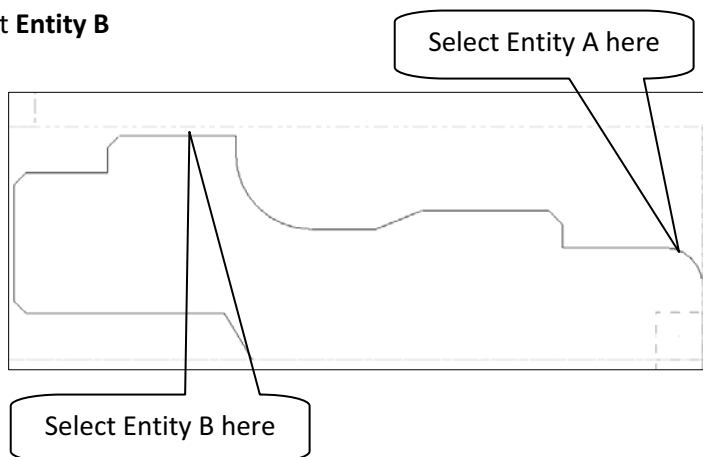
- **Rough**

- ◆ Chaining mode is **Partial** by default. You have to select the first entity and the last entity of the contour.

- Select **Entity A**

- ◆ Make sure that the chaining direction is **CCW**, otherwise select the **Reverse** button from **Chaining** dialog box.

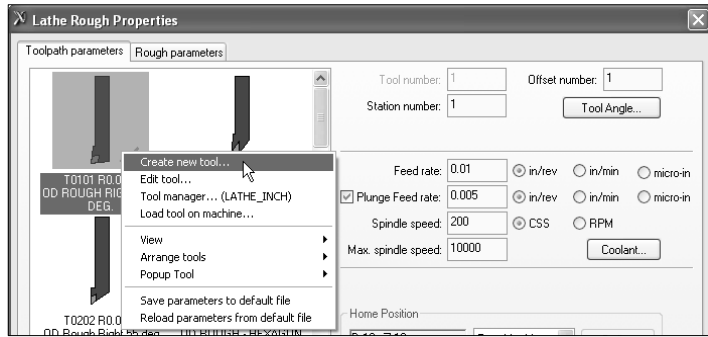
- Select **Entity B**



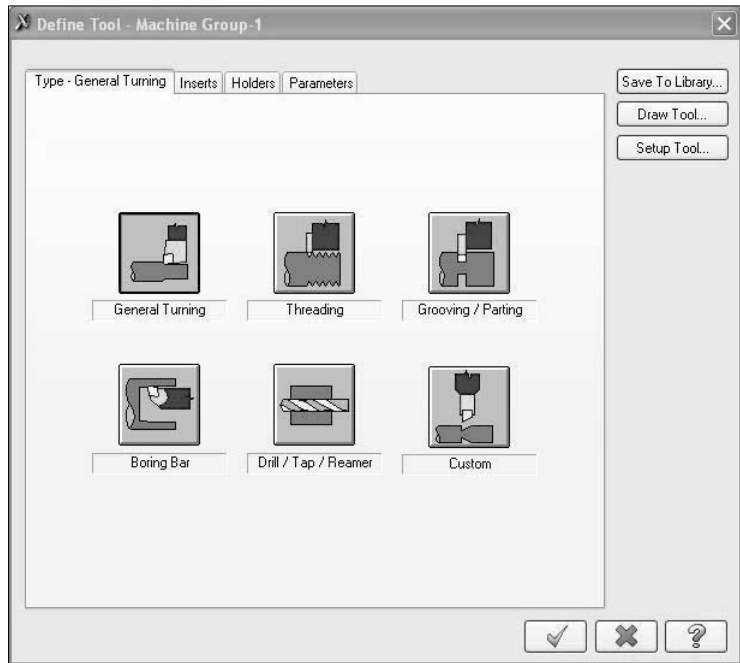
- Select the **OK** button to exit **Chaining** dialog box.



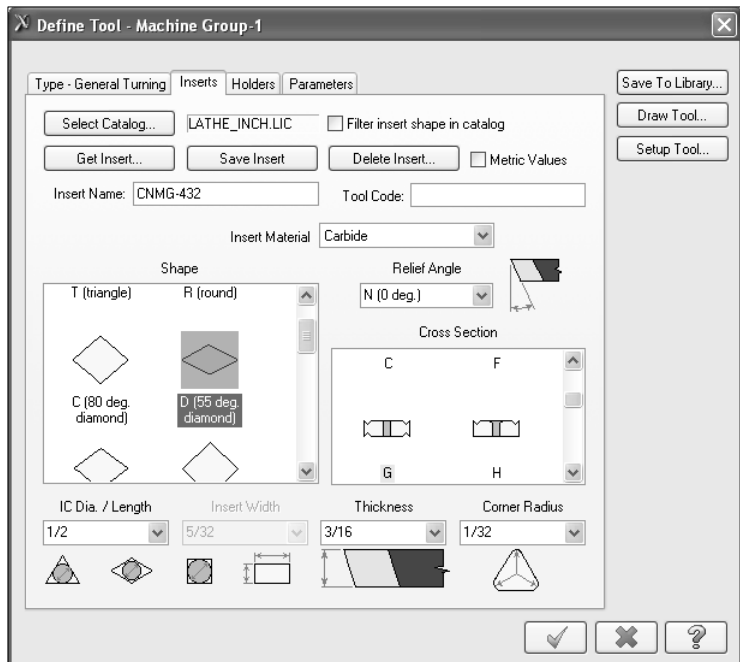
- Right-mouse clicks in **Toolpath Parameters** and select **Create new tool**.



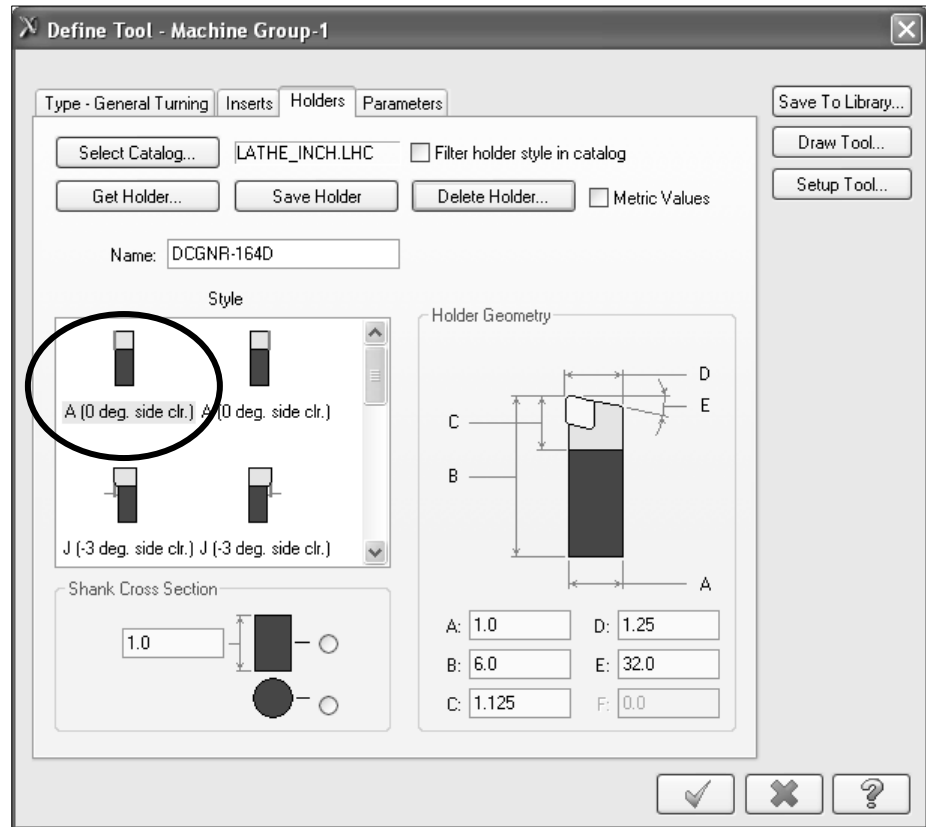
- Select the **General Turning** Button.



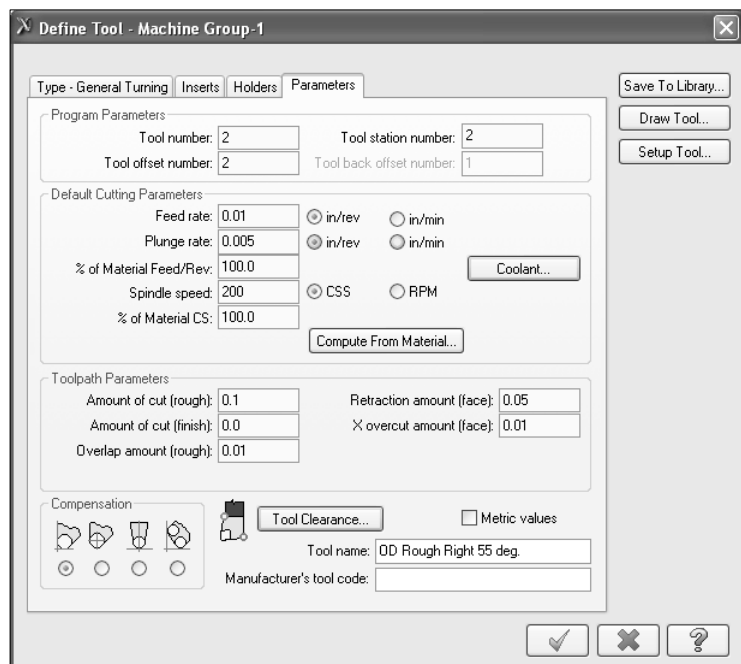
- Select the **Inserts** page and choose the **55 deg. diamond** shape.



- Select **Holders** page and make the changes as shown

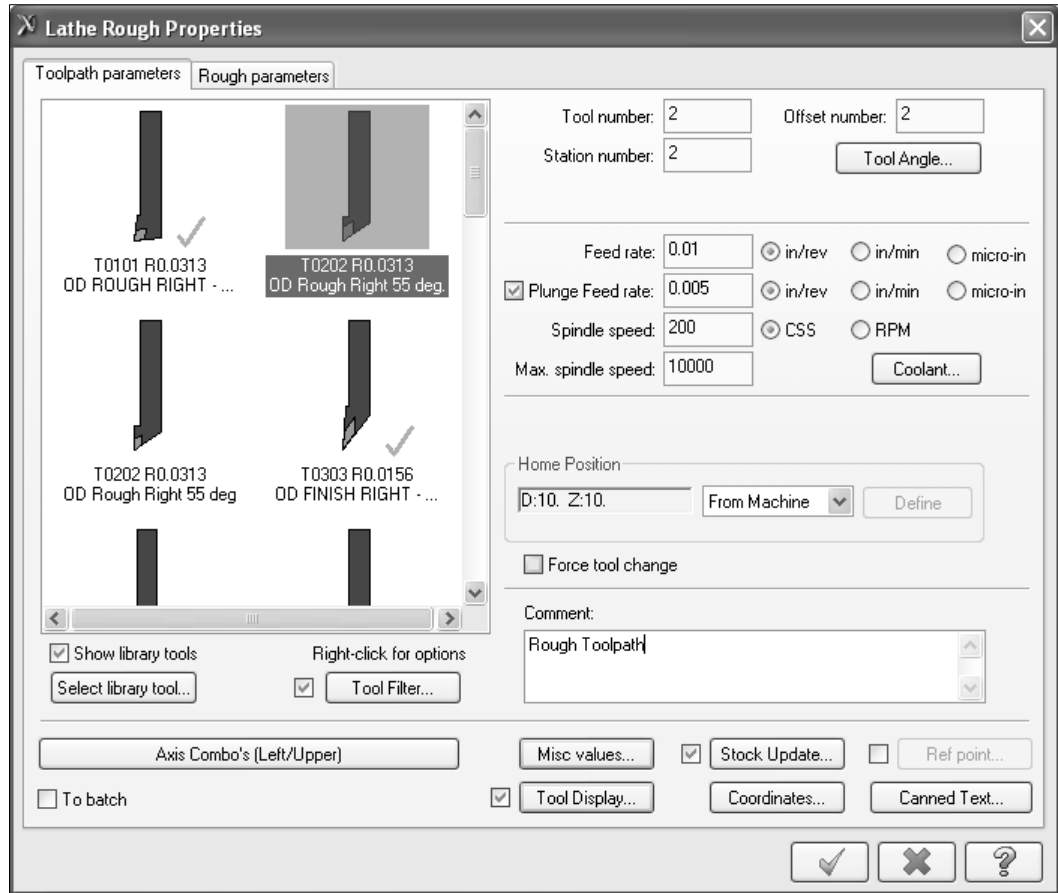


- Select the **Parameters** page and enter the name of the tool.

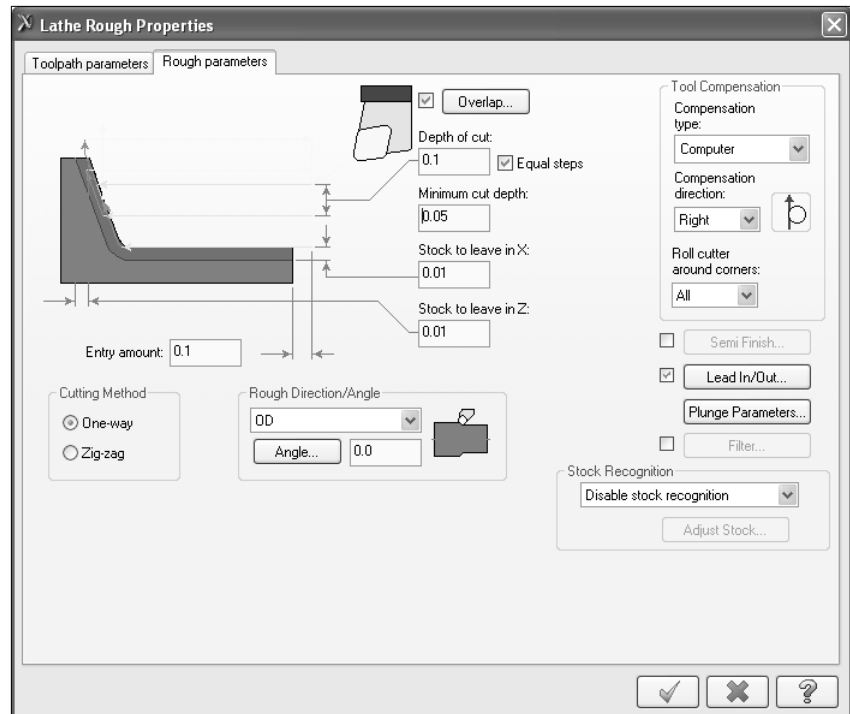


- Select the **OK** button to exit tool **Parameters.**

- Select the **Toolpath parameters** page and make all the necessary changes as shown below

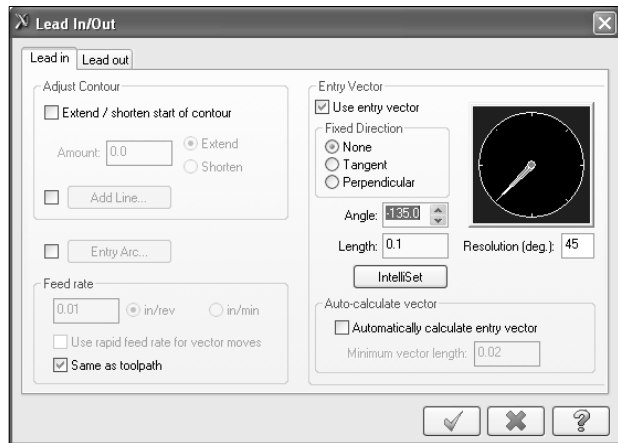


- Select the **Rough Parameters** page and make all the necessary changes as shown below.

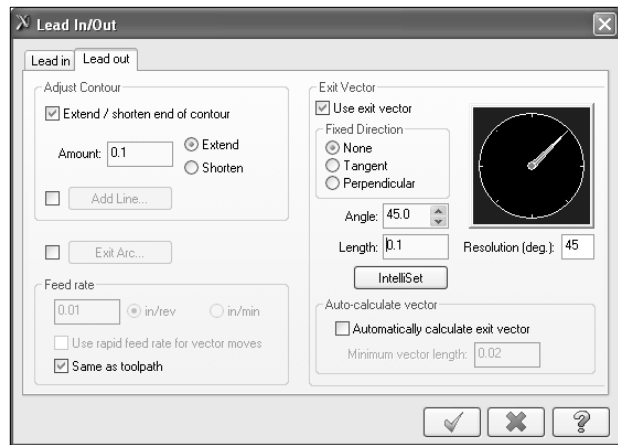



**Depth of Cut** sets the amount of material to be removed during each pass.  
**Equal Steps** sets the **Depth of cut** value as the maximum amount of material that the tool can remove at each pass to ensure equal passes.  
**Minimum Cut Depth** value determines the smallest amount that can be cut at each pass.  
**Stock to Leave in X** value sets the remaining stock in the X axis after the tool completes all passes.  
**Stock to Leave in Y** value sets the remaining stock in the Y axis after the tool completes all passes.  
**Entry Amount** value sets the height at which the tools rapids to or from the part.

- Select the **Lead In/Out** button and make the following changes.

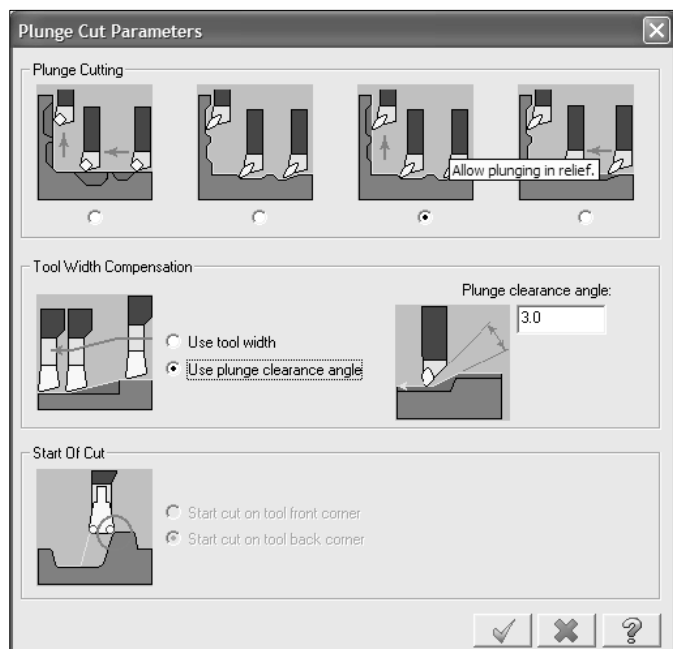



- Select **Lead Out** tab, **extend** the end of contour with **0.1** and change the **Exit Vector** settings.



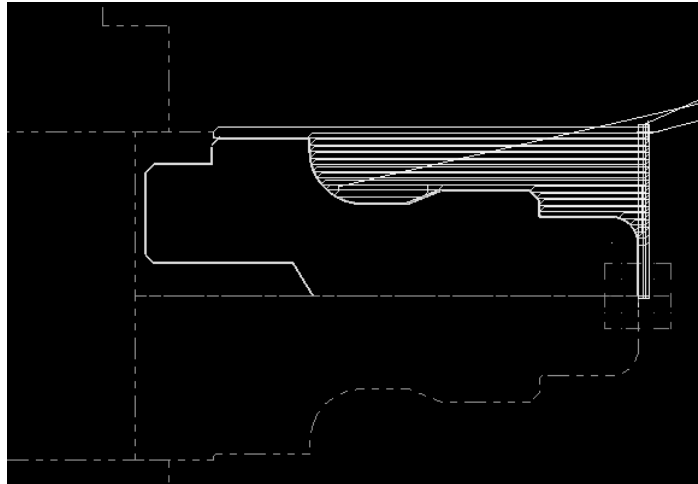
- Select the **OK** button to exit the **Lead In/Out** parameters. 

- Select the **Plunge Parameters** button and change the settings to allow the tool to plunge along the toolpath.



➤ Select the **OK** button to exit the **Plunge Cut Parameters**. 

➤ Select the **OK** button to exit the **Rough parameters**. 



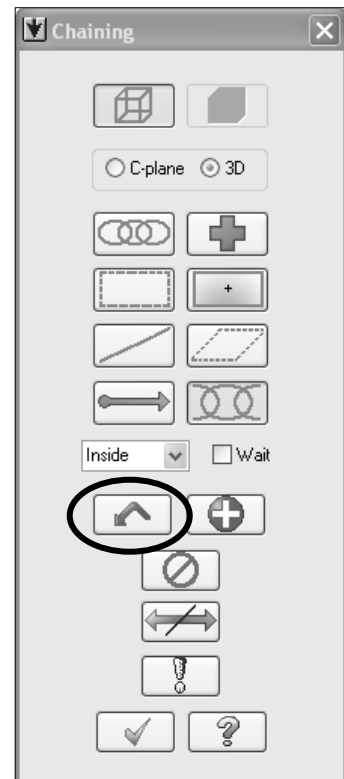
**STEP 22: FINISH THE PART.**

**Toolpaths**

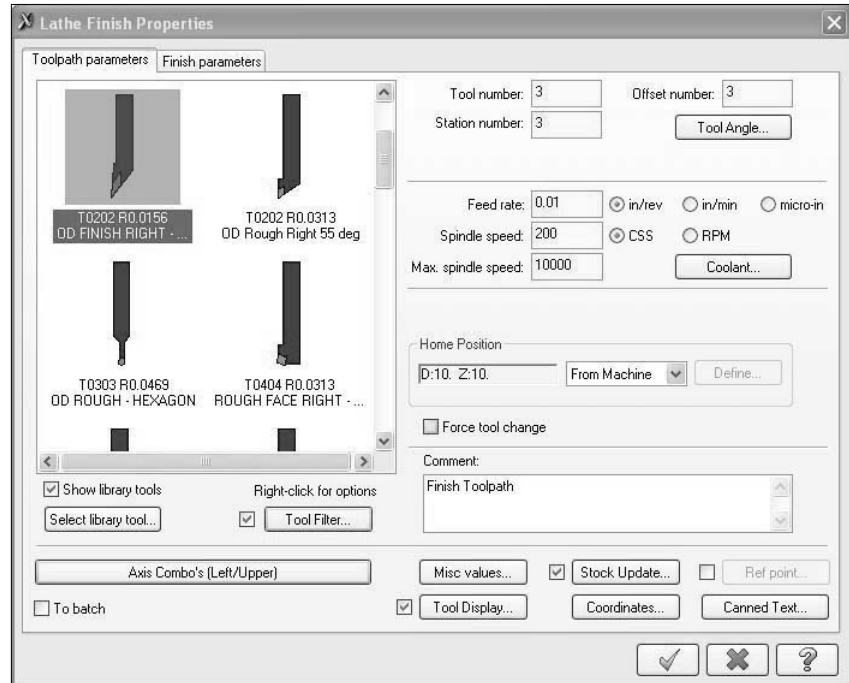
➤ **Finish** 

➤ Select **Last** button in the **Chaining** dialog box. 

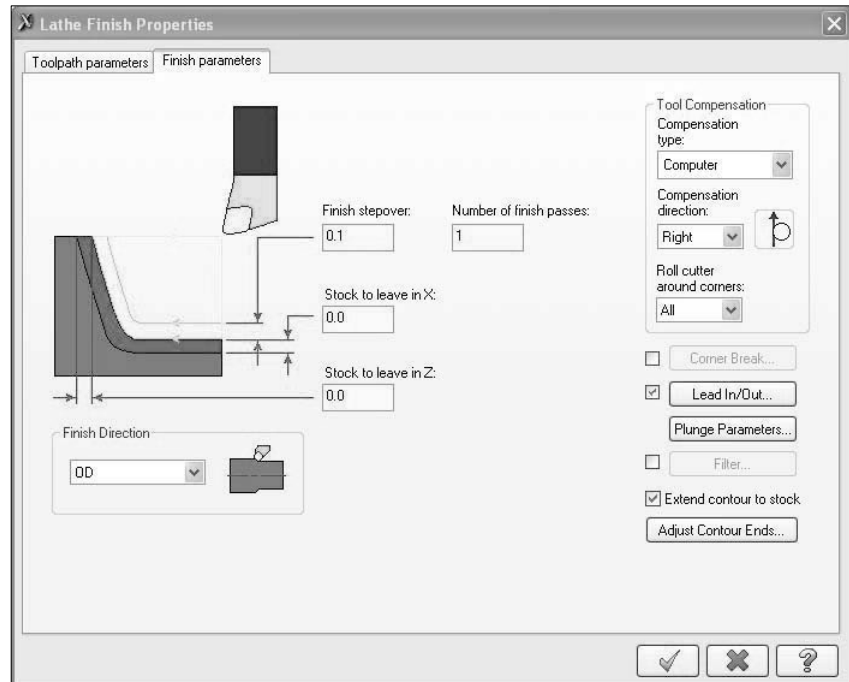
➤ Select the **OK** button to exit **Chaining** dialog box. 



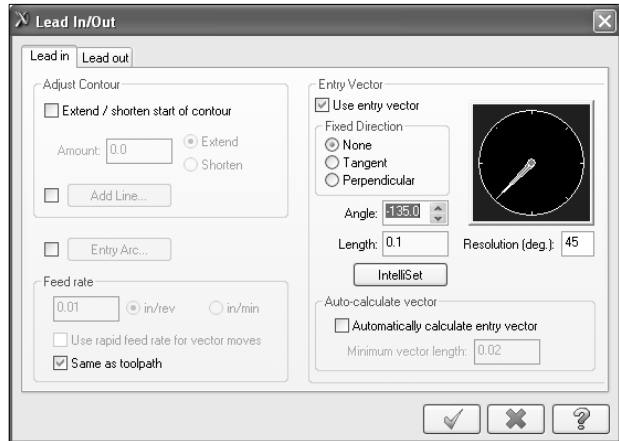
- Select the **OD Finish Right -35deg** cutter from the tool list.



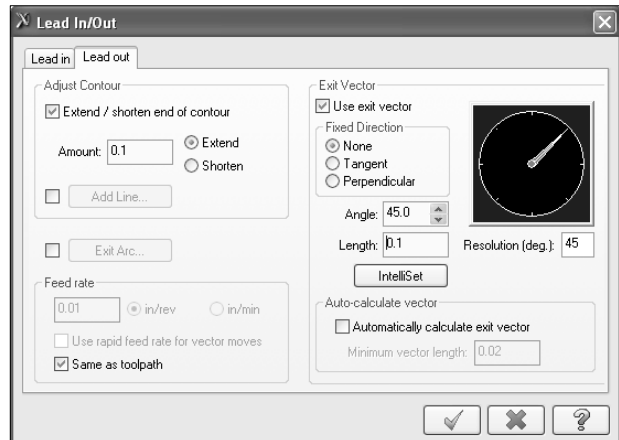
- Select the **Finish parameters** page and make all the necessary changes as shown in the following screenshot.




- Select the **Lead In/Out** button and make the following changes.

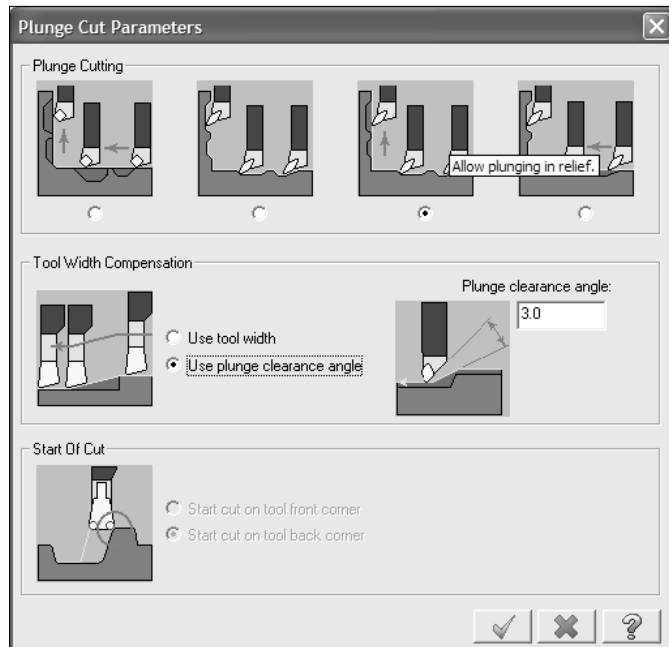


- Select **Lead Out** tab, **extend** the end of contour with 0.1 and change the **Exit Vector** settings.




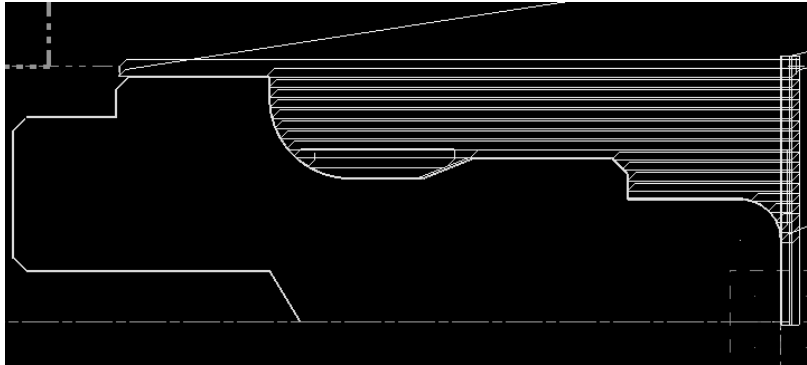
- Select the **OK** button to exit the **Lead In/Out** parameters. 

- Select the **Plunge Parameters** button and change the settings to allow the tool to plunge along the toolpath.





- Select the **OK** button to exit the **Finish Parameters**. 



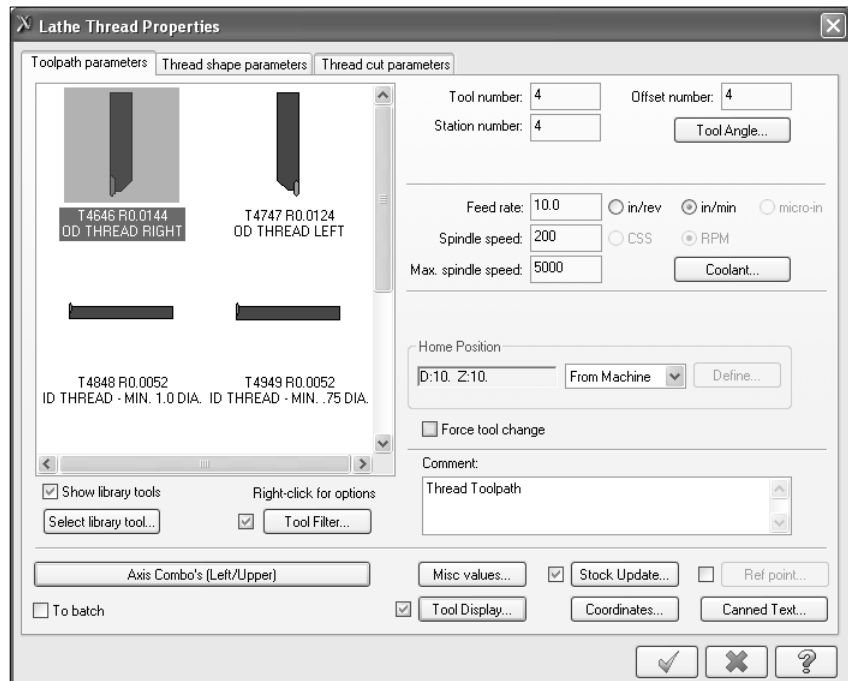
### STEP 23: CUT THE THREAD

**Thread Toolpath:** gives you the option to create a screw, bolt or nut. You can program straight threads on the outside, inside, or face of a part. You can also program multiple lead threads.

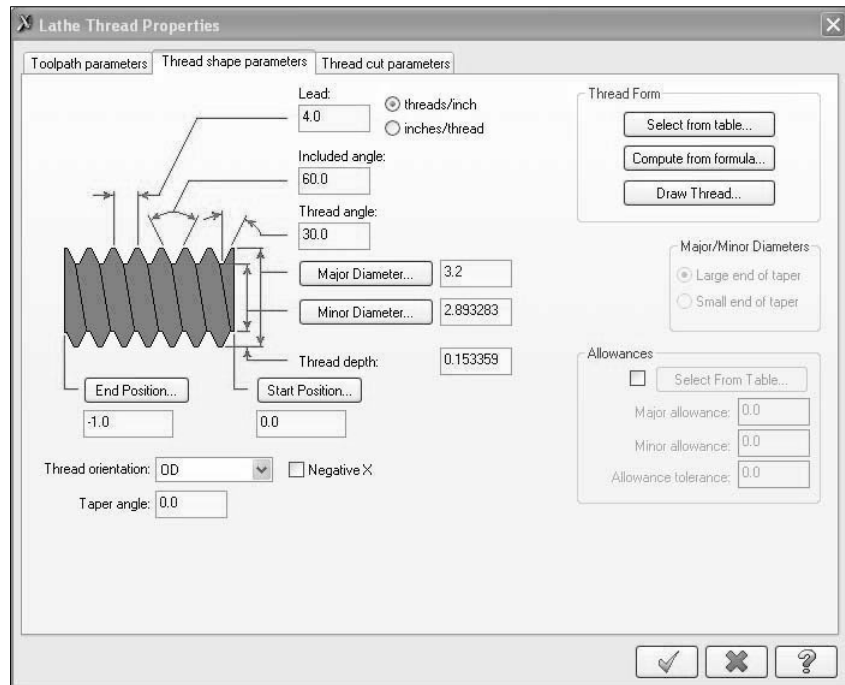
#### Toolpaths

- **Thread** 

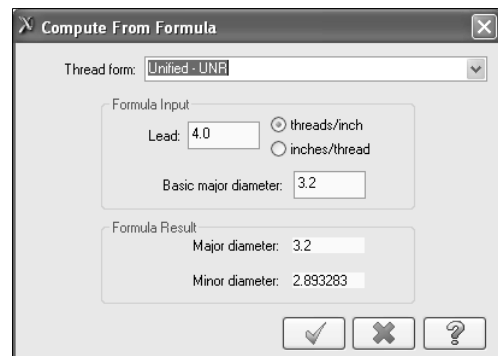
- Make all the necessary changes as shown in the picture.



- Select the **Thread shape parameters** tab and enter the values for the **Lead** and for the **Major Diameter** as shown in the following screen shot.
- To establish the **Minor Diameter** select the **Compute from formula** button.

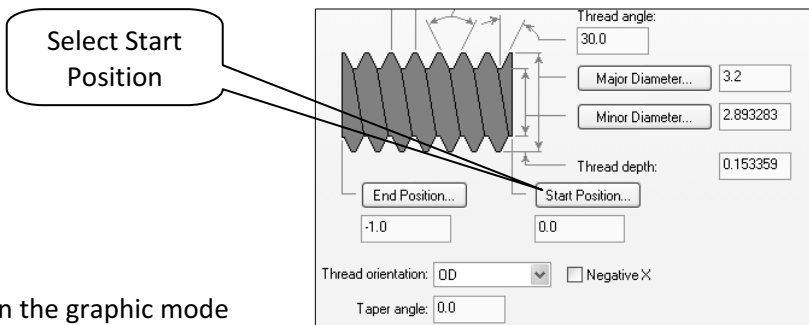


- Select **Unified - UNR** as the thread form for Mastercam to automatically calculate the **Minor Diameter** based on the **Lead** and the **Major Diameter**.

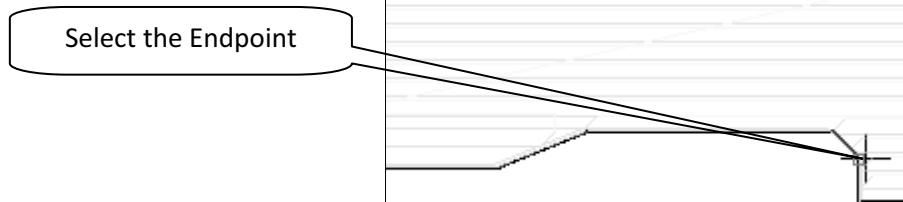


- Select the **OK** button to exit. 

- To establish the thread starting position select **Start Position** button as shown in the below picture

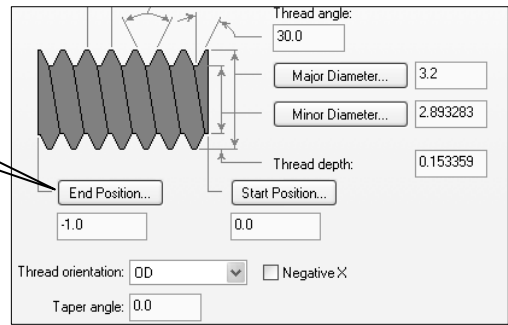


- The system will bring you back in the graphic mode where you can select a point at the start position as shown in the picture below:

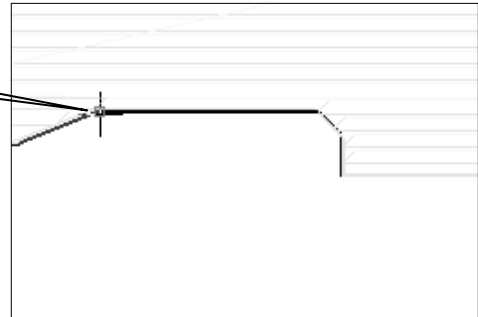


- To establish the thread end position select **End Position** button and select a point as shown in the following picture.

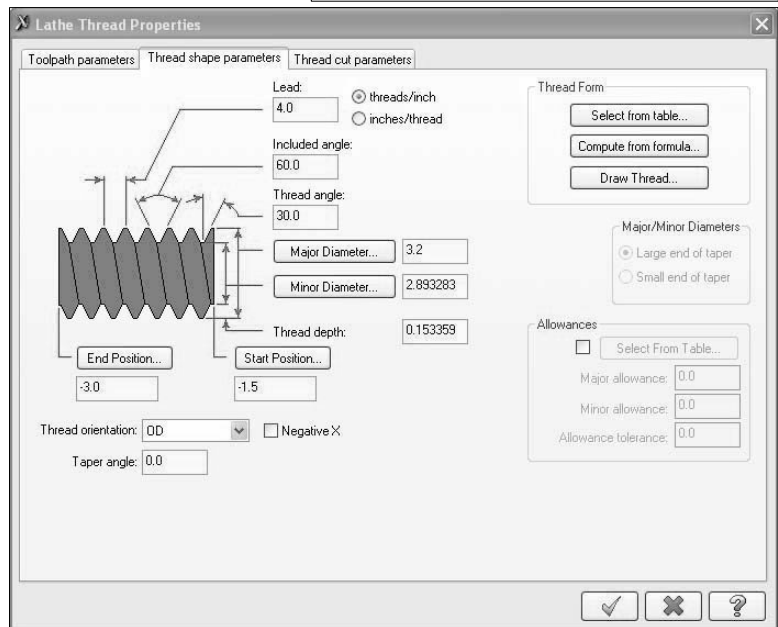
Select End Position



Select this Endpoint

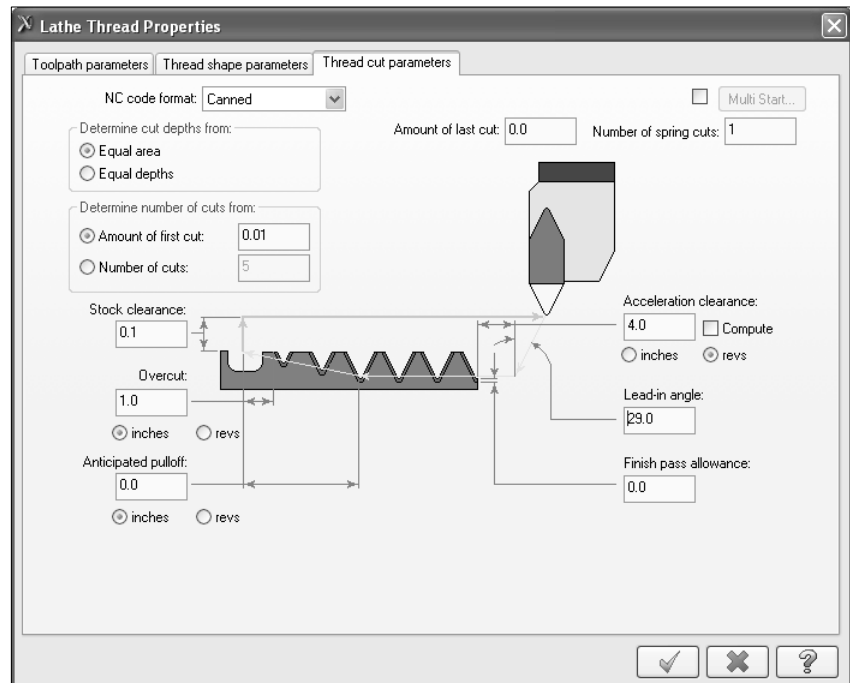


- The **Thread shape parameters** page should look like the following picture.



**Lead** sets the distance a nut would travel if turned once on a bolt for a given thread.  
**Included angle** determines the angle between sides of a thread measured in an axial plane.  
**Thread angle** determines the angle between one side of the thread and a line perpendicular to the thread axis.  
**Major Diameter** sets the thread's largest diameter.  
**Minor Diameter** sets the thread's smallest diameter.  
**Start Position** determines where on z-axis for OD /ID threads or on X-axis for Face /Back threads the thread will start.  
**End Position** determines where on z-axis for OD /ID threads or on X-axis for Face /Back threads the thread will end.

- Make all the necessary changes in the **Thread cut parameters** page as shown below.



**NC code** determines the G code that displays in the NC file depending on the toolpath you choose; longhand, box, canned or alternating.

**Determine cut depths from** determines how the material will be removed; equal amounts of material at each cut or equal depths.

**Determine number of cuts from** the amount of the first cut or based on the number of cuts. If you choose the amount of the first cut, the system automatically calculated the number based also on the amount of the last cut, the thread shape, and the depth of thread.

**Stock clearance** sets how far above the top of the stock the tool retracts between passes.

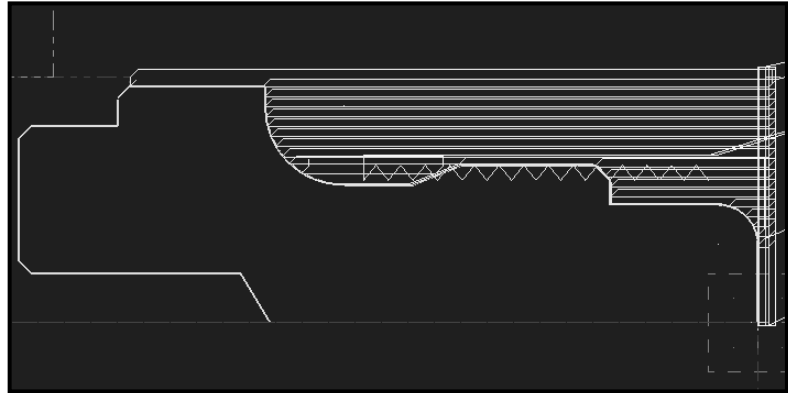
**Overcut** sets how far past the end of the thread the tool moves before retracting.

**Anticipated pull off** sets the distance from the end of the thread that the tool begins to pull away from the thread.

**Acceleration clearance** sets the necessary distance in the Z direction for the tool to accelerate to full speed before it starts cutting the thread.

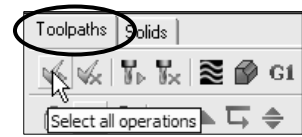
- Select the **OK** button to exit thread parameter pages.



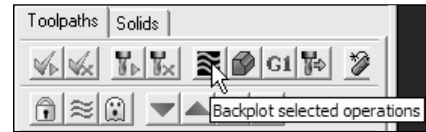


**STEP 24: BACKPLOT THE TOOLPATHS.**

- Select all operations button.

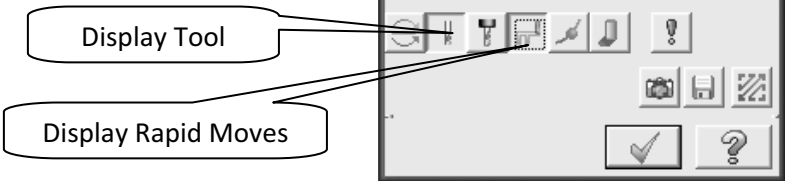


- Select **Backplot selected operations** button.

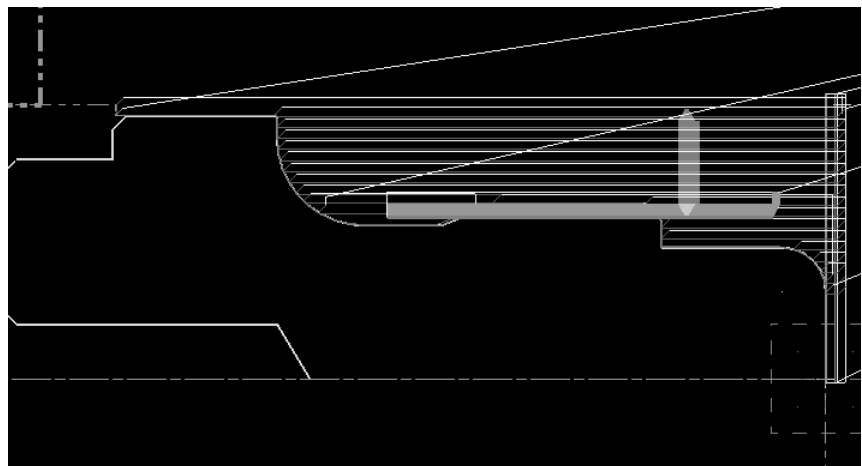


- Make sure that you have the following buttons turn on. (They look as push-down buttons)

- Display tool
- Display rapid moves
- Select Play button

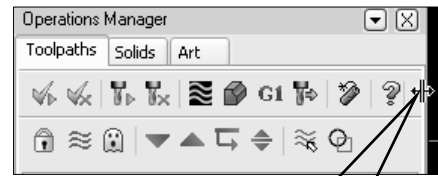


- Select the **OK** button to exit **Backplot**.

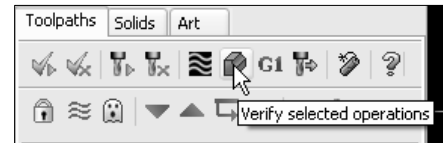


**STEP 25: VERIFY- TOOLPATH VERIFICATION**

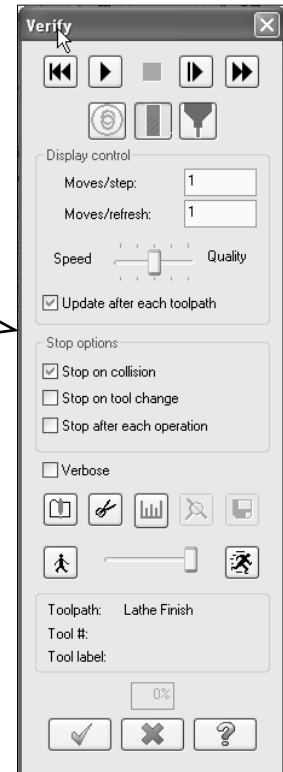
- Expand the **Toolpaths Manager** if necessary by dragging the right side.




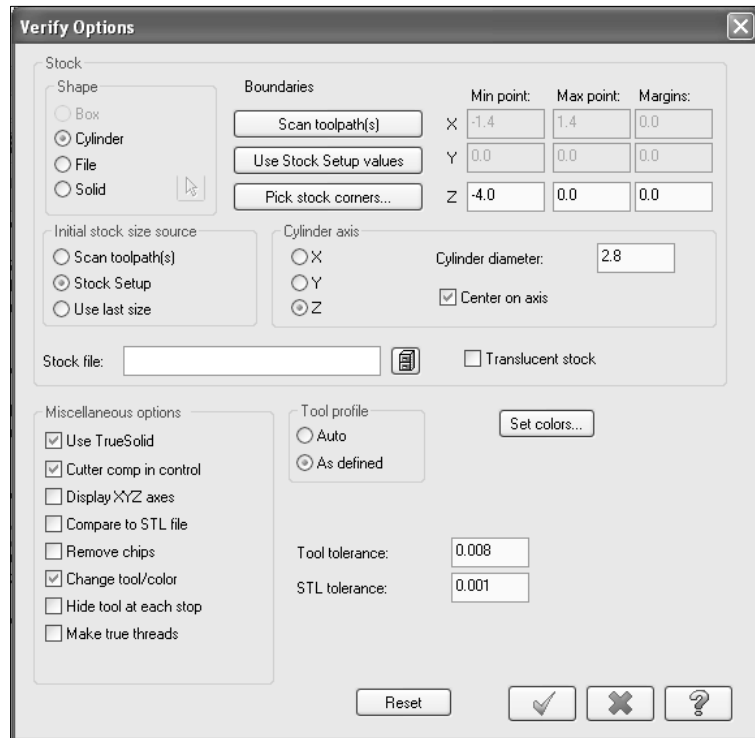
- Select **Verify all operations** button.



**Update after each toolpath** updates the stock after each operation.  
**Stop on collision** pauses the verification when the tool touches the part with a rapid move



- Select the Configure button  and make the necessary changes to the following screen shot.








**Initial stock size source** should be set to **Job Setup** to use the stock information from Stock Setup.

**Use True Solid** allows you after verifying the part, to rotate and magnify the part to more closely check features, surface finish, or scallops.

**Cutter comp in control** allows verify to use the information regarding the tool diameter and to simulate the cutter compensation

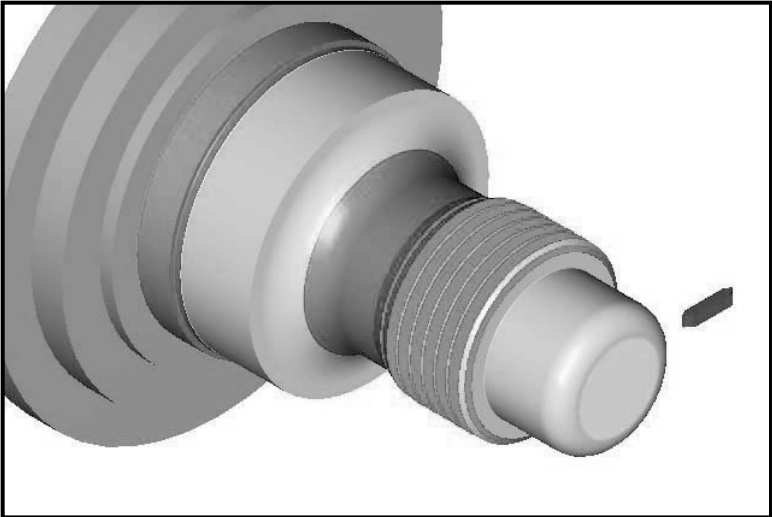
**Change tool/color** to change the color of the cut stock to indicate tool changes in the toolpath.

**Simulate drill cycles** allows the system to simulate peck drilling, chip break drilling cycles.

- Select the **OK** button to exit **Verify Options**. 
- Select the **Isometric View**. 
- Use **Fit Screen** icon to fit the solid to the screen. 
- Set the **Verify Speed** by moving the slider bar in the speed control bar. 
- Select **Machine** button to start simulation. 

The finish part should appear as shown in the following picture.

Select the **OK** button to exit **Verify**.





**STEP 26: FLIP THE PART**

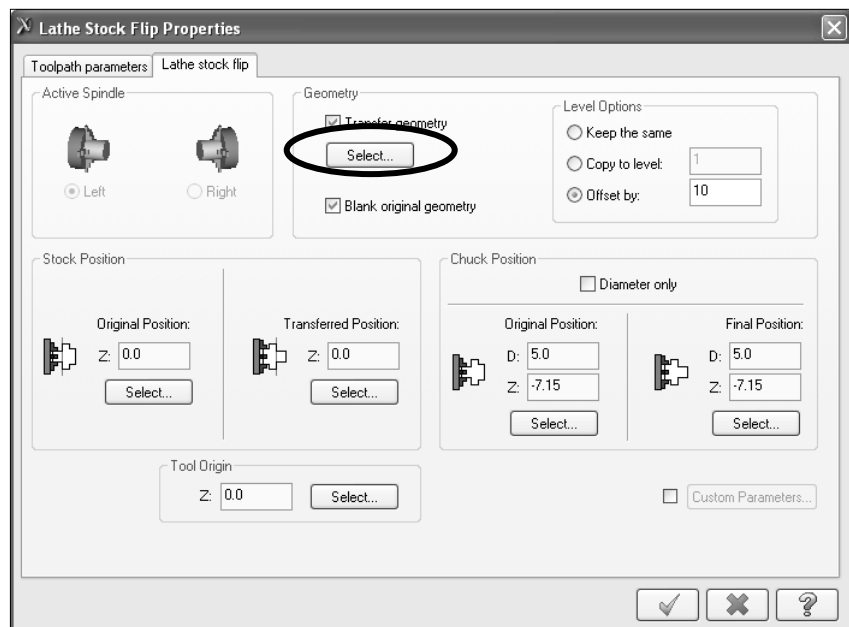
**Stock Flip:** This option is used if you wish to machine half the part and then flip the stock to finish the second half (backside) of the part.


**Toolpaths**

➤ **Misc Ops**

➤ **Stock Flip** 

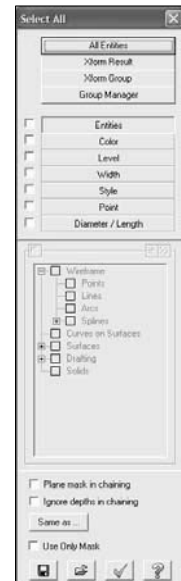
- Select lathe stock flip page and select the geometry to transfer.
- Click on **Select** button. The system brings you back in the graphic mode to allow you to select the geometry.



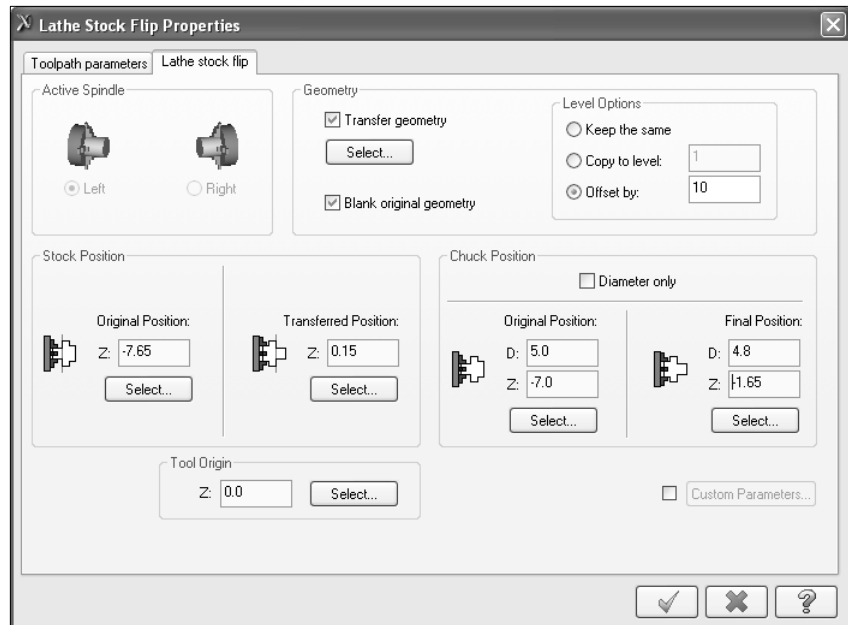
- [Select entities to transfer]: Select **all** button. 

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

- Select **End Selection** button from the **Ribbon bar**. 



- Change the settings to match the following screen shot.



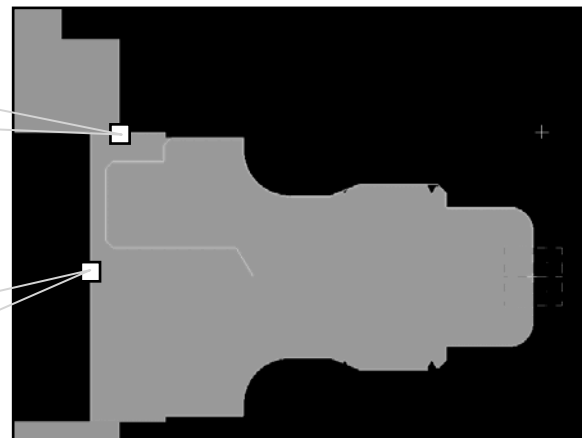
- The original geometry will be invisible (**Blank original geometry**). The resulting geometry will be saved on level 11 (**Offset by 10**).

- The stock **Original Position** is Z-(7.5+.15).

Chuck Original Position

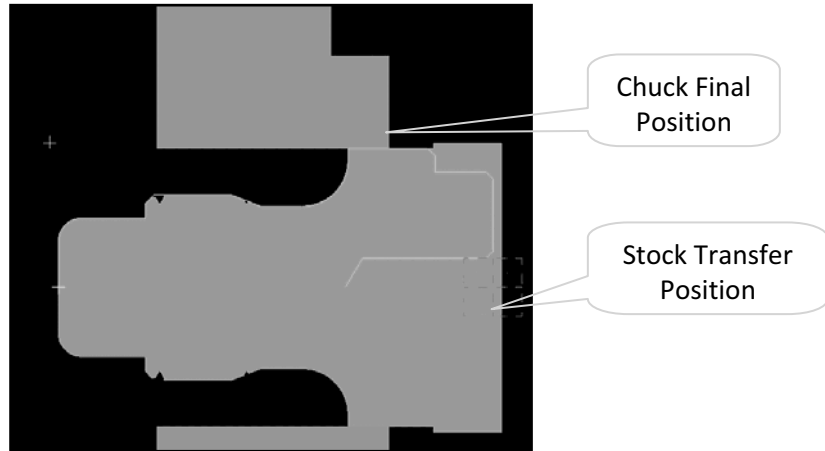
- The chuck **Original Position** is D 5.0, Z -7.0

Stock Original Position



- The stock **Transfer Position** is Z0.15

- The chuck **Final Position** is D 5.0, Z -1.65



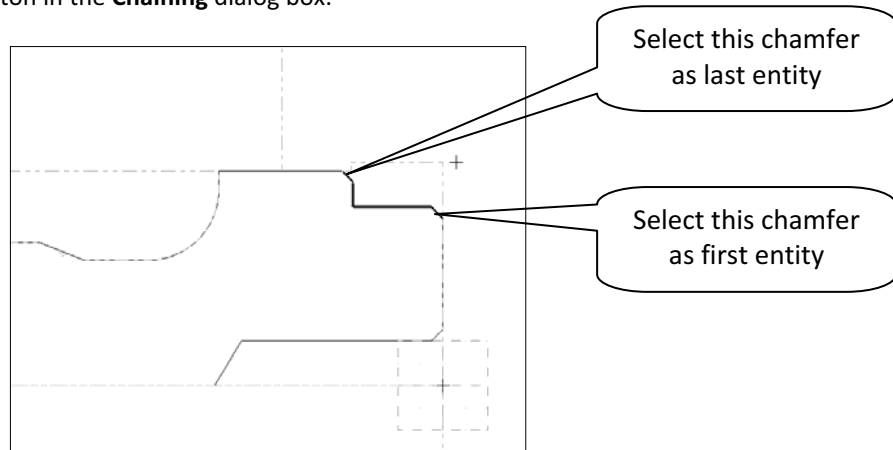
➔ Select the **OK** button to exit **Lathe stock flip parameters**.

**STEP 27: FACE THE FLIPPED PART.**

➔ To face the part, please follow the **STEP 20** pages **5-19 to 5-20**.

**STEP 28: ROUGH THE FLIPPED PART**

➔ To chain the part follow next diagram. Make sure that the direction of chaining is **CCW**, otherwise select **Reverse** button in the **Chaining** dialog box.

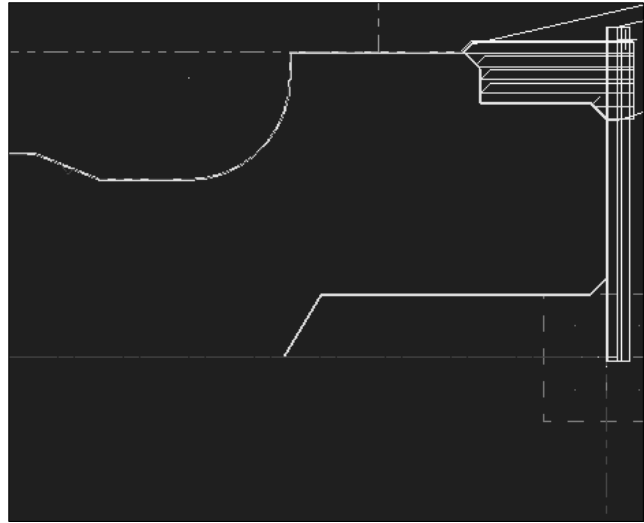


➔ To rough the part, please follow the **STEP 21** pages **5-20 to 5-26**.

➔ Select the same tool for roughing as for facing.

**STEP 29: FINISH THE FLIPPED PART**

- ◆ Tips: To chain the part use **Last** button
- ◆ To finish the part, please follow **STEP 22** from pages **5-26 to 5-29**.

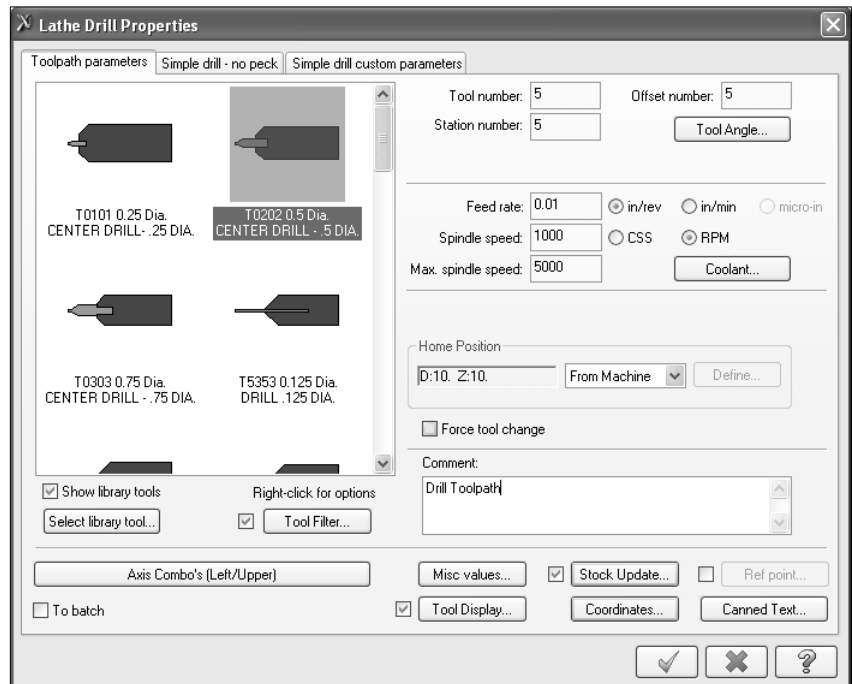


**STEP 30: CENTER DRILLING**

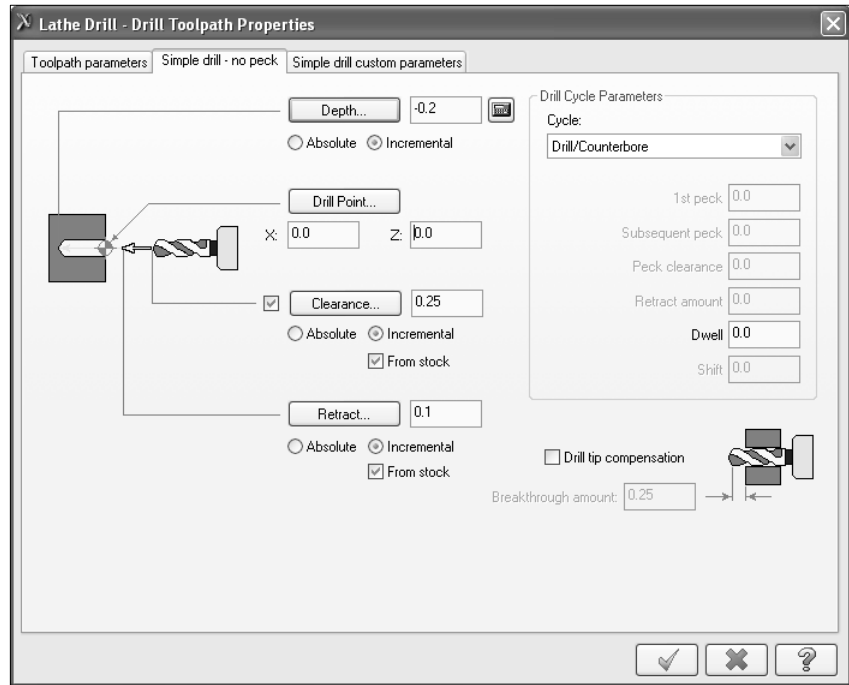
**Toolpaths**



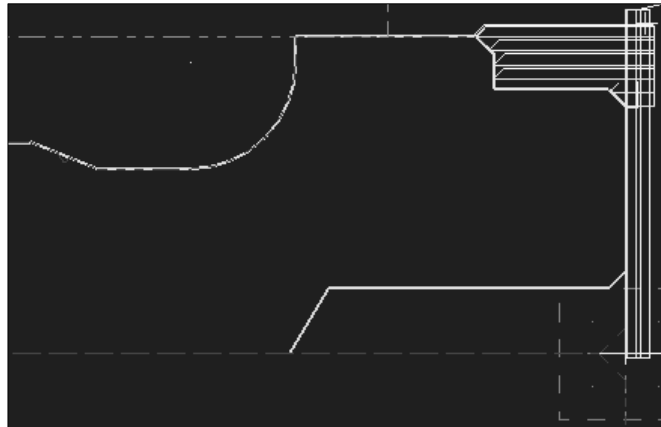
- In the Toolpath parameters page select **1/2" Center drill** and make the necessary changes as shown in the following screen shot.



- Change the parameters in **Simple drill- no peck** window.

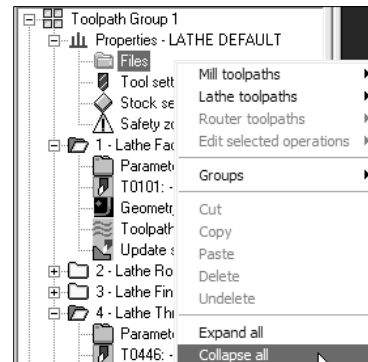


- Select the **OK** button to exit the parameters.



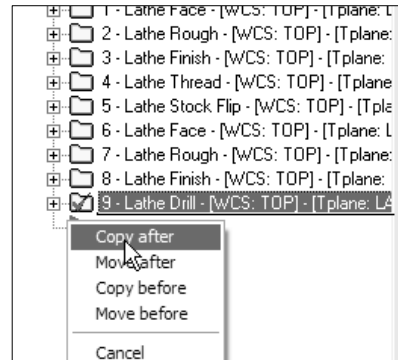
**STEP 31: DRILLING**

- **Right-mouse click** in the **Toolpaths manager** and select **Collapse all**.



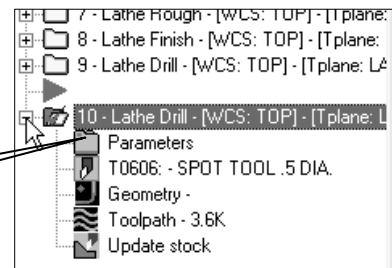
**Lathe X<sup>3</sup>**

- In the **Toolpaths manager** select the last **Lathe drill** operation.
- **Right- mouse click**, hold and drag below this operation.
- **Release** and select **Copy after**.

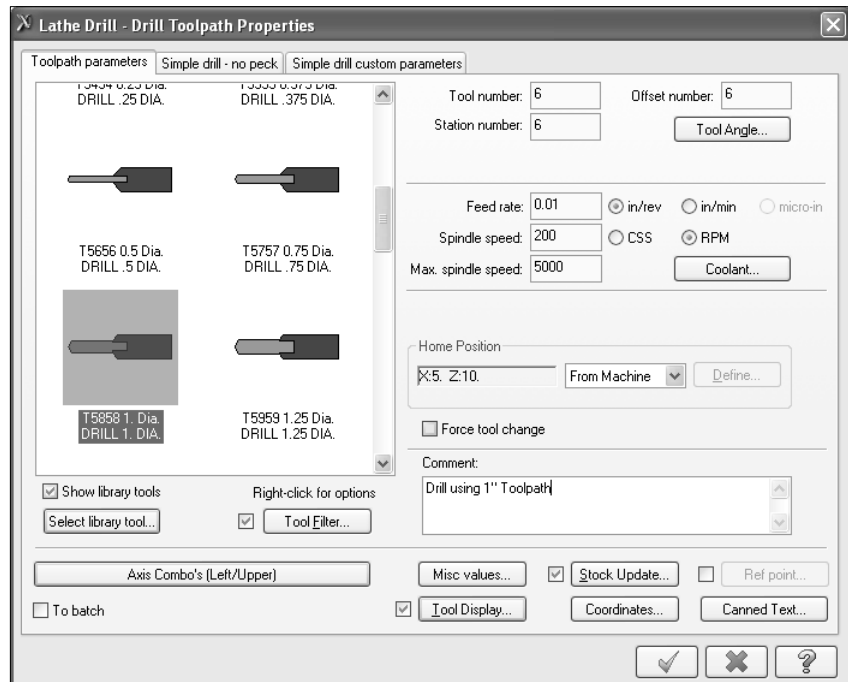


- Expand the last **Lathe drill** operation by selecting the + in front of the operation.
- Select **Parameters** in the second **Lathe Drill** operation

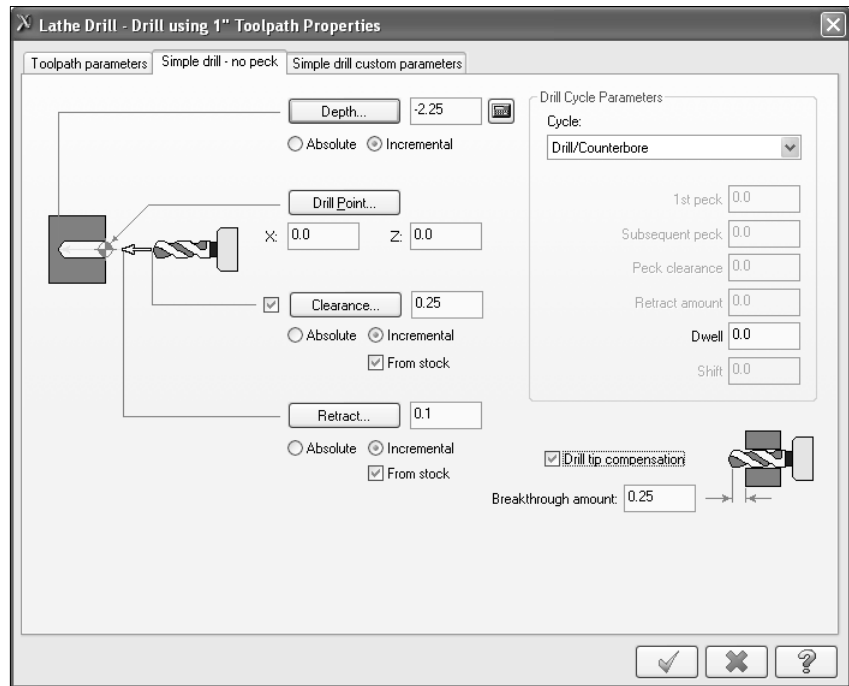
Select Parameters




- Select the **Toolpaths parameters** page and select the 1.0"Drill.

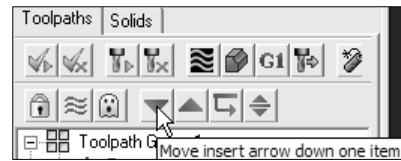


- Select **Simple drill-no peck** page and change the parameters as shown.

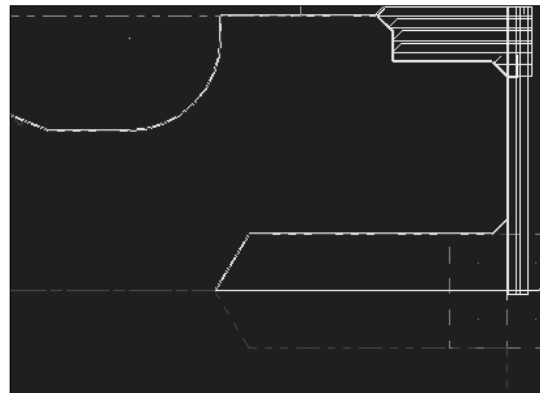
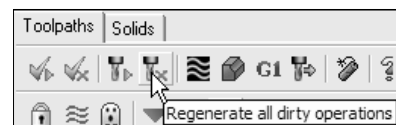


- Select the **OK** button to exit drill parameters. 

- Select **Move insert arrow down one item** button.



- Select **Regenerate all dirty operations** button.

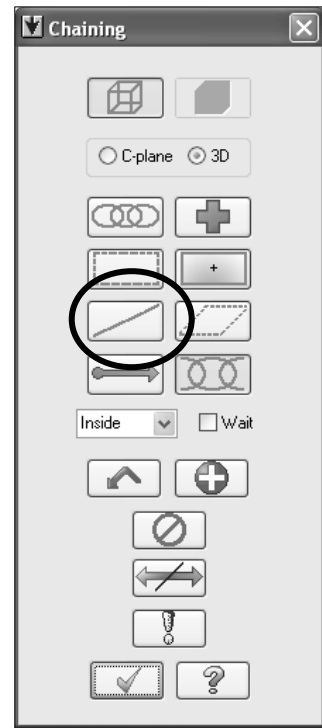
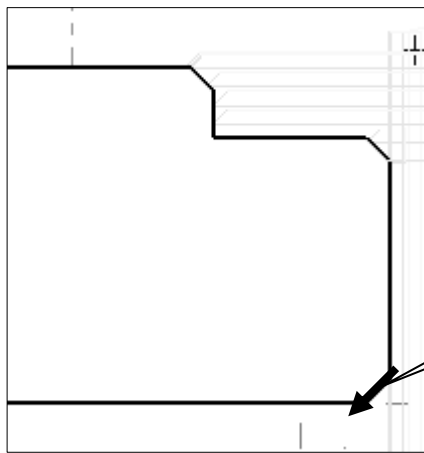


**STEP 32: CUT THE CHAMFER USING FINISH TOOLPATH.**

**Toolpaths**

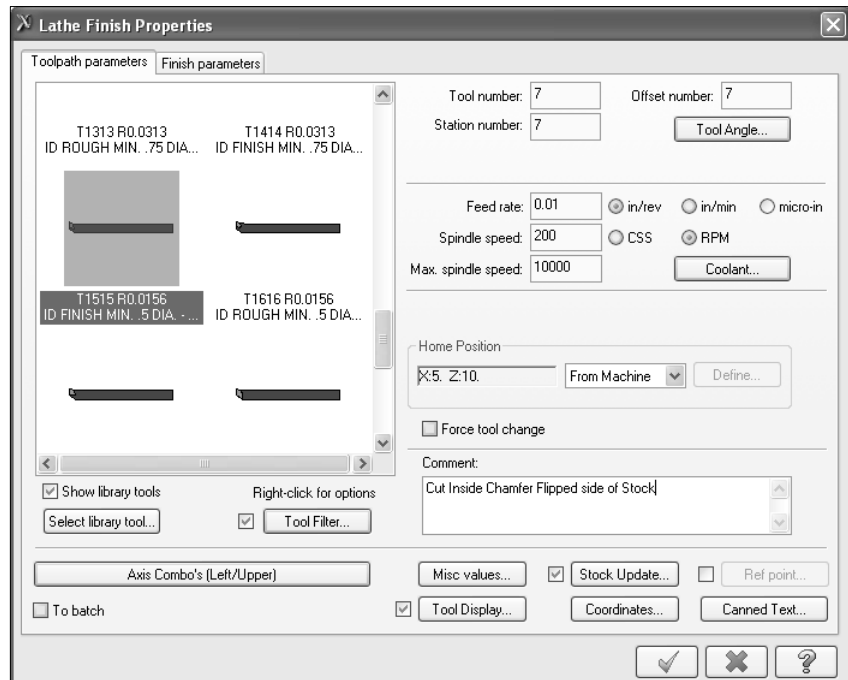
**Finish**

- Select **Single** button in the **Chaining** dialog box.
- Select the chamfer as shown.
- Make sure that the chaining direction is as shown. Otherwise select the **Reverse** button.

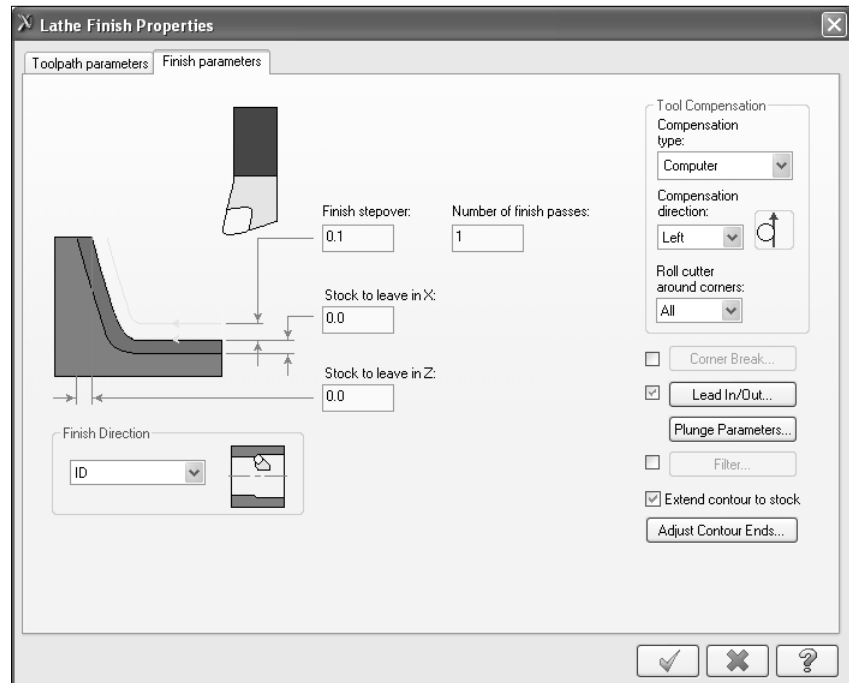


- Select the **OK** button.

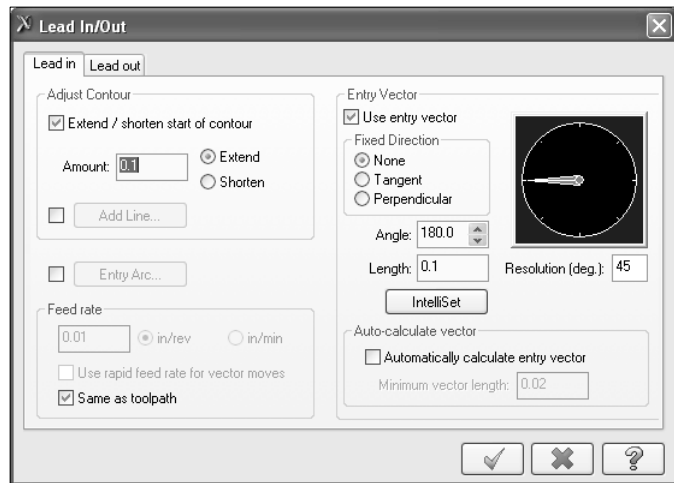
- In the **Toolpaths parameters** page select **1/2" Boring bar** and make the necessary changes as shown in the following screenshots.



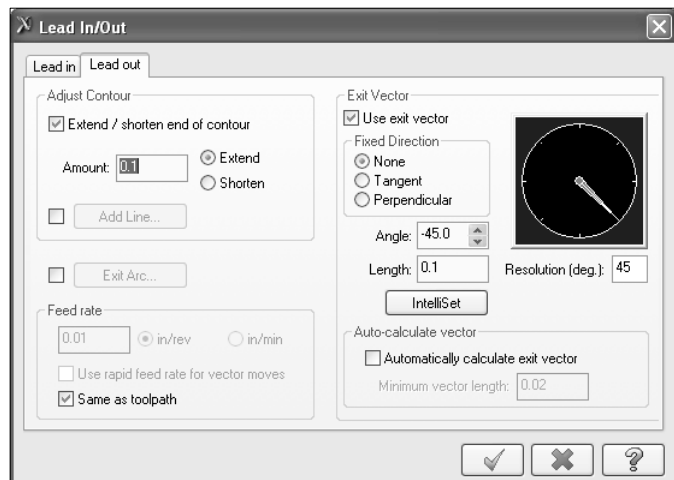




- Select the **Lead In/Out** button and set the parameters as shown.



- Select the **OK** button twice to exit the operation. 



- ◆ Verify does not support advanced stock and tailstock toolpaths.



### **STEP 33: RUN THE POST PROCESSOR TO OBTAIN THE GCODE FILE.**

- ◆ The post processor requires customization to be able to support these toolpaths.
- ◆ To run the post processor to obtain the Gcode file, please follow Step 13 from Tutorial #1 page 1-25 to 1-26.

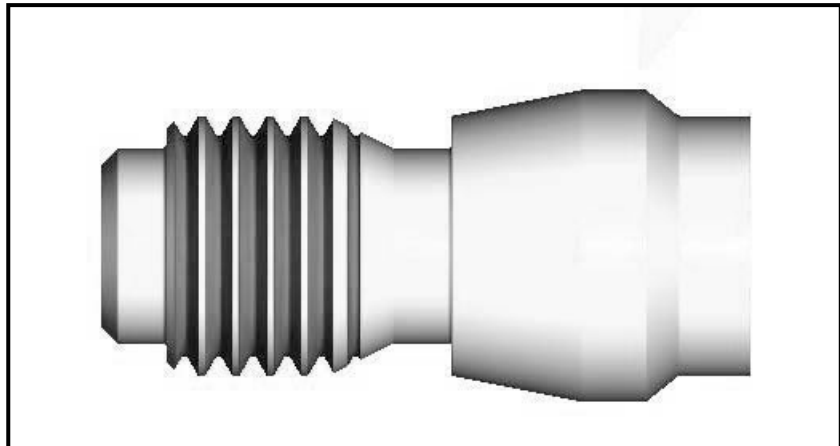
### **STEP 34: SAVE THE UPDATED MCX FILE.**

- ◆ Select **Save** icon. 



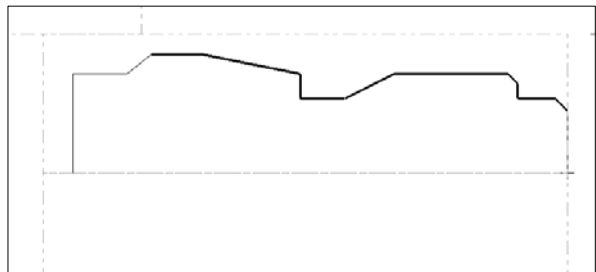
**REVIEW EXERCISE.**

- **Student practise.** Create the Toolpath for Tutorial #5 Exercise as per the instructions below;



**Tips:**

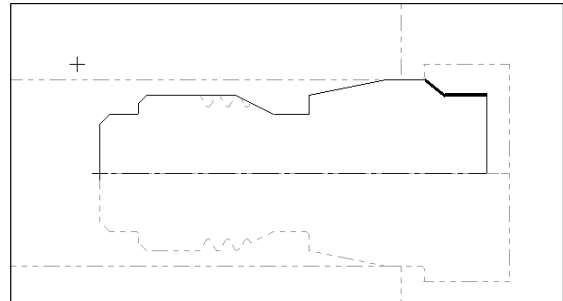
- To establish the stock size select Parameters and give OD = 1.2"; Length = 2.5"; OD Margin = 0.1 "; Right margin = 0.15"; Left margin = 0.15"
- Keep the same settings for the chuck.
- Face the part using Rough Face Right -80 deg. cutter; Rough stepover =0.1"; Finish stepover = 0.01"; 0 stock to leave;
- Rough the OD using the same cutter and the same set of parameters used in **Tutorial #5**
- Chain the contour with thicker line shown in the picture to the right.



- Finish the OD using OD Finish Right - 35 deg. cutter;
- Cut the thread using the following settings for thread shape:
- Major Diameter =1.0"
- Lead = 8 threads/inch
- Compute from formula or Select from table to establish the **Minor Diameter**
- Use **Tutorial #5** to set the other parameters.
- Backplot and Verify the toolpaths.
- Flip the part using the following settings:
- Stock
- Original Position Z = - 2.65
- Transferred Position Z = 0.15

**Chuck**

- Original Position X = 0.7; Z = - 2.15
- Final Position X = 0.5; Z = -0.55
- **Face left side part** using Rough Face Right -80 deg. cutter; Rough stepover =0.1"; Finish stepover = 0.01"; 0 stock to leave;
- Rough the OD
- **Chain** the contour with thicker line shown in the picture to the right.
- Use the same cutter and the same set of parameters used in **Tutorial #5** (Change the **Lead out** to **Add Line**; Length = 0.1; Angle =180).
- **Finish the OD** using OD Finish Right -35 deg. cutter; (Change the Lead out the same as in rough).
- **Backplot the toolpaths.**



**NOTES:**

