Mastercam® 2020

IMPERIAL | TRAINING TUTORIAL SERIES

HLE DOWNLOAD
INSTRUCTIONS INSIDE
2020

MILL ADVANCED

Mastercam® 2020

MILL ADVANCED TRAINING TUTORIAL

To order more books:

Call 1-800-529-5517 or

Visit www.emastercam.com or

Contact your Mastercam dealer

Mastercam 2020 Mill Advanced Training Tutorial

Copyright: 1998 - 2019 In-House Solutions Inc. All rights reserved

Software: Mastercam 2020

Authors: Mariana Lendel

Date: July 3, 2019

ISBN: 978-1-77146-834-3

Notice:

In-House Solutions Inc. reserves the right to make improvements to this manual at any time and without notice.

Disclaimer Of All Warranties And Liability

In-House Solutions Inc. makes no warranties, either express or implied, with respect to this manual or with respect to the software described in this manual, its quality, performance, merchantability, or fitness for any particular purpose. In-House Solutions Inc. manual is sold or licensed "as is." The entire risk as to its quality and performance is with the buyer. Should the manual prove defective following its purchase, the buyer (and not In-House Solutions Inc., its distributor, or its retailer) assumes the entire cost of all necessary servicing, repair, of correction and any incidental or consequential damages. In no event will In-House Solutions Inc. be liable for direct, indirect, or consequential damages resulting from any defect in the manual, even if In-House Solutions Inc. has been advised of the possibility of such damages. Some jurisdictions do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Copyrights

This manual is protected under International copyright laws. All rights are reserved. This document may not, in whole or part, be copied, photographed, reproduced, translated or reduced to any electronic medium or machine readable form without prior consent, in writing, from In-House Solutions Inc.

Trademarks

Mastercam is a registered trademark of CNC Software, Inc.

Microsoft, the Microsoft logo, are registered trademarks of Microsoft Corporation;

Windows 10 is a registered trademarks of Microsoft Corporation.

Table Of Content

Getting Started **15**

Objectives 16

Step 1: Starting Mastercam 16

Step 2: GUI - Graphical User Interface 17

Step 3: Navigate Through Mastercam 18

Step 4: Set The Attributes 20

Step 5: Manager Panels 22

Step 6: Setting Mastercam To Imperial 24

Step 7: Set The Grid 26

Conventions Used In This Book: 27

Mastercam® Work Flow 28

Tutorial 1: Geometry Creation **31**

Overview Of Steps Taken To Create The Part Geometry: 32

Tutorial #1 Drawing 33

Step 1: Setting Up The Graphical User Interface 34

Step 2: Create Rectangles 35

Step 3: Create Fillets For Two Of The Rectangles 39

Step 4: Create A Circle Using Circle Center Point Command 42

Step 5: Create A Line Using Line Endpoints Command 43

Step 6: Create A Circle Using Circle Center Point Command 45

Step 7: Delete The Construction Line 47

Step 8: Trim - Divide The Bigger Circle 48

Step 9: Create Fillets Between The Two Circles 50

Step 10: Mirror The Shapes About X And Y Axis 52

Step 11: Change The Main Level To 2 56

Step 12: Create The Solid Body 57

Step 13: Create The Pockets 62
Step 14: Create The Top Boss 65
Step 15: Using Solids Manager 68
Step 16: Fillet The Part By Selecting Faces 69
Step 17: Chamfer The Top Boss 73
Step 18: Save The File 75
Tutorial #1 Review Exercise 76
Create The Geometry For Tutorial #1 Exercise 77
Tutorial #1 Geometry Creation Quiz 80
Tutorial 1: Toolpath Creation 81
Overview Of Steps Taken To Create The Final Part: 82
Suggested Fixture 83
Setup Sheet 83
Step 1: Select The Machine And Set Up The Stock 84
Step 2: Rough Out The Part Using Surface High Speed Area Roughing 91
Step 3: Backplot The Toolpaths 101
Step 4: Simulate The Toolpath In Verify 102
Step 5: Finish The Flat Areas Using Surface High Speed Horizontal Area 104
Step 6: Compare The Toolpaths With The Workpiece 112
Step 7: Finish The Walls Using The Surface High Speed Waterline 114
Step 8: Post The File 123
Step 9: Save The Updated MCAM File 124
Create The Toolpaths For Tutorial #1 Exercise 125
Tutorial #1 Toolpath Creation Quiz 128
Tutorial 2: Geometry Creation 129
Overview Of Steps Taken To Create The Part Geometry: 130
Tutorial #2 Drawing 131
Step 1: Setting Up The Graphical User Interface 132

Step 2: Create Two Circles Given The Center Points And The Diameters 133
Step 3: Create A Line 136
Step 4: Trim The Arc 138
Step 5: Create The Surface Wireframe 140
Step 6: Create A Sweep Surface 149
Step 7: Extend All Surface Edges 153
Step 8: Create The Solid Using Extrude 159
Step 9: Create The Solid 160
Step 10: Trim The Solid With The Surface 165
Step 11: Use The Rotate Command To Create The Other Half Of The Part 169
Step 12: Use The Solid Boolean Add Command To Make One Solid 172
Step 13: Create The Solid To Be Used As Stock 174
Step 14: Save The File 185
Create The Geometry For Tutorial #2 Exercise 188
Tutorial #2 Geometry Creation Quiz 192
Tutorial 2: Toolpath Creation 193
Overview Of Steps Taken To Create The Final Part: 194
Suggested Fixture 195
Setup Sheet 195
Step 1: Select The Machine And Set Up Tool Settings 196
Step 2: Setup The Stock Model 199
Step 3: Change The Main Level And Make The Stock Solid Invisible 201
Step 4: Surface High Speed - Area Roughing (Rest Material Strategy) 202
Step 5: Backplot The Toolpaths 215
Step 6: Simulate The Toolpath In Verify 216
Step 7: Create A Stock Model After The Rough Operation 217
Step 8: Finish One Side Of The Part Using Surface High Speed - Radial 219

Step 9: Backplot And Verify The Toolpath 225
Step 10: Finish The Area Using Surface High Speed Blend 228
Step 11: Finish The Entire Part Using Transform-rotate Toolpath 242
Step 12: Post The File 247
Step 13: Save The Updated MCAM File 248
Create The Toolpaths For Tutorial #2 Exercise 249
Tutorial #2 Toolpath Creation Quiz 253
Tutorial 3: Geometry Creation 255
Overview Of Steps Taken To Create The Part Geometry: 256
Tutorial #3 Drawing 257
Step 1: Setting Up The Graphical User Interface 258
Step 2: Create The Rectangle 258
Step 3: Create The 2D Wireframe For The Revolved Surface 260
Step 4: Create The Geometry To Cut The Solid 274
Step 5: Create The Wireframe For The Swept Surface 283
Step 6: Create Sweep Surface 307
Step 7: Create The Extruded Solid 311
Step 8: Create A Solid Body By Revolving A Closed Chain 321
Step 9: Cut The Revolve Solid Using The Solid Extrude Command 324
Step 10: Cut The Box Solid With The Revolved Solid Using Boolean Remove 331
Step 11: Use The Solid Trim Command To Cut The Solid With The Surface 334
Step 12: Add The Rest Of The Box To The Solid Using Boolean Add 340
Step 13: Apply A Draft Angle To The Vertical Faces 347
Step 14: Create The Solid Fillets 353
Step 15: Create Curve All Edges 360
Step 16: Save The File 361
Tutorial #3 Review Exercise 362
Create The Geometry For Tutorial #3 Exercise 363

Tutorial #3 Geometry Creation Quiz 369
Tutorial 3: Toolpath Creation 371
Overview Of Steps Taken To Create The Final Part: 372
Suggested Fixture 373
Setup Sheet 373
Step 1: Select The Machine And Set Up The Stock 374
Step 2: Rough Out The Part Using Dynamic OptiRough 378
Step 3: Backplot The Toolpaths 387
Step 4: Verify The Toolpath 388
Step 5: Set The Stock Model From The Rough Operation 389
Step 6: Surface High Speed Dynamic OptiRough - Rest Material 391
Step 7: Set The Stock Model After All The Roughing Operations 406
Step 8: Finish The Part Using Surface High Speed - Equal Scallop 409
Step 9: Post Process The File 420
Step 10: Save The Updated MCAM File 421
Create The Toolpaths For Tutorial #3 Exercise 422
Tutorial #3 Toolpath Creation Quiz 426
Tutorial 4: Geometry Creation 427
Overview Of Steps Taken To Create The Part Geometry: 428
Tutorial #4 Drawing 429
Step 1: Setting Up The Graphical User Interface 430
Step 2: Create The Revolved Surface Wireframe 430
Step 3: Create The Revolved Surface 442
Step 4: Create The 2D Wireframe For One Pocket 446
Step 5: Create The Wall Wireframe For One Pocket 461
Step 6: Create The Pocket Wall Surfaces 469
Step 7: Create The Pocket Floor Surface 472

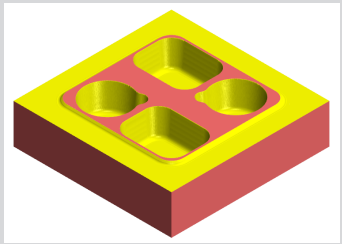
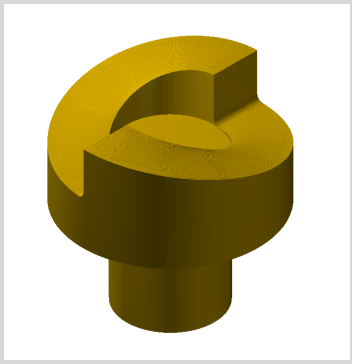
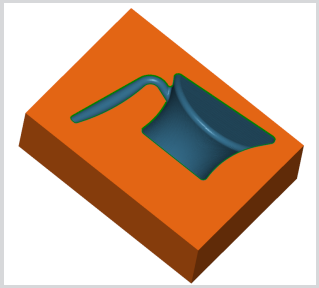
Step 8: Create The Fillet Surface 477
Step 9: Create The 2D Wireframe For The Cut In The Wall 481
Step 10: Create The Draft Surface With A 10 Degrees Draft Angle 492
Step 11: Trim The Surfaces 495
Step 12: Create The Symmetrical Geometry Mirrored About The Y Axis 505
Step 13: Create The Fillet Surfaces With The Radius 0.0625" 509
Step 14: Use Three Fillet Blend Surface To Smooth The Corners 521
Step 15: Rotate - Copy The Surfaces 523
Step 16: Change And Move Some Entities On A New Level 526
Step 17: Save The File 528
Tutorial #4 Review Exercise 529
Create The Geometry For Tutorial #4 Exercise 530
Tutorial #4 Geometry Creation Quiz 536
Tutorial 4: Toolpath Creation 537
Overview Of Steps Taken To Create The Final Part: 538
Suggested Fixture 539
Setup Sheet 539
Step 1: Select The Machine And Set Up The Stock 540
Step 2: Rough Out The Part Using Surface High Speed - Area Rough 544
Step 3: Backplot The Toolpaths 553
Step 4: Verify The Toolpath 554
Step 5: Set The Stock Model From The Rough Operation 555
Step 6: Cover The Pockets To Finish The Top Area 557
Step 7: Finish The Top Area Using Surface High Speed Spiral 559
Step 8: Finish The Walls Using Surface High Speed Waterline 568
Step 9: Scallop Cut The Pocket Using Maximum Stock Engagement 577
Step 10: Finish The Rest Of The Pocket Using Surface High Speed Scallop 587
Step 11: Finish The Rest Of The Pockets Using Transform Rotate 590

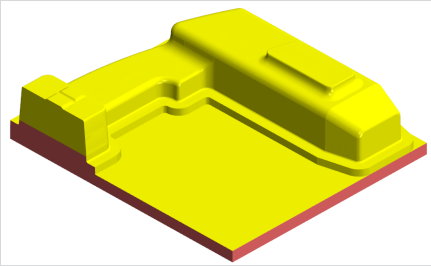
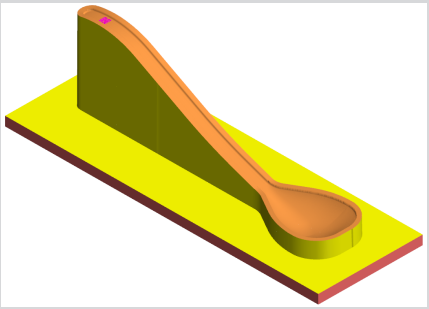
Step 12: Post Process The File 594
Step 13: Save The Updated MCAM File 595
Create The Toolpaths For Tutorial #4 Exercise 596
Tutorial #4 Toolpath Creation Quiz 601
Tutorial 5: Core Model Geometry 603
Overview Of Steps Taken To Create The Core Mold Of A Solid Model : 604
Tutorial #5 Drawing 605
Create The Solid Model 606
Step 1: Setting Up The Graphical User Interface 606
Step 2: Open The File With The Wireframe 606
Step 3: Create The Solid Base And Bosses 607
Step 4: Create The Draft Faces 617
Step 5: Move The Solid On A Different Level 621
Step 6: Create The Fillets 624
Step 7: Hollow The Solid Using Shell Command 638
Step 8: Modify The Shell Operation To Remove A Face 642
Step 9: Create The Cutouts Using Solids Extrude 645
Step 10: Create The Inside Pockets 650
Step 11: Save The File 664
Create The Mold Core 665
Step 12: Save The File To Create The Core Mold 665
Step 13: Prepare The Solid To Create The Core 665
Step 14: Use Solid Impression To Create The Mold Core 685
Step 15: Move The Origin At The Top, Center Of The Part 695
Step 16: Save The File 699
Tutorial #5 Review Exercise 701
Create The Mold Cavity Geometry For Tutorial #5 Exercise 702

Tutorial #5 Geometry Creation Quiz 705
Tutorial 5: Toolpath Creation **707**
Overview Of Steps Taken To Create The Final Part: 708
Suggested Fixture 709
Setup Sheet 710
Step 1: Select The Machine And Set Up The Stock 711
Step 2: 2D High Speed Dynamic Mill 715
Step 3: Backplot The Toolpath 724
Step 4: Simulate The Toolpath In Verify 725
Step 5: Rough Out The Core Using OptiRough Toolpath 726
Step 6: Finish The Core Using Surface High Speed Hybrid 737
Step 7: Clean The Sharp Edges Using Surface High Speed Pencil 745
Step 8: Finish The Outside Step Using 2D HS Dynamic Contour 752
Step 9: Post The File 760
Step 10: Save The Updated MCAM File 762
Create The Toolpaths For Tutorial #5 Exercise 763
Tutorial #5 Toolpath Creation Quiz 766
Tutorial 6: Geometry Creation **767**
Overview Of Steps Taken To Create The Surface Geometry: 768
Tutorial #6 Drawing 769
Create The Solid Model 770
Step 1: Setting Up The Graphical User Interface 770
Step 2: Open The File With The Wireframe 770
Step 3: Create The Net Surfaces 771
Step 4: Create The Loft Surfaces 780
Step 5: Create The Flat Boundary Surface 795
Step 6: Move The Surfaces On Level 10 798
Step 7: Save The File 801

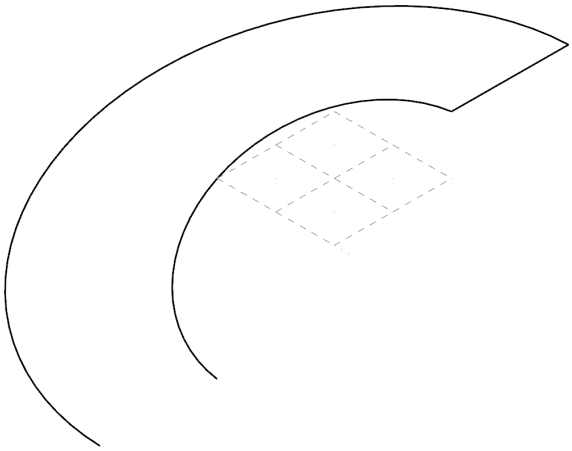
Tutorial #6 Review Exercise 803
Create The Geometry For Tutorial #6 Exercise 804
Tutorial #6 Geometry Creation Quiz 813
Tutorial 6: Toolpath Creation 815
Overview Of Steps Taken To Create The Final Part: 816
Suggested Fixture 817
Setup Sheet 818
Step 1: Select The Machine And Set Up The Stock 819
Step 2: 2D High Speed Dynamic Mill 823
Step 3: Backplot The Toolpath 830
Step 4: Simulate The Toolpath In Verify 831
Step 5: Rough Out The Boss Using OptiRough Toolpath 834
Step 6: Finish The Core Using Surface High Speed Scallop 844
Step 7: Clean The Sharp Edges Using Surface High Speed Pencil 851
Step 8: Engraving The Letter Using Surface High Speed Project 858
Step 9: Post The File 869
Step 10: Save The Updated MCAM File 870
Create The Toolpaths For Tutorial #6 Exercise 871
Tutorial #6 Toolpath Creation Quiz 875
Quiz Answers 877

Mill Advanced Projects

Tutorial	Geometry Functions	Toolpath Creation
#1 	Solid Extrude Create Body Solid Extrude Cut Body Solid Fillet Solid Chamfer	High Speed Area Roughing High Speed Horizontal High Speed Waterline
#2 	Swept Surface Solid Extrude Solid Trim To Surface Solid Boolean Add Use Levels	High Speed Surface Area Roughing Rest Material High Speed Surface Radial Surface Finish Blend Transform - Rotate By Coordinate
#3 	Wireframe for Solid Solid Extrude Solid Revolved Swept Surface Solid Trim to face Solid Fillet Solid Draft Face Boolean Remove Boolean Add	High Speed Surface Dynamic OptiRough High Speed Surface Dynamic OptiRough with Rest Material High Speed Surface Hybrid Edit Projection.

Tutorial	Geometry Functions	Toolpath Creation
#4 	Revolved Surface Project Curve Onto Surface Ruled/Draft Surface Curve At Intersection Trim Surface To Curves Surface Fillet Fillet Blend Surface	High Speed Surface Area Roughing High Speed Surface Spiral High Speed Surface Scallop Transform-Rotate High Speed Surface Waterline
#5 	Solid Extrude Solid Draft to Face Solid Constant Radius Fillet Solid Shell Curves All Edges Solid Impression	2D High Speed Dynamic Surface High Speed OptiRough Surface High Speed Hybrid Surface High Speed Pencil 2D High Speed Contour Dynamic
#6 	Net Surface Loft Surface Flat Boundary Surface	2D High Speed Dynamic Surface High Speed OptiRough Surface High Speed Scallop Surface High Speed Pencil Surface High Speed Project

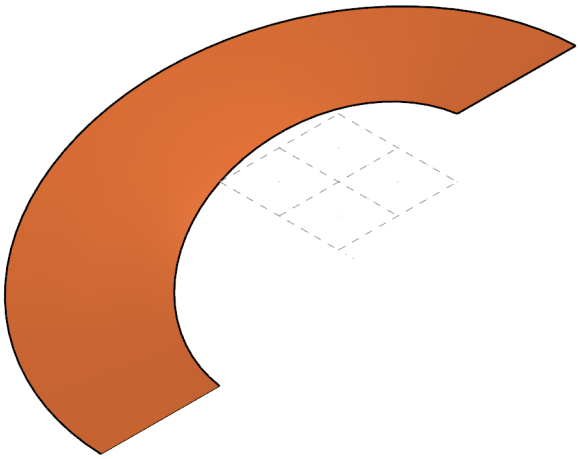
♦ The geometry should look as shown.



STEP 6: CREATE A SWEEP SURFACE

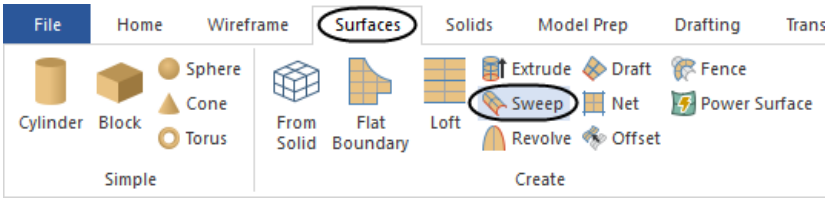
Sweep Surface is a surface generated by translating or rotating one or more contours (across curves) along one or two other contours (along curves).
Applications: it is used when the across section of the surface at any point is constant (when the surface is generated from one across contour and one along contour).
This is also used when the across section at any section is not constant (when the surface is generated from two or more across contours and one along contour). You can have a maximum of two along contours and just one across contour.

Step Preview:

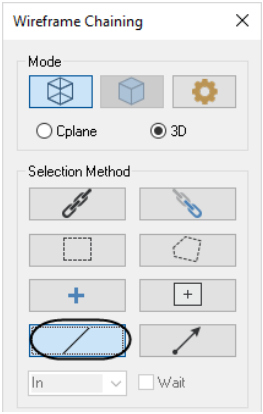


Surfaces

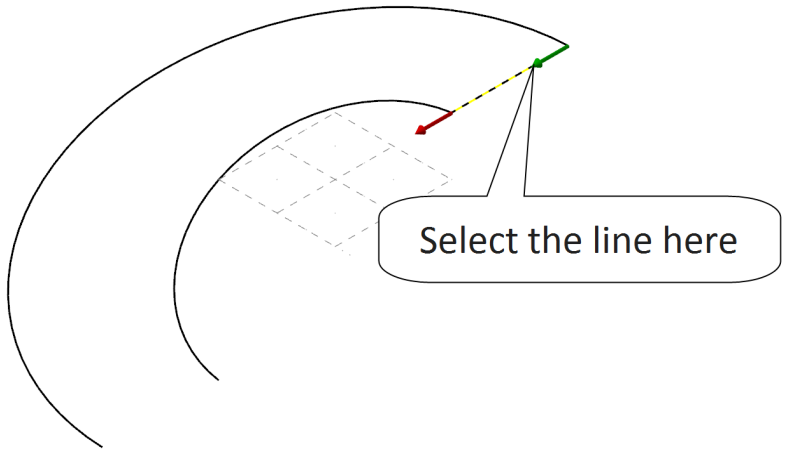
♦ From the **Create** group, select **Sweep** as shown.



♦ In the **Chaining** dialog box, enable **Single** as shown.

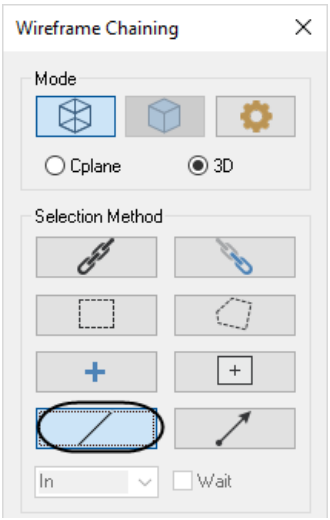


♦ [Swept surface: define the across contour(s)]: Select the line as shown.

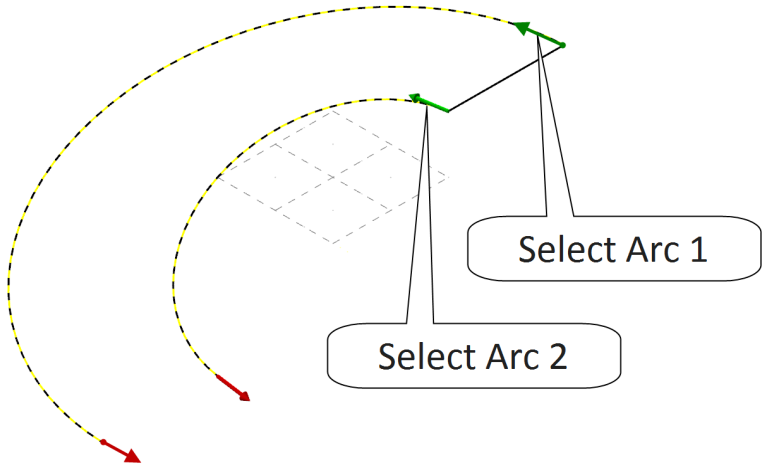


♦ In the **Chaining** dialog box, select the **OK** button to continue.

♦ In the **Chaining** dialog box, enable **Single** as shown.

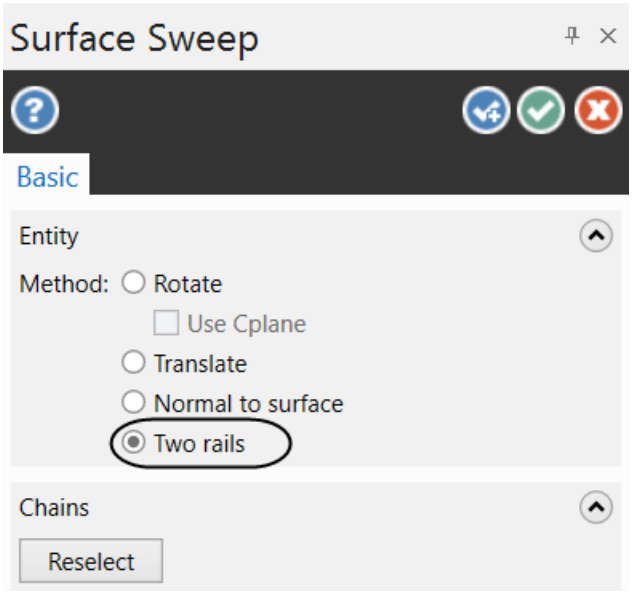


♦ [Swept surface: define the along contour(s)]: Select the arcs in the same directions as shown.

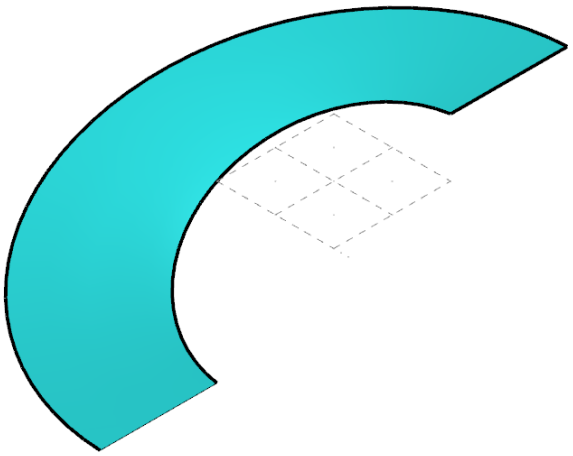


♦ In the **Chaining** dialog box, select the **OK** button to continue.

♦ In the **Surface Sweep** panel, enable **Two rails** as shown.



♦ The surface will be generated as shown.

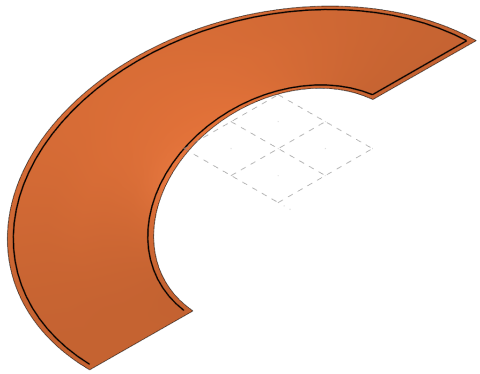


♦ From the **Surface Sweep** panel, select the **OK** button to exit the command.

STEP 7: EXTEND ALL SURFACE EDGES

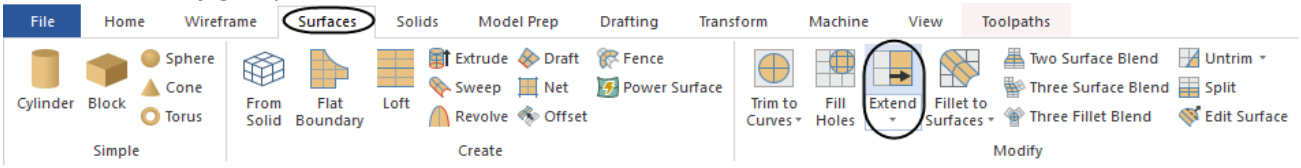
To be able to trim a solid to a surface, the surface edges need to overlap the edges of the solid. In this step you will use **Create Surface Extend** to extend all of the surface edges with a small amount.

Step Preview:

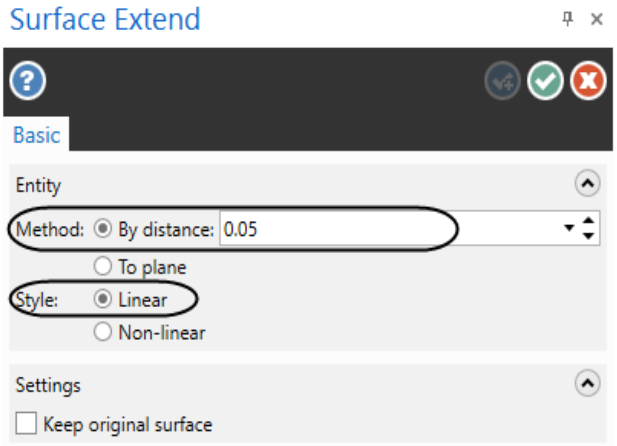


Surfaces

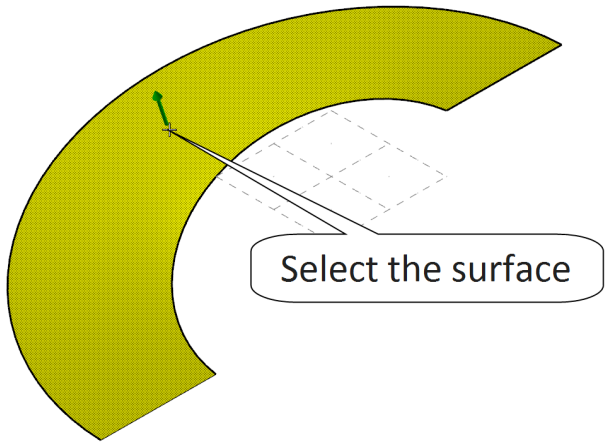
- From the **Modify** group, select the **Extend** icon as shown.



- In the **Surface Extend** panel, enable **Linear** and leave the **Method** set to **By distance** of **0.05**. Also, ensure that the **Keep original surface** is disabled as shown.

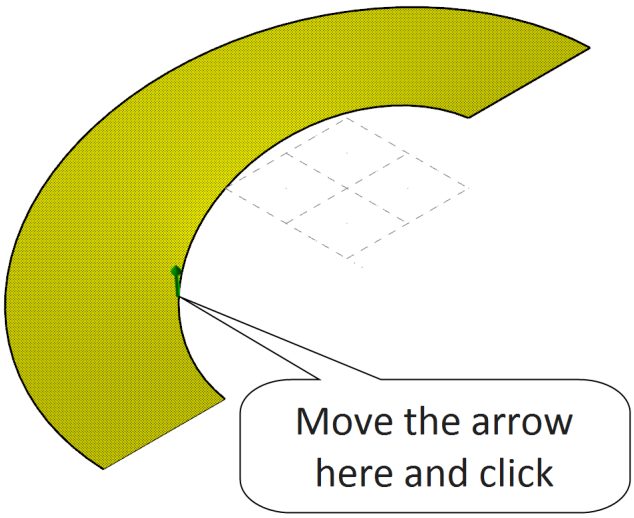


♦ [Select a surface to extend]: Select the surface as shown.

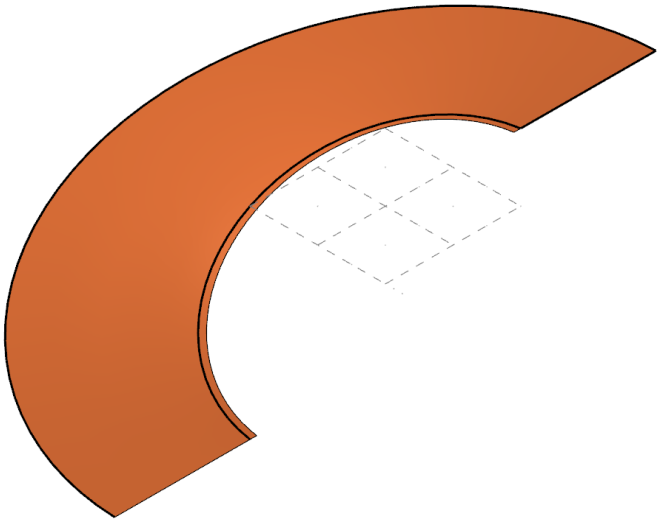


Note: When you click on the surface to be selected, an arrow will appear on the screen and Mastercam will prompt you to slide the arrow to the edge to extend from. You will have to drag the arrow to the edge and click to accept it. The cursor might not be on the arrow. You will need to repeat the steps for all four edges.

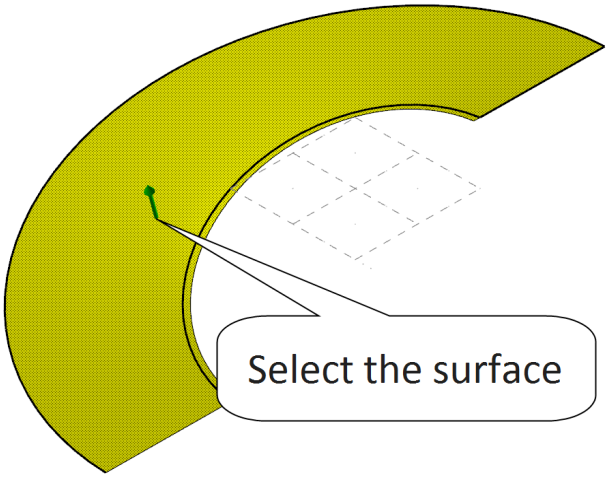
♦ [Slide arrow to edge to extend from]: Move the arrow as shown and click.



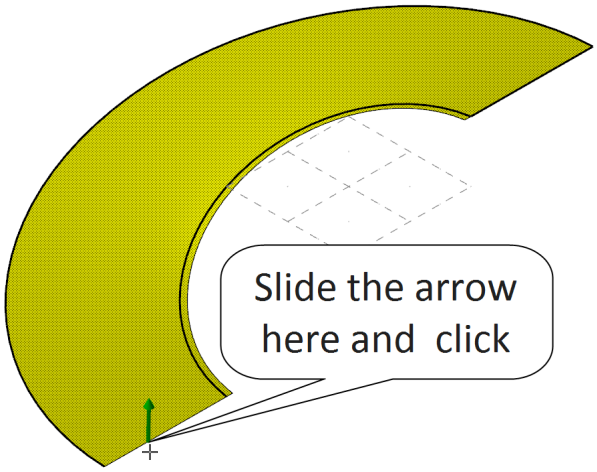
- The surface edge will be extended as shown.



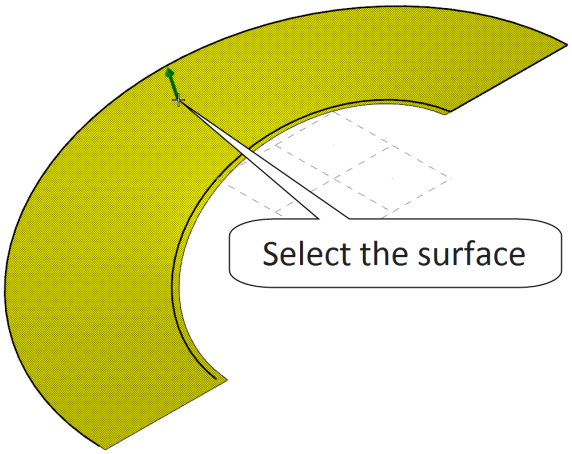
- In the **Surface Extend** panel, select the **OK and Create New Operation** button.
- [Select a surface to extend]: Select the surface as shown.



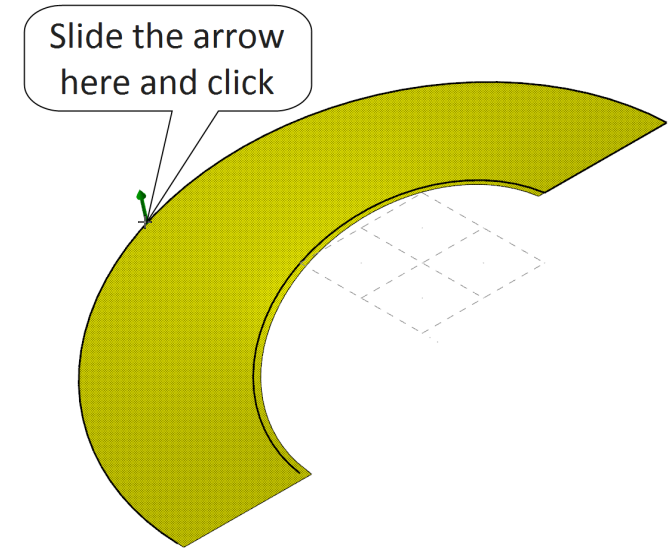
- [Slide arrow to edge to extend from]: Move the arrow as shown and click.



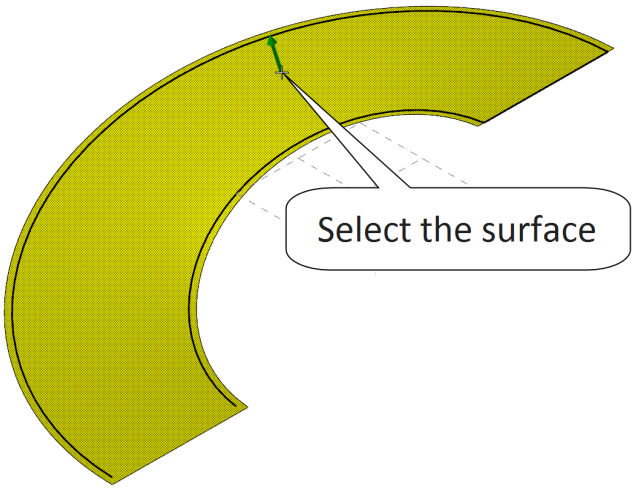
- In the Surface Extend panel, select the **OK and Create New Operation** button.
- [Select a surface to extend]: Select the surface as shown.



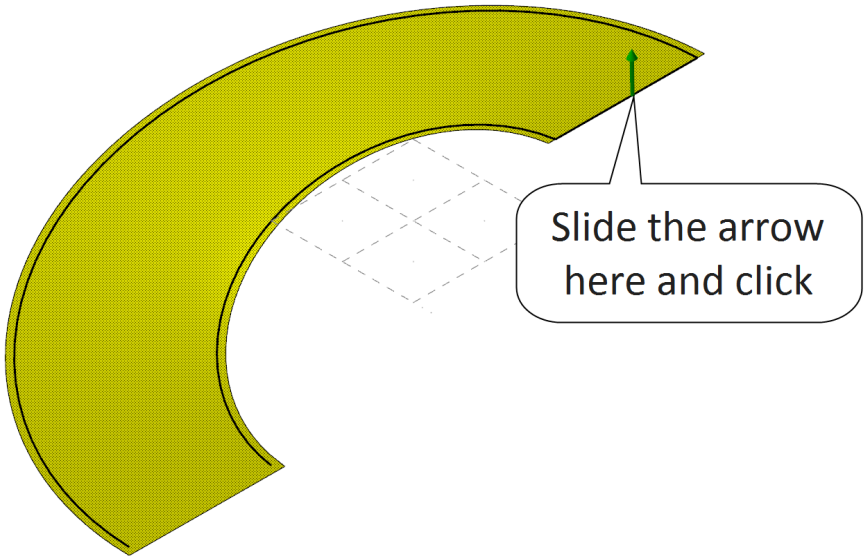
- [Slide arrow to edge to extend from]: Move the arrow as shown and click.



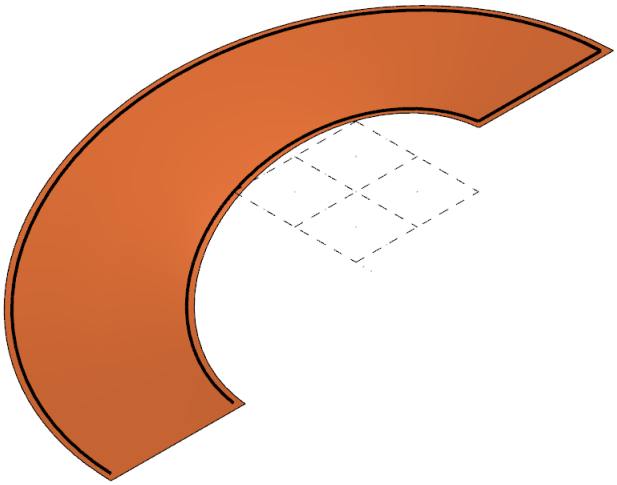
- In the **Surface Extend** panel, select the **OK and Create New Operation** button.
- [Select a surface to extend]: Select the surface as shown.



♦ [Slide arrow to edge to extend from]: Move the arrow as shown and click.



♦ The surface should look as shown.



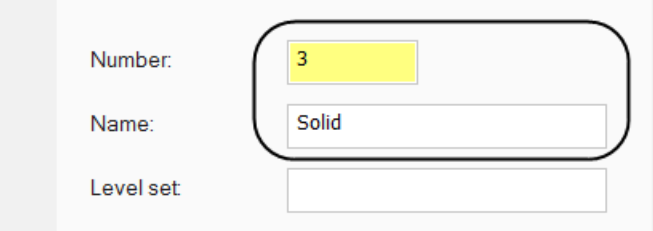
♦ Select the **OK** button to exit the command.

STEP 8: CREATE THE SOLID USING EXTRUDE

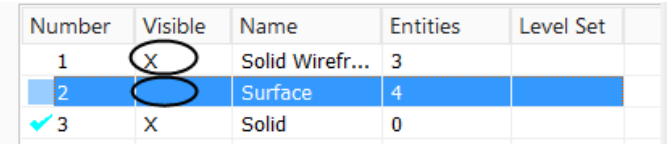
In this step you will use the **Solid Extrude** command to create the solid.

8.1 Make the Main Level Level 3 and make Level 1 visible and Level 2 invisible

- Select the **Levels** tab if needed.
- In the **Levels** panel, enter **3** in the **Number** field and then click in the **Name** field and type "Solid" as shown.

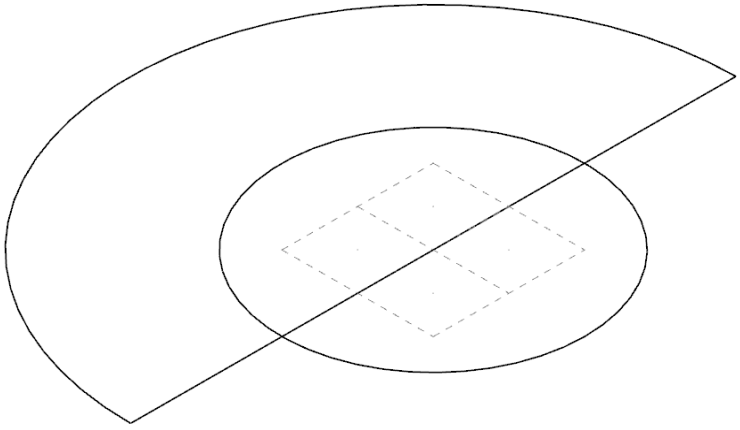


- Click in the **Visible** column next to **Level 1** to make it visible (the X should appear). Then click in the visible column next to **Level 2** to remove the X and make this level invisible as shown.



Number	Visible	Name	Entities	Level Set
1	X	Solid Wirefr...	3	
2		Surface	4	
3	X	Solid	0	

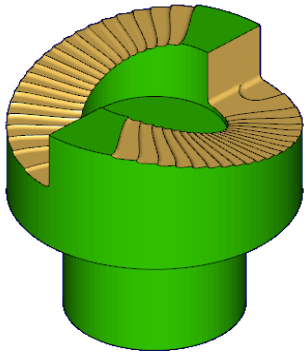
- The geometry should look as shown.



STEP 4: SURFACE HIGH SPEED - AREA ROUGHING (REST MATERIAL STRATEGY)

Surface High Speed Area Roughing with Rest Material Strategy toolpath is designed to calculate the cutting passes on only the stock left over from one or more previous roughing operations, instead of the entire drive surfaces (solid). In our case we will use the same stock model as the previous operation.

Toolpath Preview:

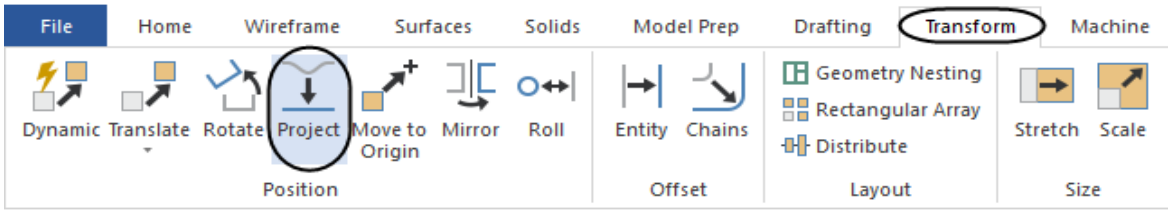


4.1 Project the arcs at 1.0" height above Z 0.0

Note: Our stock has a hole in the middle with the diameter of 2.0". To avoid machining the hole again, we should provide two containment boundaries; the 4.0" diameter outside arc and the 2.0" diameter arc. To be able to select them quickly, we should project them above the part.

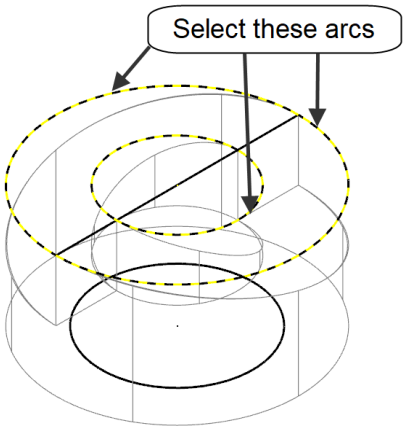
Transform

- From the **Position** group, select **Project** as shown.



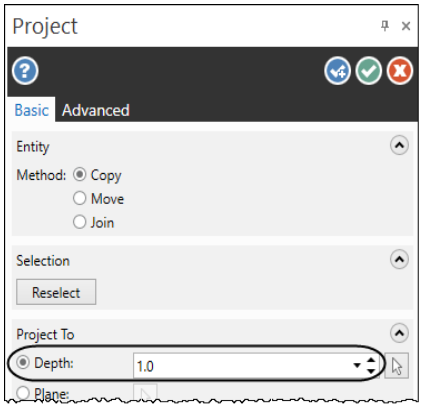
- Press **Alt + S** to unshade the surfaces if needed.
- In the **Quick Mask Toolbar** enable **Select only arc entities** icon as shown.

♦ [Select entities to project]: Select the arcs as shown.

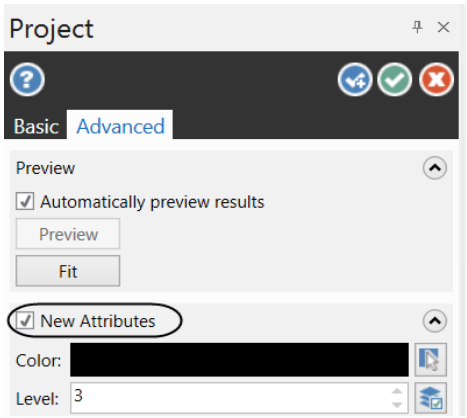


♦ Click on the **End Selection** button or press **Enter** to finish the selection.

♦ In the **Project** panel, make sure that **Copy** is selected and change the **Depth** to **1.0** as shown.



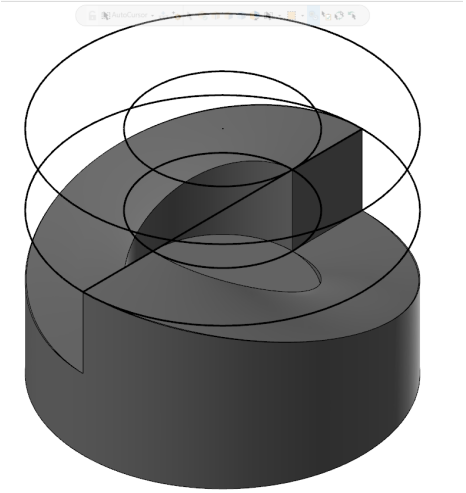
♦ Select the **Advanced** tab and enable **New Attributes** to create the arcs on **Level 3**.



♦ Select the **OK** button to exit the **Project** panel.

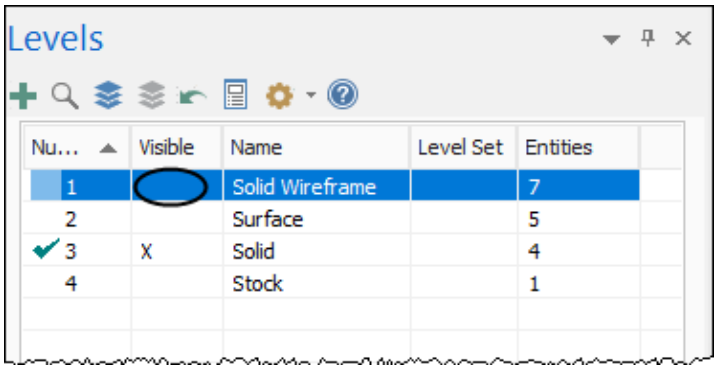
- Press **Alt + F1** to fit the drawing to the screen.
- Right mouse click in the graphics window and from the **Mini Toolbar**, select the **Clear Colors** icon.

- Press **Alt + S**, if needed, to display the solid in the shaded mode.
- The geometry should look as shown.

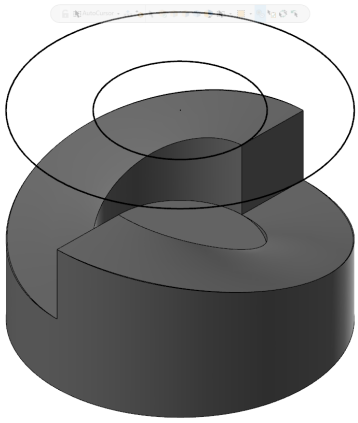


4.2 Make Level 1 invisible

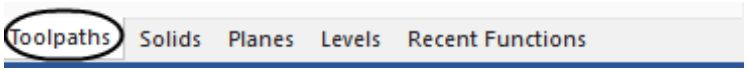
- In the **Levels** panel, remove the **X** in the **Visible** column of **Level 1** as shown.



- The geometry, in a shaded mode, should look as shown.



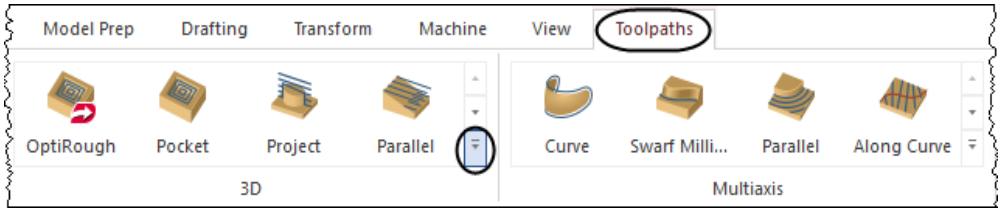
- Click on the **Toolpaths** tab to open the **Toolpaths Manager**.



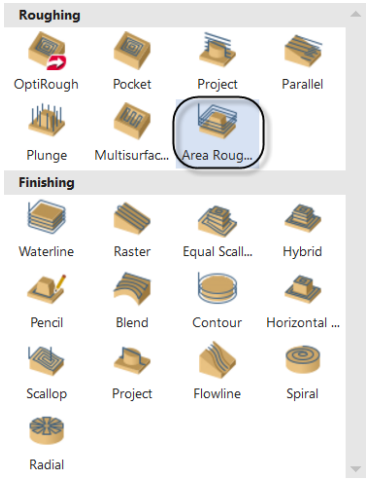
4.3 Toolpath selection

Toolpaths

- From the **3D** group, select the **Expand gallery** arrow as shown.



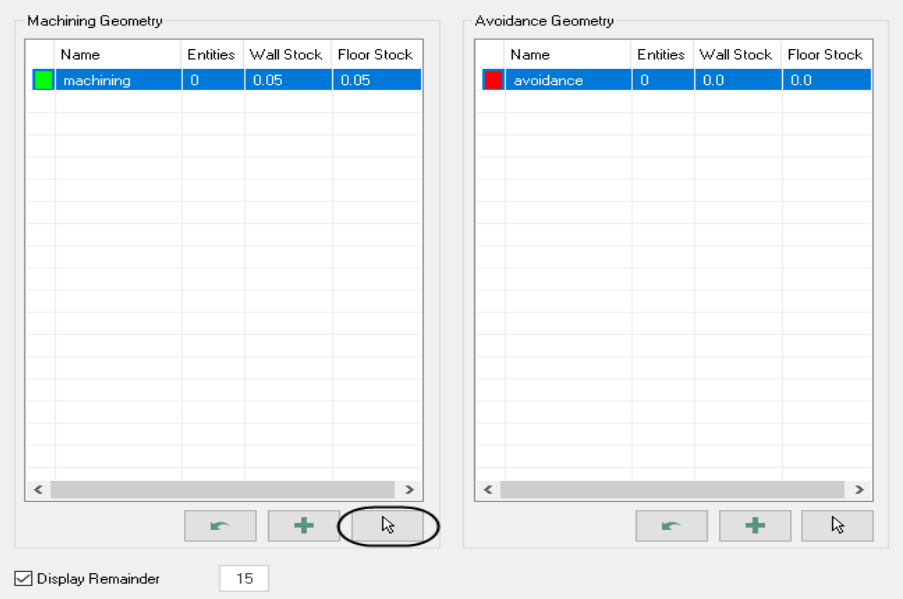
- From the **Toolpath gallery**, select **Area Roughing** as shown.



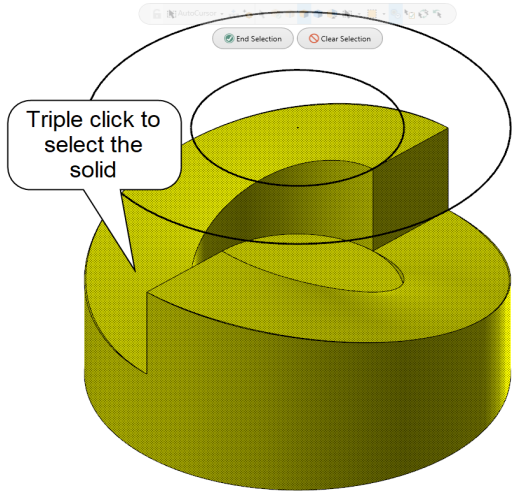
4.4 Surfaces or Solid selections

In the **Model Geometry** page you can select the geometry (surfaces or a solid) to be machined, as well as the geometry to be avoided. You can also set the stock to leave for both **Machining Geometry** and **Avoidance Geometry**.

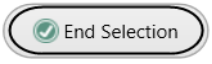
- From the **Model Geometry**, in the **Machining Geometry** area, click on the **machining** row to activate it and then click on the **Select** button as shown.



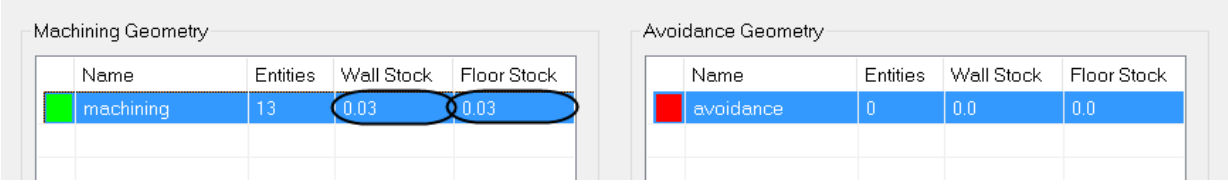
- [Select Solid Face, Surface, or Mesh]: Triple click to select the solid body as shown.



*Note: Make sure that the entire solid is selected. You can also make a window around the entire geometry if the triple click does not work, or use the **Quick Mask** bar to **Select all solid entities**.*

- Click on the **End Selection** button or press **Enter** to finish the selection. 

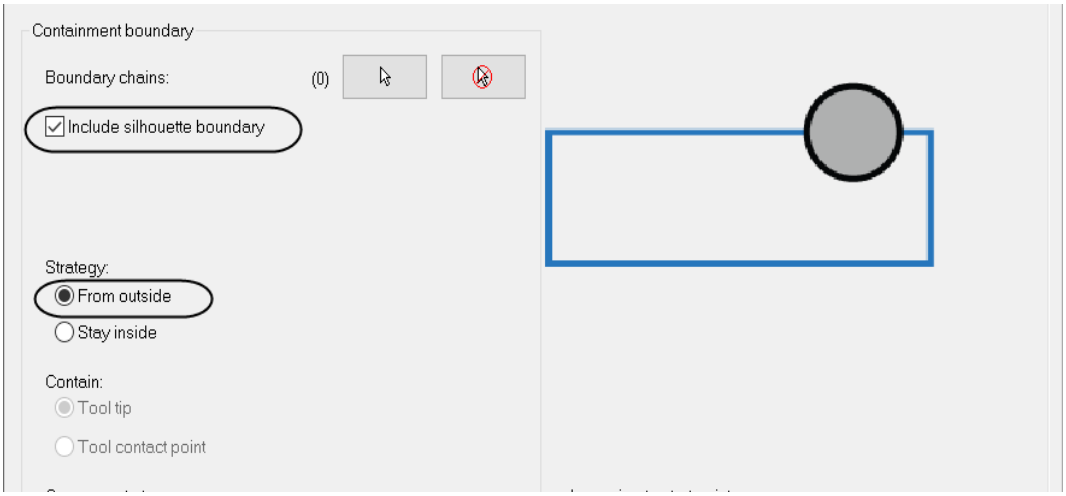
- Double click in the **Wall Stock** column and enter **0.03**. Repeat the step in the **Floor Stock** column if needed.
- The **Machining Geometry** and **Avoidance Geometry** area should look as shown.



4.5 Set the Toolpath Control Page

Use this page to set tool containment parameters and the Strategy used in the surface high speed toolpath. Containment boundaries are used to control the tool's position around the boundary of your part. The boundary is a closed set of wireframe curves which enclose the area to be machined. Mastercam will not create tool motions that violate the boundary, regardless of the selected cut surfaces. For **Area roughing**, if a boundary was not specified Mastercam will generate a min/max boundary around the selected drive surfaces. This boundary can be adjusted.

- From the **Tree view** list, select **Toolpath Control**.
- Enable the **Include silhouette boundary** and in the **Strategy** area, enable **From outside** as shown.

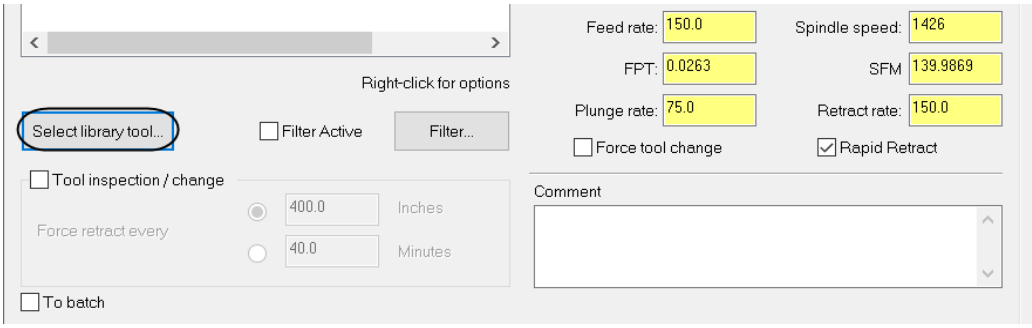


From outside sets the toolpath to start from the outside and work its way towards the inner boundary.

4.6 Setting the Tool page

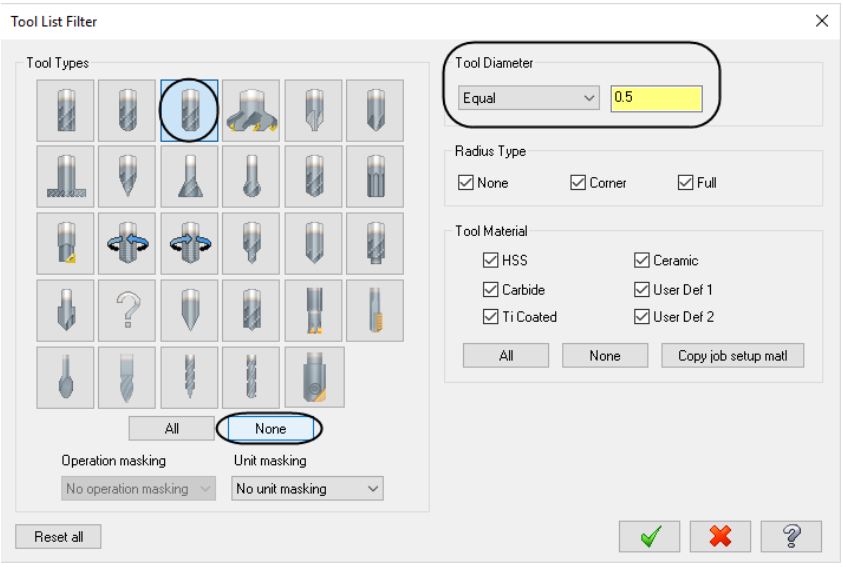
The **Tool** page allows you to select the tool and enter feeds and speeds and configure automatic tool inspection.

- From the **Tree View area**, select **Tool**.
- To select the tool, click on the **Select library tool** button as shown.



- Click on the **Filter** button.

- Under **Tool Types**, select the **None** button, then select **Bull Endmill** icon. Under **Tool Diameter**, select **Equal** and enter **0.5"** as shown.



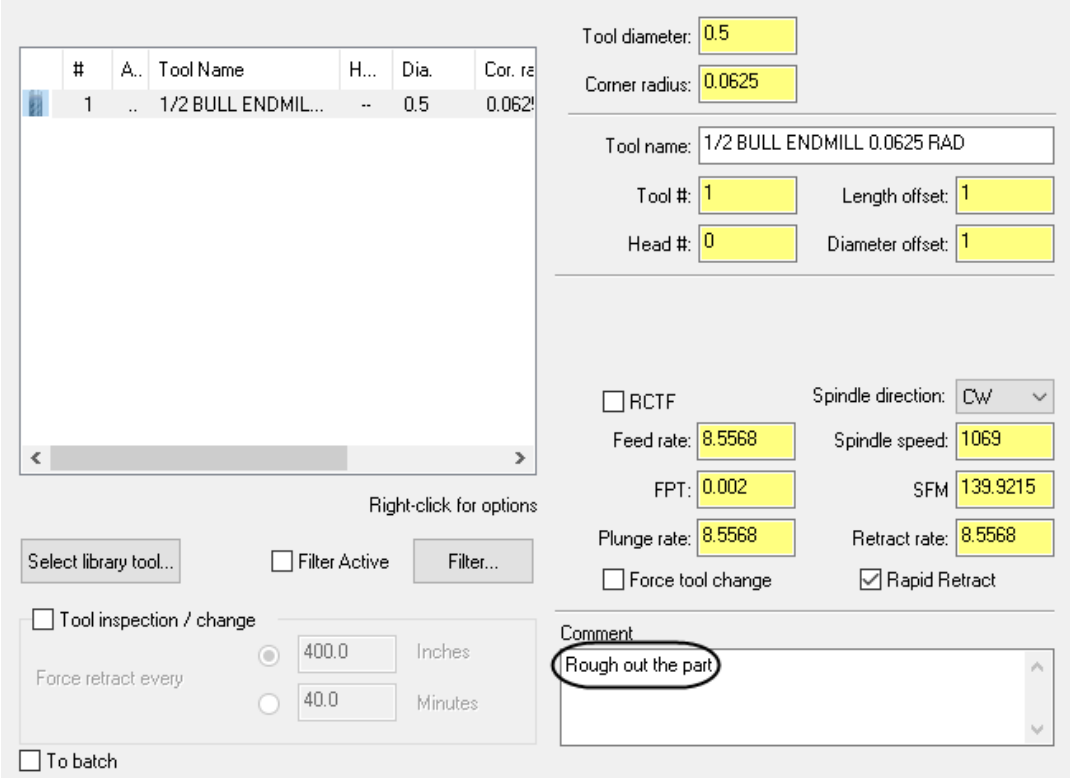
- Make sure that all the other settings are as shown in the screenshot above, and then select the **OK** button to exit.

- From the **Tool Selection** list, select the **1/2" Bull Endmill** with the corner radius **0.0625"**.

#	Assembly Na...	Tool Name	Holder Name	Dia.	Cor. rad.
344	--	1/2 BULL ENDMILL 0.0313 RAD	--	0.5	0.031...
345	--	1/2 BULL ENDMILL 0.0625 RAD	--	0.5	0.0625
346	--	1/2 BULL ENDMILL 0.125 RAD	--	0.5	0.125

- Select the **OK** button to exit the **Tool Selection** dialog box.

- Add a comment **Rough out the part** in the **Comment** area to identify the toolpath in the **Toolpaths Manager** and also in the NC file. The **Tool** page should look as shown.

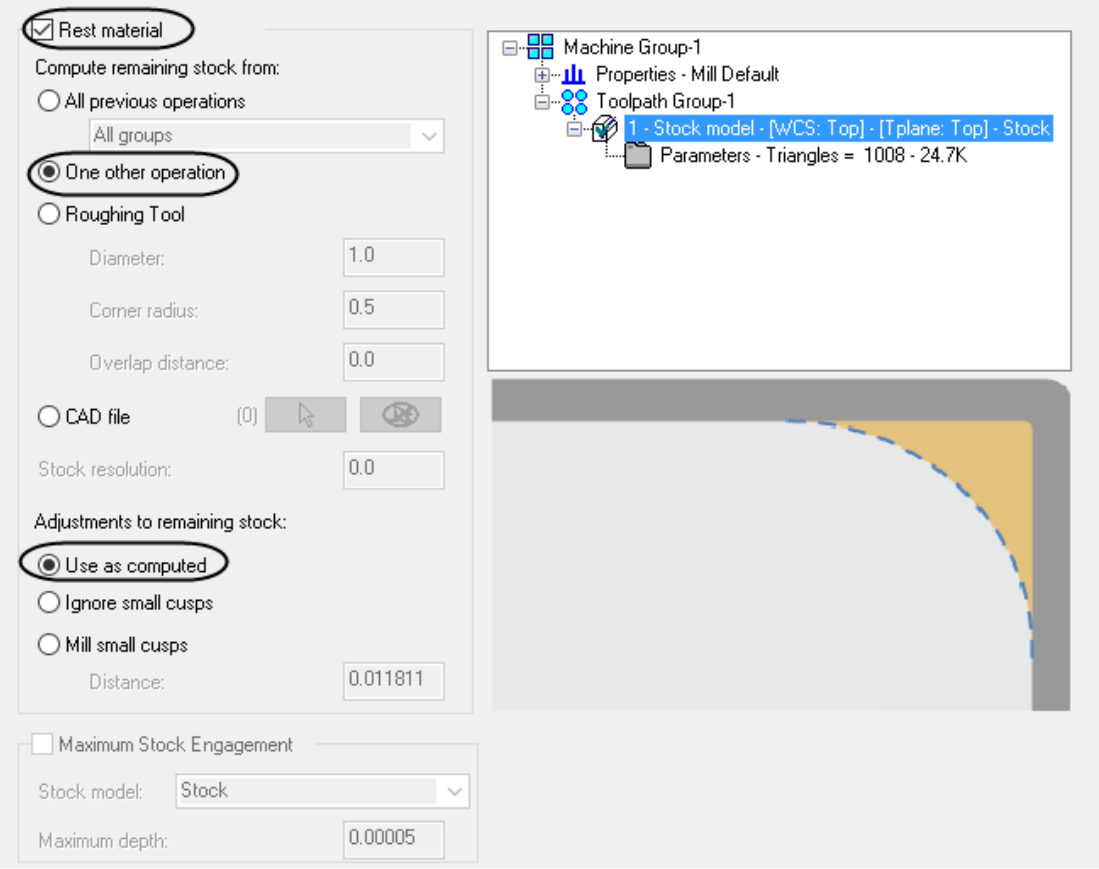


Note: The feeds and spindle speed are based on the tool definition. You can overwrite them with the feeds and speed that you want to use. For a high speed toolpath, the feed rates and the spindle speed are too small.

4.7 Set the Stock page

The **Stock** page allows you to define how Mastercam calculates the stock model for a surface high speed toolpath. The stock model defines the amount of stock to be machined by the toolpath. You can choose between one or more source operations from the current part, the diameter of the roughing tool or an external CAD file such as an STL file.

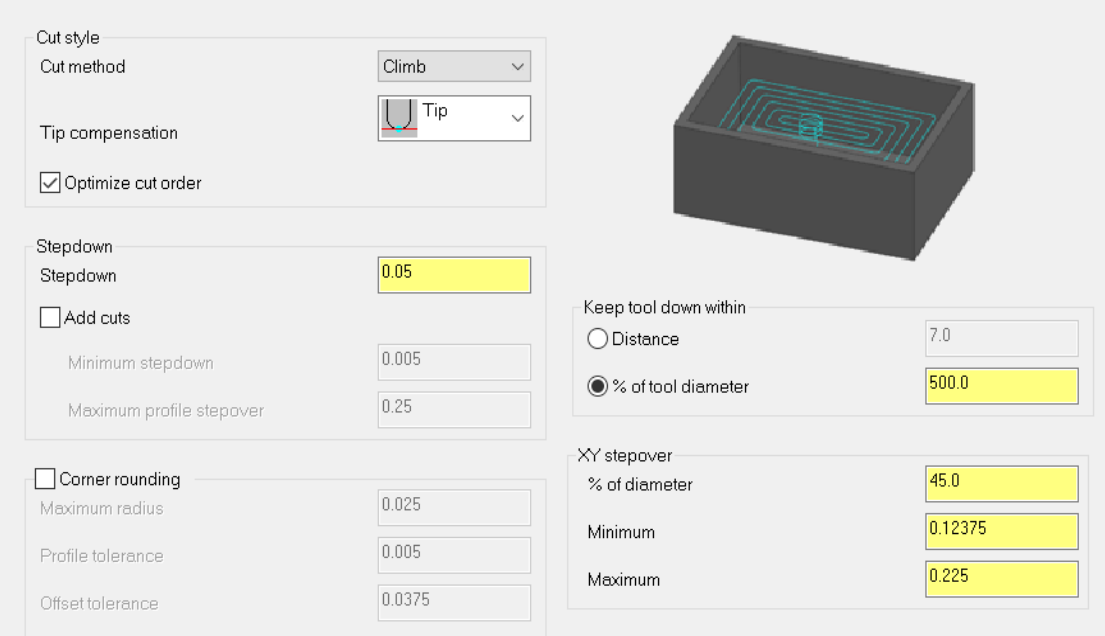
- From the **Tree View** area, select the **Stock** page.
- Enable **Rest material**, select **One other operation** and enable **Use as computed** as shown.



4.8 Set the parameters in the Cut Parameters page

In this page you can set the **Cutting method**, configure the Z spacing (**Stepdown**), the XY spacing (**XY stepover**) and the Smoothing (**Corner rounding**). You can also set the tool containment options.

♦ From the **Tree View** area, select the **Cut parameters** page and make sure the parameters are set as shown.



Optimize cut order places the tool in an area and keeps it there until all cuts in the area are made.

Stepdown value sets a constant Z spacing between cutting passes.

Add cuts allows you to insert additional cutting passes in areas of your part where the profile is close to flat.

Corner rounding is used to round the corners of the toolpath. This lets the machine tool maintain a higher feed rate and reduces wear on the cutter.

XY stepover settings allow you to configure the spacing between the passes at the same Z depth.

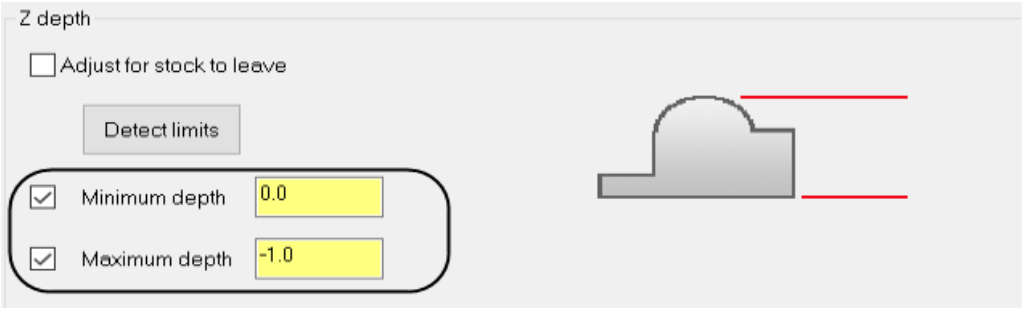
4.9 Set the Transitions page

*Note: The **Transitions** parameters are not beeing used in this toolpath as the toolpath strategy is set from the outside. The tool will automatically plunge.*

4.10 Set the Steep/Shallow page

The **Steep/Shallow** page allows you to limit how much of your drive surfaces will be machined. Typically these options are used to create machining passes in steep or shallow areas, but they can be useful for many different part shapes.

- From the **Tree View** area, select the **Steep/Shallow** page.
- Enter the **Minimum** and **Maximum depth** on the selected drive surface as shown.



Use Z depths allows you to enter the **Minimum** and **Maximum depth**.

Detect limits automatically populates the fields with the minimum and maximum depths, based on the selected drive surface.

In-House Solutions

Mastercam® 2020

TRAINING SOLUTIONS

- Training Tutorials
- Instructor Materials
- Handbooks
- Professional Courseware
- Pro. Cert. Curriculum
- Online Video eCourses
- Site Licenses
- Sitewide Subscription
- Online Community

TRAINING TUTORIALS

Our popular line of Mastercam Training Tutorials cover every Mastercam application, offering the most extensive collection of Mastercam training solutions available. Each book contains a series of tutorials that guide you through creating geometry, applying then verifying toolpaths and generating G-Code. Helpful hints, review exercises and quizzes complete the learning experience.

The Home Learning Edition (HLE) Demo Software is available for download with each eBook, and can be purchased on DVD for $5.

ARE YOU AN INSTRUCTOR?

Buy 10 or more of the Mill Essentials, Mill Advanced or Lathe Training Tutorials, get the corresponding Instructor Guide for Free! (see page 5)

Mill Essentials

The Mill Essentials Training Tutorial takes a very comprehensive look at 2D machining with Mastercam.

This book begins with the absolute basics by introducing the Mastercam user interface and will have you creating geometry, mastering 2D toolpaths and posting code before you know it.

- 7 Step-by-Step Tutorials with Review Exercises
- Includes Video Training DVD and Mastercam HLE Demo Software

Price $65 (eBook)
ISBN: 978-1-77146-870-1
Price $90 (Print)
ISBN: 978-1-77146-833-6

Lathe

The Lathe Training Tutorial is ideal for both beginners and current Mastercam users.

This book introduces 2D geometry creation and lathe 2D toolpaths providing an excellent foundation for many lathe applications.

- 7 Step-by-Step Tutorials with Review Exercises
- Includes Video Training DVD and Mastercam HLE Demo Software

Price $45 (eBook)
ISBN: 978-1-77146-872-5
Price $65 (Print)
ISBN: 978-1-77146-835-0

ORDER: 1.800.529.5517 • books@inhousesolutions.com • www.eMastercam.com

Mill Advanced

The Mill Advanced Training Tutorial picks up where Mill Essentials leaves off, introducing 3D concepts including surface high speed toolpaths.

It is strongly recommended that you have a good understanding of 2D machining before beginning this book.

- 6 Step-by-Step Tutorials with Review Exercises
- Includes Video Training DVD and Mastercam HLE Demo Software

Price $60 (eBook)
ISBN: 978-1-77146-871-8
Price $80 (Print)
ISBN: 978-1-77146-834-3

Multiaxis Essentials

The Multiaxis Essentials Training Tutorial is intended for the advanced Mastercam user looking to learn Mastercam multiaxis programming.

A firm grasp on both 2D and 3D machining is required which can be attained by completing the Mill Essentials and Mill Advanced Training Tutorials.

- 10 Step-by-Step Tutorials
- Includes Video Training DVD and Mastercam HLE Demo Software

Price $85 (eBook)
ISBN: 978-1-77146-878-7
Price $90 (Print)
ISBN: 978-1-77146-841-1

Multiaxis Advanced

The Multiaxis Advanced Training Tutorial is intended for the advanced Mastercam user.

This book contains projects demonstrating a variety of Multiaxis Advanced milling applications such as pattern application toolpaths.

- 6 Step-by-Step Tutorials
- Includes Mastercam HLE Demo Software

Price $75 (eBook)
ISBN: 978-1-77146-879-4
Price $80 (Print)
ISBN: 978-1-77146-842-8

Lathe C & Y Axis

The Mastercam 2020 Lathe C & Y Axis Training Tutorial is intended for the advanced lathe user that wants to learn how to program lathe parts that include milling operations.

Advanced C-Axis toolpaths as well as the Y-Axis rotation will be described in this book. Examples on how to use the Mill toolpaths on a Lathe with Live Tooling are also incorporated.

Price $65 (eBook)
ISBN: 978-1-77146-887-9
Price $85 (Print)
ISBN: 978-1-77146-848-0

Solids

The Solids Training Tutorial provides concise step-by-step instructions on creating and manipulating 3D wireframe and solid geometry.

This book details commands such as extrude, loft, revolve, sweep, boolean add, fillet, chamfer and more.

- 9 Step-by-Step Tutorials with Review Exercises
- Includes Mastercam HLE Demo Software

Price $40 (eBook)
ISBN: 978-1-77146-873-2
Price $60 (Print)
ISBN: 978-1-77146-836-7

Mastercam for SOLIDWORKS

The Mastercam 2020 for SOLIDWORKS Programming Exercises book provides a comprehensive "hands on" method of learning Mastercam for SOLIDWORKS. You will learn how to program a variety of different parts that require most of the toolpath types available in Mastercam for SOLIDWORKS. Extensive emphasis is put on making parametric changes and toolpath updates to match the SOLIDWORKS model changes. Primary focus is on toolpath creation on SOLIDWORKS models.

Price $65 (eBook)
ISBN: 978-1-77146-881-7
Price $85 (Print)
ISBN: 978-1-77146-844-2

Router

The Router Training Tutorial offers detailed coverage of 2D geometry creation, drilling, contouring, pocketing, nesting, block drilling and importing graphics to machine.

Instruction on tool settings, stock setup and custom profile tool creation are also included.

- 8 Step-by-Step Tutorials with Review Exercises
- Includes Mastercam HLE Demo Software

Price $65 (eBook)
ISBN: 978-1-77146-876-3
Price $85 (Print)
ISBN: 978-1-77146-839-8

Beginner

The Beginner Training Tutorial provides a comprehensive step-by-step approach to learning the basics of three Mastercam modules: Mill Essentials (2D), Lathe and Solids.

It is an excellent choice for new Mastercam users looking to get a broader overview of the software.

- 8 Step-by-Step Tutorials with Review Exercises
- Includes Mastercam HLE Demo Software

Price $65 (eBook)
ISBN: 978-1-77146-874-9
Price $85 (Print)
ISBN: 978-1-77146-837-4

Design

The Design Training Tutorial provides a comprehensive step-by-step approach to learning geometry creation within Mastercam.

Its focus is 2D and 3D geometry creation with explanations given on how to dimension the parts.

- 12 Step-by-Step Tutorials with Review Exercises
- Includes Mastercam HLE Demo Software

Price $45 (eBook)
ISBN: 978-1-77146-875-6
Price $65 (Print)
ISBN: 978-1-77146-838-1

CAD Import & Mill Essentials

The CAD Import & Mill Essentials Toolpaths Training Tutorial is intended for anyone looking to understand the ins and outs of Mastercam Mill Essentials toolpaths, while learning the best practices for importing geometry from various CAD software packages.

- 7 Step-by-Step Tutorials with Review Exercises
- Includes Mastercam HLE Demo Software

Price $70 (eBook)
ISBN: 978-1-77146-878-7
Price $90 (Print)
ISBN: 978-1-77146-846-6

CAD Import & Mill Advanced

The CAD Import & Mill Advanced Toolpaths Training Tutorial consists of 6 projects and 6 accompanying practice exercises. It is intended for intermediate to experienced Mastercam users who are primarily importing 3D geometry from another CAD software package.

- 6 Step-by-Step Tutorials with Review Exercises
- Includes Mastercam HLE Demo Software

Price $60 (eBook)
ISBN: 978-1-77146-884-8
Price $80 (Print)
ISBN: 978-1-77146-847-3

Wire

The Wire Training Tutorial provides users with an excellent resource for learning how to use Mastercam to program wire EDM machines.

In addition to geometry creation, the book focuses on wirepaths for dies, taper angle projects and more.

- 6 Step-by-Step Tutorials with Review Exercises
- Includes Mastercam HLE Demo Software

Price $40 (eBook)
IBSN: 978-1-77146-877-0
Price $60 (Print)
ISBN: 978-1-77146-840-4

Project Workbook

The Mastercam 2020 Project Workbook is ideal for High School students, hobbyists and those who prefer engaging in project-based learning. The Workbook includes an overview of CAD/CAM and basic machining followed by a series of step-by-step projects for both mills and lathes. *Note: no machining instructions included.*

- Five projects included: Art Lithophane, Bowling Pin, Shield, F1 Car, and Jewelry Box
- Includes Mastercam HLE Demo Software

Price $60 (eBook)
ISBN: 978-1-77146-880-0
Price $75 (Print)
ISBN: 978-1-77146-843-5

Nesting eBook

This tutorial includes a variety of projects that are using Nesting options in Mastercam to fit parts onto a sheet of material for best yield.

You will learn how Nesting operates on geometry and how you can create and use tabs to assist in holding down the nested parts. You will also learn how Nesting operates on toolpaths and how you can use WCS (Work Coordinate System) to set the parts of an assembly in the proper view for machining.

Price $35
(eBook only)
ISBN: 978-1-77146-885-5

SITE LICENSE

An eBook site license allows an educational facility to purchase one or several of our Training Solutions in eBook format (PDF). This in turn grants lifetime access to the content from any workstation on campus for unlimited users.

For more information on eBook Site Licenses, email **eBooks@inhousesolutions.com** or call **1.800.529.5517**.

INSTRUCTOR KITS

These are the ultimate toolkits for instructors looking to enhance their 2D mill, 3D mill and lathe classes while minimizing prep time. Each kit contains tests, quizzes, mid-terms, finals, powerpoint presentations, lesson plans, answer sheets, and more.

Instructor Guide & Training Tutorial are included in each kit. Each print kit includes an Instructor DVD, Video Training DVD, and Mastercam HLE Demo Software. Download links are provided for eBook kits.

eBook

Bundle of all three:
$200
ISBN: 978-1-77146-882-4

Print

$100 Mill Essentials Kit
ISBN: 978-1-77146-864-0
$100 Mill Advanced Kit
ISBN: 978-1-77146-865-7
$100 Lathe Kit
ISBN: 978-1-77146-866-4

Bundle of all three:
$250
ISBN: 978-1-77146-845-9

ORDER: 1.800.529.5517 • books@inhousesolutions.com • www.eMastercam.com

NEW!

MASTERCAM PROFESSIONAL CERTIFICATION CURRICULUM

This 3-part series is designed to help you prepare for your Professional Level Mastercam Certification™ Test. The skills exam must be administered by a Mastercam Certified Instructor or a Mastercam Certified Reseller.

Part 1 – Mill 2D

Part 1 – Mill 2D begins at the absolute basics by introducing the Mastercam user interface. It will have you creating geometry, drilling and creating contour toolpaths before you know it. Its gradual progression leads to more advanced concepts such as multiple setup scenarios and 2D High Speed Toolpaths. All of the parts within the book are designed with machinability in mind.

A multitude of topics are covered including 2D geometry, tool settings, stock setup, drilling, tapping, contouring, pocketing, circle milling. You will learn the 2D High Speed Toolpaths such as dynamic mill, area mill, dynamic rest mill, how to import a solid and machine it and how to use the WCS in multiple fixture applications.

Price $100

ISBN: 978-1-77146-867-1

Part 2 – Solids

Part 2 – Solids will teach a variety of useful solids commands, that include extrude, loft, revolve, sweep, boolean add and remove, fillet, chamfer, shell, trimming, and creating solid patterns. You will learn how to change a solids color and create a solid geometry from surfaces, as well as how to manipulate a solid by using commands from the Model Prep menu such as Push-Pull, Move and Split Solid Face. You will use create Layout and learn how to dimension parts to create blueprints.

Price $100

ISBN: 978-1-77146-868-8

Part 3 – Advanced Mill 2D

Part 3 – Advanced Mill 2D is dedicated to the power user. You will learn how to machine an imported solid model using the WCS for multiple setups. To better organize the parts, you will master how to use levels and view sheets. You will practice indexing a 4-axis part using the tool planes defined in the Plane manager. Fixtures will be used and the part will be align to their faces. You will learn how to save operations to a library and how to import them for different parts. A brief introduction to the basic 3D machining will be also covered.

Price $100

ISBN: 978-1-77146-869-5

Part 1, 2 & 3 Bundle

This part 1, 2 & 3 bundle provides you all three Mastercam Professional Certification Curriculum at a better price.

Price $250

ISBN: 978-1-77146-904-3

ORDER: 1.800.529.5517 • books@inhousesolutions.com • www.eMastercam.com

HANDBOOKS

The Mastercam 2020 Handbooks provide an academic approach to teaching the theory and application of Mastercam. The Handbook series is designed to teach the fundamentals of Mastercam, gradually working up to more complex material with each volume. Each Handbook comes with a Student DVD that contains files referenced within the book, and the Mastercam 2020 HLE Demo Software.

Handbook Volume 1
Mill 2D & Solids

The Mastercam 2020 Handbook Volume 1 is an excellent resource that teaches the theory of Mastercam Mill and Solids. The material intertwines conceptual subject matter with practical applications suitable for beginners and intermediates alike. You not only learn how to use Mastercam but why things work as they do.

Price $90 (eBook)
ISBN: 978-1-77146-893-0
Price $98 (Print)
ISBN: 978-1-77146-855-8

Handbook Volume 2
3D Modeling & Machining

The Mastercam 2020 Handbook Volume 2 takes an academic approach to teaching Mastercam 3D modeling and machining. The material is most suitable for intermediates (including individuals that have completed Volume 1). The book teaches more advanced CAD modeling techniques and explains surface creation.

Price $90 (eBook)
ISBN: 978-1-77146-894-7
Price $98 (Print)
ISBN: 978-1-77146-856-5

Handbook Volume 3
Multiaxis & Machining

The Mastercam 2020 Handbook Volume 3 is an excellent resource that teaches the theory of multiaxis machining with Mastercam. This book covers the classic family of multiaxis toolpaths including drill 5-axis, curve 5-axis, swarf 5-axis, multiaxis flowline and multiaxis multi-surfaces as well as the drill & circle mill family.

Price $90 (eBook)
ISBN: 978-1-77146-895-4
Price $98 (Print)
ISBN: 978-1-77146-857-2

FREE eBOOKS

How-To Tips Collection

The In-House Solutions support specialists take note of the questions that are asked. We realize that if you're asking a question there are ten more people who want to know the answer but haven't asked. Our goal is to make your life easier, so we've collected the answers to your most popular questions here, in one convenient eBook.

Price – FREE!
(eBook only)

Horizontal Machining with Indexing

The Indexing Training Tutorial explains how to use the Plane Manager for working with tool planes and work offsets.

Examples include horizontal machining using the WCS and a multiple fixtured tombstone project.

Price – FREE!
(eBook only)

Download at www.**eMastercam**.com/**freebooks**

Mastercam @Courses

Included with each eCourse: HLE demo software, corresponding PDF eBook, and personalized final certificate.

Mastercam CAD/CAM Systems 2020 Home Learning Edition Demo Software DOWNLOAD

LOG IN & LEARN TODAY!

Expand your Mastercam knowledge, anytime and at your own pace, with our selection of step-by-step online video eCourses.

Mastercam eCourses provide both novice and seasoned Mastercam users with the tools and information they need to excel.

The *"log in & learn"* format of each eCourse allows users to set up their own online classroom, where each user's experience is customized and tracked. Because the eCourses are not subscription-based and have no expiration date, users can log on and off at any time, and finish the program at their convenience without additional expense.

Approximate completion time ranges from 7.5 to 15 hours depending on the eCourse, making it possible for employees or students to gain new skills outside of work or studies.

Highlights:

- Online previews with table of contents including the time it takes to complete each session.
- Mastercam 2020 Home Learning Edition Demo Software download is included so you can follow along with our instructors.
- Corresponding eBook is provided.
- Quizzes follow each tutorial.
- Personalized certificate of completion for each successfully completed eCourse.
- **Instant, lifetime access**

$149 each

ORDER: 1.800.529.5517 • books@inhousesolutions.com • www.eMastercam.com

Mill Essentials eCourse

The Mill Essentials eCourse introduces students to 2D CAD and milling toolpaths. It covers wireframe and solids creation as well as 2D mill toolpaths such as contour, drilling, blend, peel, dynamic area, transform, Feature Based Drilling, and more. This course serves as an excellent introduction to Mastercam.

Mill Advanced eCourse

The Mill Advanced eCourse builds on what students have learned in the Mill Essentials eCourse. It moves into more advanced CAD and demonstrated 3D wireframe, solid, and surface creation commands. 3 axis toolpaths such as Area Roughing, Dynamic OptiRough, Scallop, Pencil, Waterline, Radial, Hybrid, and more are covered.

Lathe eCourse

The Mastercam Lathe eCourse covers wireframe creation, working with imported part files, stock setup, facing, roughing, finishing, grooving, drilling, and cutoff toolpaths. Stock operations such as advance, flip, and tailstock are also covered. You will also learn how to program parts in a VTL.

Multiaxis Essentials eCourse

The Multiaxis Essentials eCourse covers 4 & 5 axis toolpaths. Toolpaths include contour with axis substitution, drilling with axis substitution, drilling with rotary axis positioning, rotary 4-axis, curve 5-axis, swarf 5-axis, drill 5-axis, circle mill 5-axis, flow 5-axis, and multisurface 5-axis. This course skips most CAD in favor of focusing on toolpaths.

www.**eMastercam**.com/**eCourses**

2020

ORDER: 1.800.529.5517 • books@inhousesolutions.com • www.**eMastercam**.com

ORDER: 1.800.529.5517 • books@inhousesolutions.com • www.eMastercam.com

www.**eMastercam**.com

Sitewide Subscription

An eMastercam sitewide subscription will grant you instant access to all of our online resources, including our full library of eBooks and eCourses. Once subscribed, you will be able to watch all of our streaming eCourses in your browser or read any of our Mastercam eBooks using our Webviewer.

$39.99 /1 month

$129.99 /4 months (save $29.97)

BEST VALUE:

$359.99 /12 months (save $119.89)

www.**eMastercam**.com/
sitewide-subscription

PROFESSIONAL COURSEWARE

The Mastercam Professional Courseware titles are intended for industrial training settings. Instead of step-by-step instructions, these books introduce concepts through sequences of specialized training exercises followed by parts the users are expected to produce with minimal guidelines.

Professional Courseware Mill Essentials

The Mastercam 2020 Mill Essentials Professional Courseware provides in-depth coverage of 2D wireframes and solids geometry, as well as contour, pocket, drilling, circle milling and slot milling toolpaths. More advanced exercises explain the use of the Work Coordinate System (WCS), 2D high speed toolpaths, Feature Based Machining (FBM) and more.

Price $60 (eBook)
ISBN: 978-1-77146-896-1
Price $70 (Print)
ISBN: 978-1-77146-858-9

Professional Courseware Mill Advanced

The Mastercam 2020 Mill Advanced Professional Courseware covers a multitude of features that teach a user to create 3D wireframes, surfaces and solids for 3D modeling and toolpaths. Interactive training exercises introduce 3D geometry functionality, while newer surface high speed toolpaths are thoroughly investigated along with their various parameter settings.

Price $50 (eBook)
ISBN: 978-1-77146-897-8
Price $60 (Print)
ISBN: 978-1-77146-859-6

Professional Courseware Lathe

The Mastercam 2020 Lathe Professional Courseware offers an in-depth look at Mastercam Lathe geometry and toolpath creation. Advanced toolpaths such as Misc Ops and C-Axis toolpaths are also described. Additional Mastercam files are provided along with guidelines for creating the toolpaths to machine each part.

Price $55 (eBook)
ISBN: 978-1-77146-898-5
Price $65 (Print)
ISBN: 978-1-77146-860-2

Professional Courseware Multiaxis

The Mastercam 2020 Multiaxis Professional Courseware details numerous toolpaths that allow a user to successfully machine 4-axis and 5-axis parts. Multiaxis Advanced toolpaths have been included with more complex parts along with instructions on how to machine them. Machine Simulation is used to check for any collisions between the part, the tool and any of the machine's components.

Price $65 (eBook)
ISBN: 978-1-77146-899-2
Price $75 (Print)
ISBN: 978-1-77146-861-9

Join the eMastercam community!

eMastercam is one of the largest and oldest online forums for swapping knowledge of CNC machines, tools, manufacturing processes and technology. After hours, eMastercam continues to be a place for Machinists, Engineers and others in the manufacturing industry to connect, share stories, opinions and get to know each other beyond the parts we make and the tools we use.

- Active user forums with an education-specific sub forum
- Free downloads and educational resources
- Free post processors and advanced development requests
- Overviews of Mastercam 2020 and related products
- The place to find our Mastercam Training Solutions
- Industry insights and much more!

www.**eMastercam**.com/**forums**

eMastercam.com
YOUR ONLINE MASTERCAM SOURCE

We don't just educate, we inspire!

eMastercam
We appreciate your feedback

TELL US WHAT YOU THINK

Our goal is to provide you the best Mastercam Training Solutions, and we do that with your help.

- Tell us what you like about our training solutions
- Let us know what you think can be improved
- Give us suggestions for future products

www.**eMastercam**.com/**feedback**

In-House Solutions

240 Holiday Inn Drive, Unit A
Cambridge, Ontario, Canada N3C 3X4
T: 800.529.5517 F: 519.658.1335
books@inhousesolutions.com
www.**inhousesolutions**.com