Use Aspire to create ShopBot tool path

HTMAA 2021, Harvard Shop

Initial documentation created by Joon
Feel free to add more comments and tips on this document

*Note : Before using Aspire, please prepare your cut design file and export in dxf file format. The sample file in this document includes three layers- 1) profile for 2mm depth engraving 2) profile for holes, and 3) profile for outmost edge of each parts.
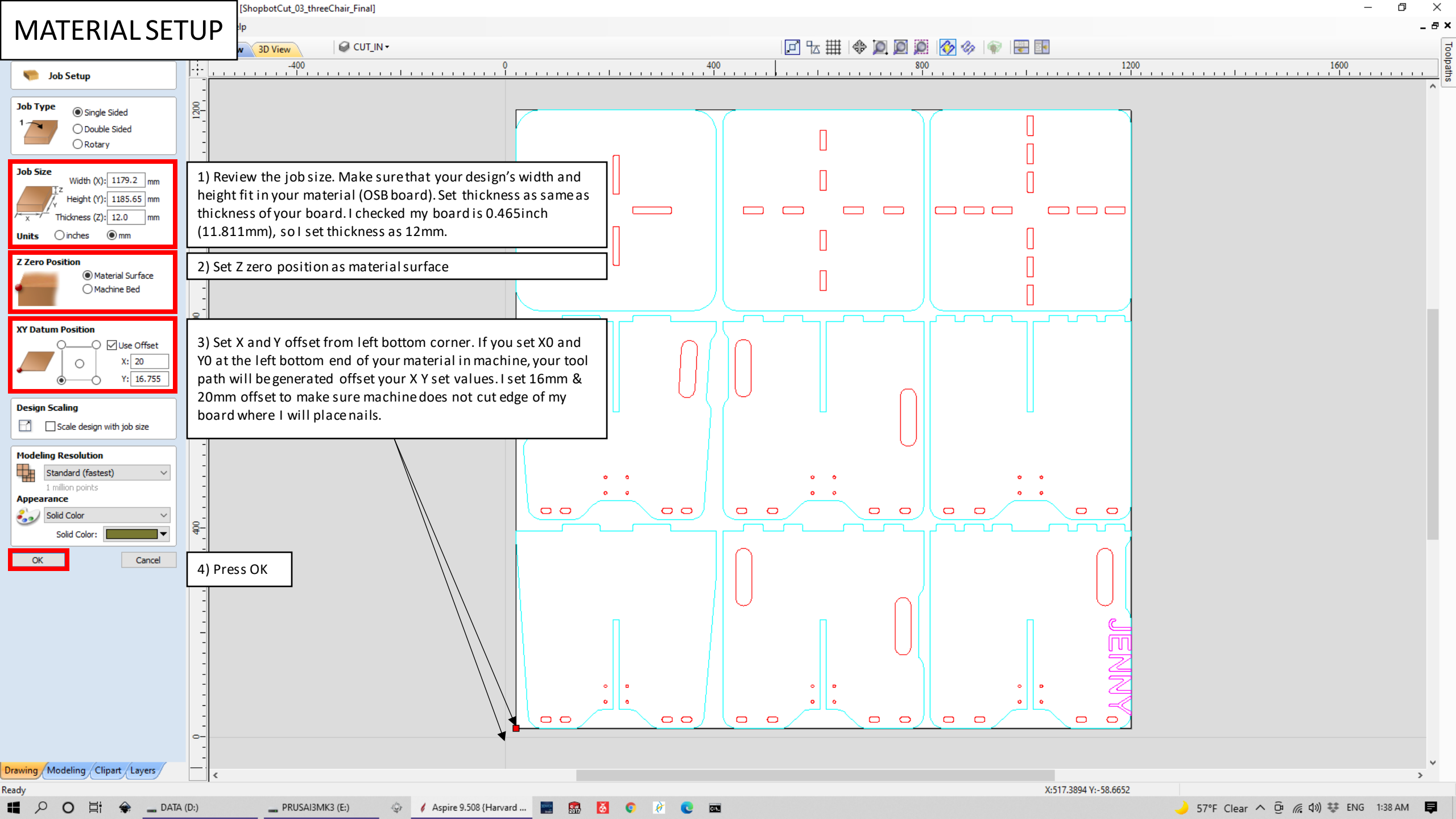
2) Open an existing file
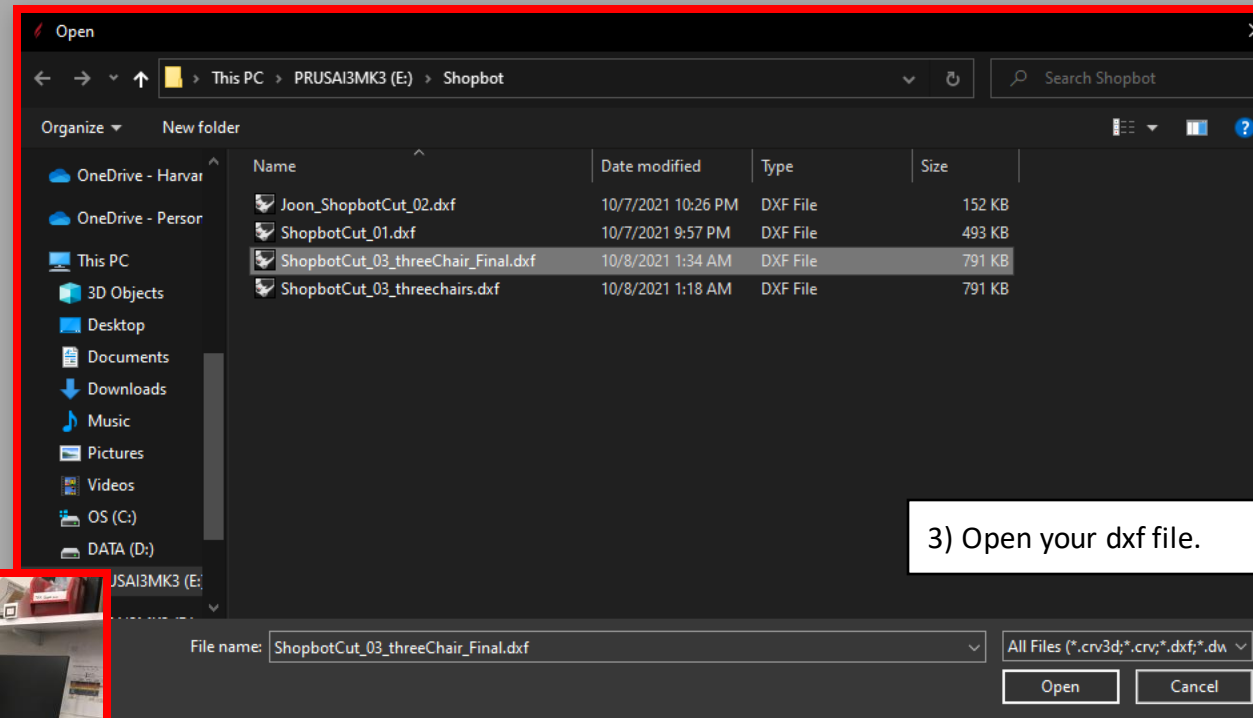
3) Open your dxf file.

1) Launch Aspire software, the program is installed in a computer besides ShopBot and an Alienware besides electronics.

Job Setup

Job Type
- ○ Single Sided
- ○ Double Sided
- ○ Rotary

Job Size
Width (X): 1179.2 mm
Height (Y): 1185.65 mm
Thickness (Z): 12.0 mm
Units ○ inches ● mm

1) Review the job size. Make sure that your design's width and height fit in your material (OSB board). Set thickness as same as thickness of your board. I checked my board is 0.465inch (11.811mm), so I set thickness as 12mm.

Z Zero Position
- ● Material Surface
- ○ Machine Bed

2) Set Z zero position as material surface

XY Datum Position
☑ Use Offset
X: 20
Y: 16.755

3) Set X and Y offset from left bottom corner. If you set X0 and Y0 at the left bottom end of your material in machine, your tool path will be generated offset your X Y set values. I set 16mm & 20mm offset to make sure machine does not cut edge of my board where I will place nails.

Design Scaling
☐ Scale design with job size

Modeling Resolution
Standard (fastest)
1 million points

Appearance
Solid Color

Solid Color:

OK   Cancel

4) Press OK

Drawing / Modeling / Clipart / Layers

Ready

X:517.3894 Y:-58.6652

57°F Clear   ENG 1:38 AM

MATERIAL SETUP

Material Setup

Set ...

Home Pos: X:0.0 Y:0.0 Z:20.32

5.08mm
Z 0
12.0mm

XY Datum

X: 20.0
Y: 16.755

1) Click "Set" to review material setup

Toolpath Operations

Toolpaths

No Toolpaths Created Yet

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN

Add New Layer...

Active Sheet: 0

Drawing | Modeling | Clipart | Layers

3D View | CUT_IN

Ready

X:1389.5660 Y:487.0041

57°F Clear ENG 1:39 AM

MATERIAL SETUP

[ShopbotCut_03_threeChair_Final]

Toolpaths

Material Setup

1) Check thickness, offset, Z-Zero set up.

Thickness 12.0 mm

XY Datum ☑ Use Offset
X: 20.0
Y: 16.755

☑ Show detailed summary on toolpath tab

Z-Zero
◉ Material Surface
○ Machine Bed

Model Position in Material
◉ Gap Above Model
0.0 mm
○ Gap Below Model
12.0 mm

Model Thickness 0.0 mm
Modeling Plane Z 0.0 mm   Set...

Rapid Z Gaps above Material
Z1 Clearance (Z1) 5.08 mm
Plunge (Z2) 5.08 mm

Home / Start Position
X: 0.0   Y: 0.0

Z Gap above Material 20.32

2) Press OK if everything looks fine.

OK   Cancel

Layers List
0
CUT_OUT
CUT_HALF
CUT_IN

Add New Layer...

Active Sheet: 0

Drawing | Modeling | Clipart | Layers

Ready

X:1147.1534 Y:408.9391

POCKET CUT

2) Right click on the first layer you want to cut or make a pocket. Select all vector.

4) Click Pocket Cut
In this case, I do not want to cut all the way through the material. I want to cut certain depth all area inside.

Toolpath Operations

3) You will see selected vector highlighted as dashed line.

1) Click Layer

Toolpaths

No Toolpaths Created Yet

Add New Layer

Active Sheet: 0

Drawing Modeling Clipart Layers

Ready

X:1174.5446 Y: -0.5602   W:41.578 H:185.066 S:5

POCKET CUT
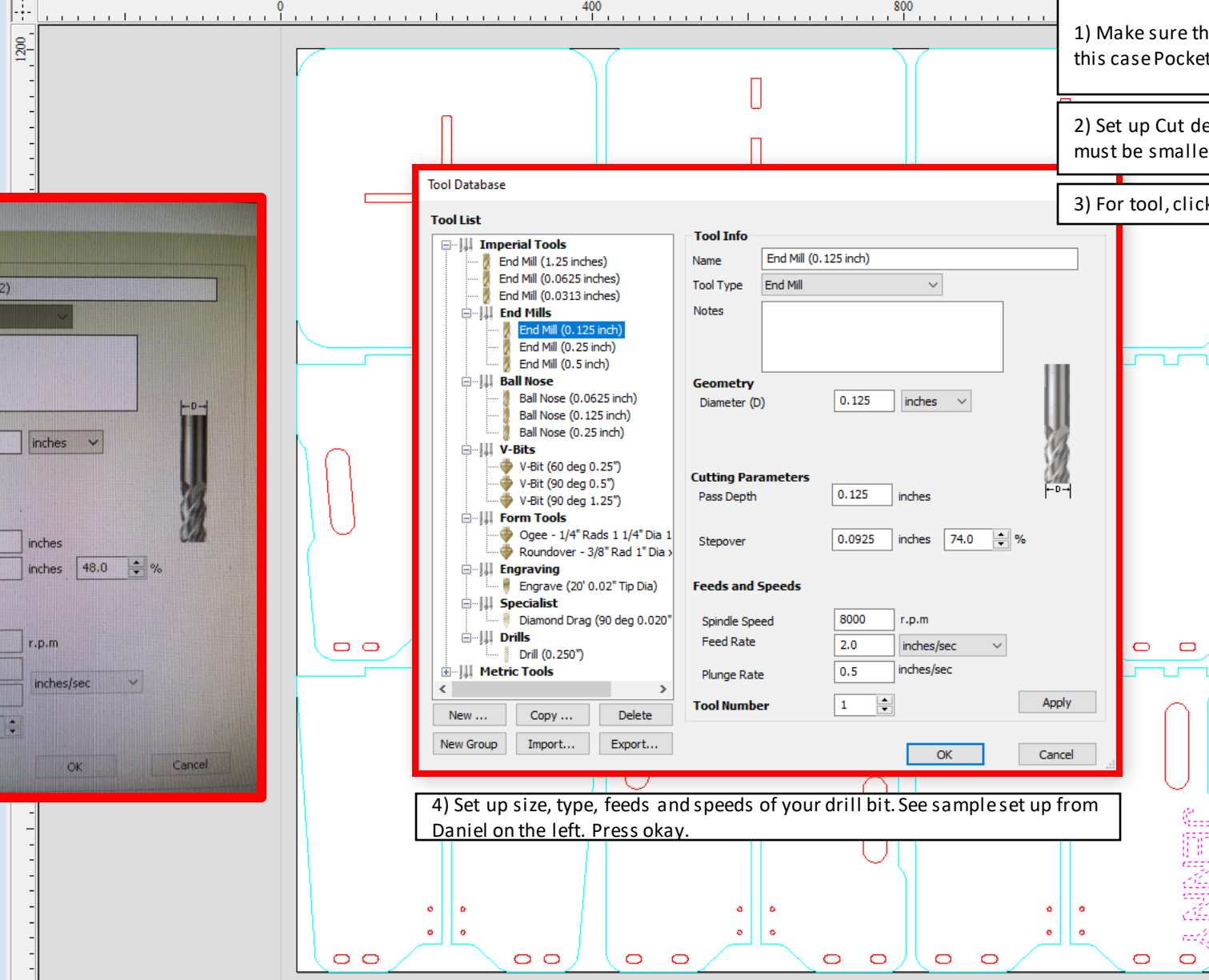
1) Make sure that you are in right function, in this case Pocket Toolpath.

2) Set up Cut depth as you wish. The number must be smaller than your material thickness.

3) For tool, click select

4) Set up size, type, feeds and speeds of your drill bit. See sample set up from Daniel on the left. Press okay.

5) Press calculate

Toolpaths — Pocket Toolpath

Cutting Depths
- Start Depth (D): 0.0 mm
- Cut Depth (C): 2.0 mm
- ☐ Show advanced toolpath options

Tool: End Mill (0.125 inch) [Select ...] [Edit ...]

Clear Pocket ...
- ◉ Offset ○ Raster
- Cut Direction: ○ Climb ◉ Conventional
- Raster Angle: 0.0 degrees
- Profile Pass: Last

☐ Ramp Plunge Moves — Distance 1.0 mm

- Safe Z: 5.08 mm
- Home Position: X:0.00 Y:0.00 Z:20.32
- Name: Pocket 1

[Calculate] [Close]

Tool Database

Tool List
- Imperial Tools
  - End Mill (1.25 inches)
  - End Mill (0.0625 inches)
  - End Mill (0.0313 inches)
  - End Mills
    - End Mill (0.125 inch)
    - End Mill (0.25 inch)
    - End Mill (0.5 inch)
  - Ball Nose
    - Ball Nose (0.0625 inch)
    - Ball Nose (0.125 inch)
    - Ball Nose (0.25 inch)
  - V-Bits
    - V-Bit (60 deg 0.25")
    - V-Bit (90 deg 0.5")
    - V-Bit (90 deg 1.25")
  - Form Tools
    - Ogee - 1/4" Rads 1 1/4" Dia 1
    - Roundover - 3/8" Rad 1" Dia >
  - Engraving
    - Engrave (20' 0.02" Tip Dia)
  - Specialist
    - Diamond Drag (90 deg 0.020")
  - Drills
    - Drill (0.250")
- Metric Tools

[New ...] [Copy ...] [Delete]
[New Group] [Import...] [Export...]

Tool Info
- Name: End Mill (0.125 inch)
- Tool Type: End Mill
- Notes:

Geometry
- Diameter (D): 0.125 inches

Cutting Parameters
- Pass Depth: 0.125 inches
- Stepover: 0.0925 inches 74.0 %

Feeds and Speeds
- Spindle Speed: 8000 r.p.m
- Feed Rate: 2.0 inches/sec
- Plunge Rate: 0.5 inches/sec

- Tool Number: 1

[Apply]
[OK] [Cancel]

Edit Tool (sample from Daniel)

Tool Info
- Name: 1/8" Downcut (64-012)
- Tool Type: End Mill
- Notes:

Geometry
- Diameter (D): 0.125 inches

Cutting Parameters
- Pass Depth: 0.125 inches
- Stepover: 0.06 inches 48.0 %

Feeds and Speeds
- Spindle Speed: 18000 r.p.m
- Feed Rate: 2.0 inches/sec
- Plunge Rate: 2.0
- Tool Number: 4

[OK] [Cancel]

POCKET CUT

3D View

CUT_HALF ▾

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN

1) Automatically you will see output in 3D view. You can always change view during tool path creation

Add New Layer...

Active Sheet: 0

Drawing / Modeling / Clipart / **Layers**

Ready

X:767.4966 Y:627.9026 Z: 0.0000

Toolpaths

Preview Toolpaths

Cherry

Solid Material Color

Machined Area Color ....
- ○ Material Color
- ○ Global Fill Color
- ○ Toolpath Color   Set All
- ☐ Animate preview   ☑ Draw tool

Preview Selected Toolpath

▶ ⏸ ⏭ ⏭⏭ ⏮

Speed

Preview All Sides

Preview All Toolpaths

Preview Visible Toolpaths

Reset Preview   Undo Last

Save Preview Image

Double click on waste areas in 3D view to remove them.

Close

☑ **Toolpaths**

☑ Pocket 1

2) Check your tool path placed in Toolpaths and in right order. Since this is first tool path, you will see only one tool path. Press close.
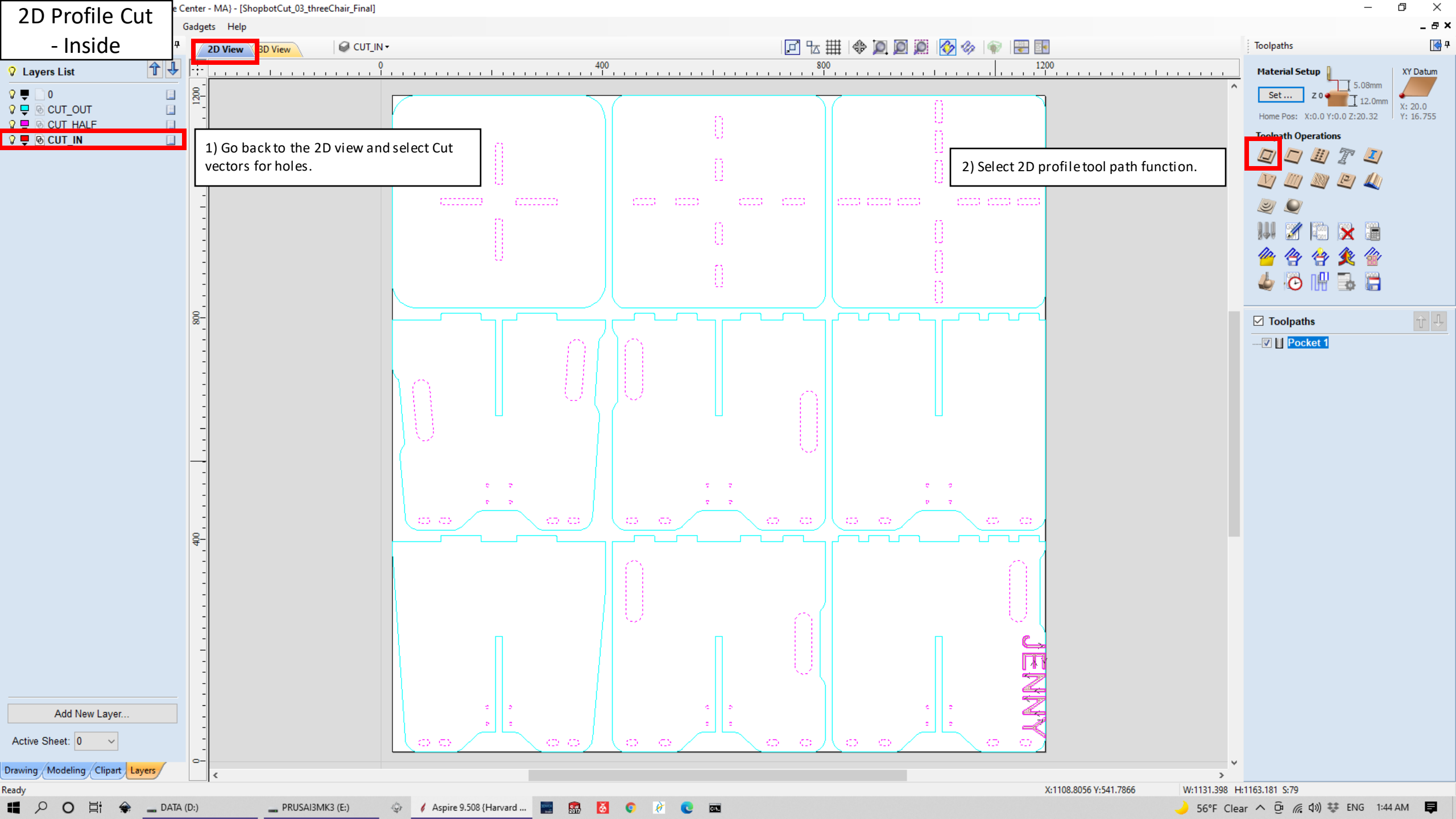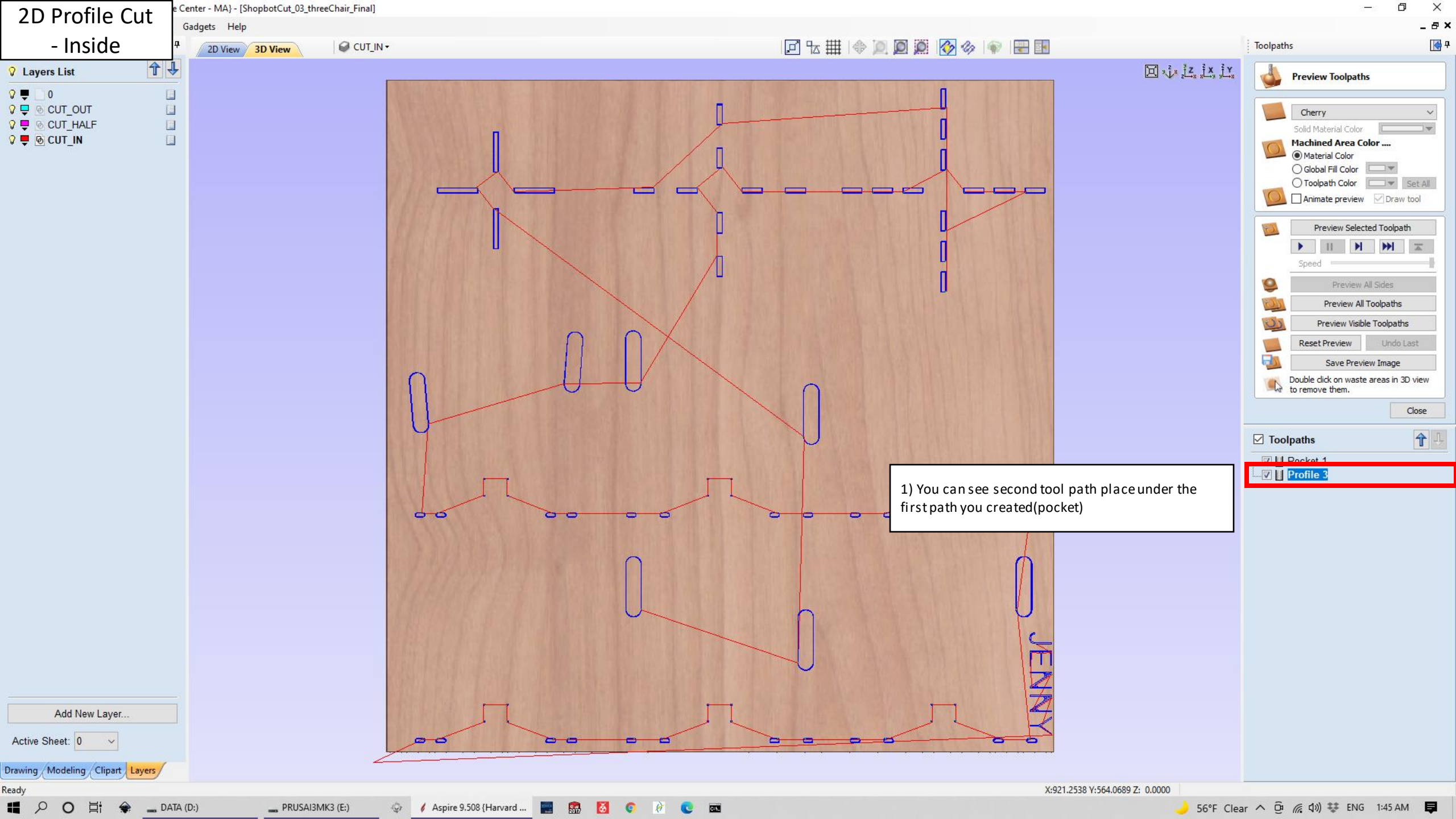
56°F Clear   ENG 1:43 AM

2D Profile Cut - Inside

1) Go back to the 2D view and select Cut vectors for holes.

2) Select 2D profile tool path function.

e Center - MA} - [ShopbotCut_03_threeChair_Final]

Gadgets   Help

2D View   3D View   CUT_IN ▾

Toolpaths

1) Double check if you selected 2D Profile Tool path

2D Profile Toolpath

2) Set 0 as Start Depth, and your material thickness as Cut Depth.

Cutting Depths
Start Depth (D)   0.0   mm
Cut Depth (C)   12.0   mm
☑ Show advanced toolpath options

3) Set your tool as we did in previous pocket cut.

🔧 **Tool:** End Mill (0.125 inch)
Select ...   Edit ...

4) Passes is number of pass to reach your set up cut depth. If you set it up as 4, it will cut 3mm in each cut and run 4 times to make a clean cut. I set it up as 4, but 3 might also works.

Passes: 4   Edit Passes ...

Machine Vectors...
○ Outside / Right
● Inside / Left
○ On
Direction ● Climb   ○ Conventional
Allowance offset   0.0   mm

5) IMPORTANT: If you want to make a hole, Machine Vectors should INSIDE / LEFT.

☐ **Do Separate Last Pass**
Allowance (A)   0.0   mm
☐ Reverse direction

6) The size of hole that I have in the cut part is small, so I did not made tabs. However, you will need this function when you make a Outside Cut.

☐ **Add tabs to toolpath**
Length   5.0   mm
Thickness   2.0   mm
☑ 3D tabs   Edit Tabs ...

Ramp   Leads   Order   Start At   Corners

☐ **Add ramps to toolpath**
Type   ○ Smooth
   ● Zig Zag
   ○ Spiral
Specify Ramp ...
   ☐ Ramp on Lead In
   ● Distance   100.0   mm
   ○ Angle   20.0   degrees
      Distance   100.0   mm

Safe Z   5.08 mm
Home Position   X:0.00 Y:0.00 Z:20.32
☐ Project toolpath onto 3D model
Vector Selection: Manual   Selector ...
Name: Profile 3

7) Calculate!

Calculate   Close

Layers List
○ 0
○ CUT_OUT
○ CUT_HALF
○ CUT_IN

Add New Layer...

Active Sheet: 0

Drawing   Modeling   Clipart   Layers

Ready   X:1340.2617 Y:465.0911   W:1131.398 H:1163.181 S:79

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2D Profile Cut - Inside

1) You can see second tool path place under the first path you created(pocket)

2D Profile Cut - Outside

Gadgets   Help

2D View   3D View   CUT_OUT

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN
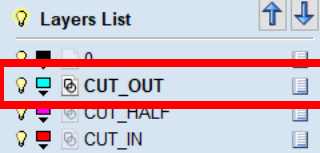
1) Go to 2D view and select vectors in the last layer. In this layer, I place outer edges of my parts

Add New Layer...

Active Sheet: 0

Drawing / Modeling / Clipart / **Layers**

Ready

X:1373.5702 Y:256.8990   W:1179.200 H:1185.650 S:9

Toolpaths

2D Profile Toolpath

Cutting Depths
Start Depth (D)   0.0   mm
Cut Depth (C)   12.0   mm
☑ Show advanced toolpath options

Tool: End Mill (0.125 inch)
Select ...   Edit ...
Passes: 4   Edit Passes ...

Machine Vectors...
⦿ Outside / Right
○ Inside / Left
○ On
Direction ⦿ Climb   ○ Conventional
Allowance offset   0.0   mm

☐ Do Separate Last Pass
Allowance (A)   0.0   mm
☐ Reverse direction

☑ Add tabs to toolpath
Length   5.0   mm
Thickness   2.0   mm
☑ 3D tabs   Edit Tabs ...

Ramp   Leads   Order   Start At   Corners

☐ Add ramps to toolpath
Type   ○ Smooth   ⦿ Zig Zag   ○ Spiral
Specify Ramp ...
☐ Ramp on Lead In
⦿ Distance   100.0   mm
○ Angle   20.0   degrees
Distance   100.0   mm

Safe Z   5.08 mm
Home Position   X:0.00 Y:0.00 Z:20.32
☐ Project toolpath onto 3D model
Vector Selection: Manual   Selector ...
Name: Profile 4

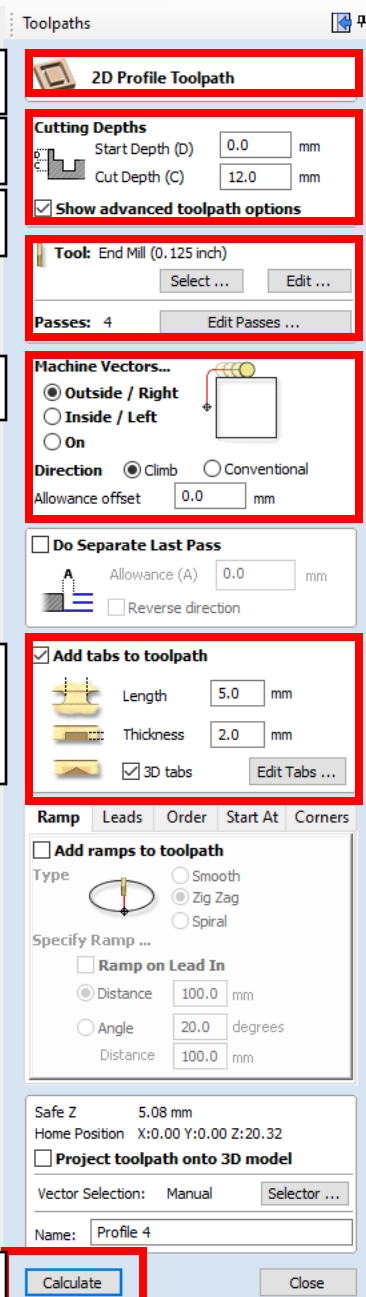2) Select 2D Profile Tool path function, as we did in previous step.
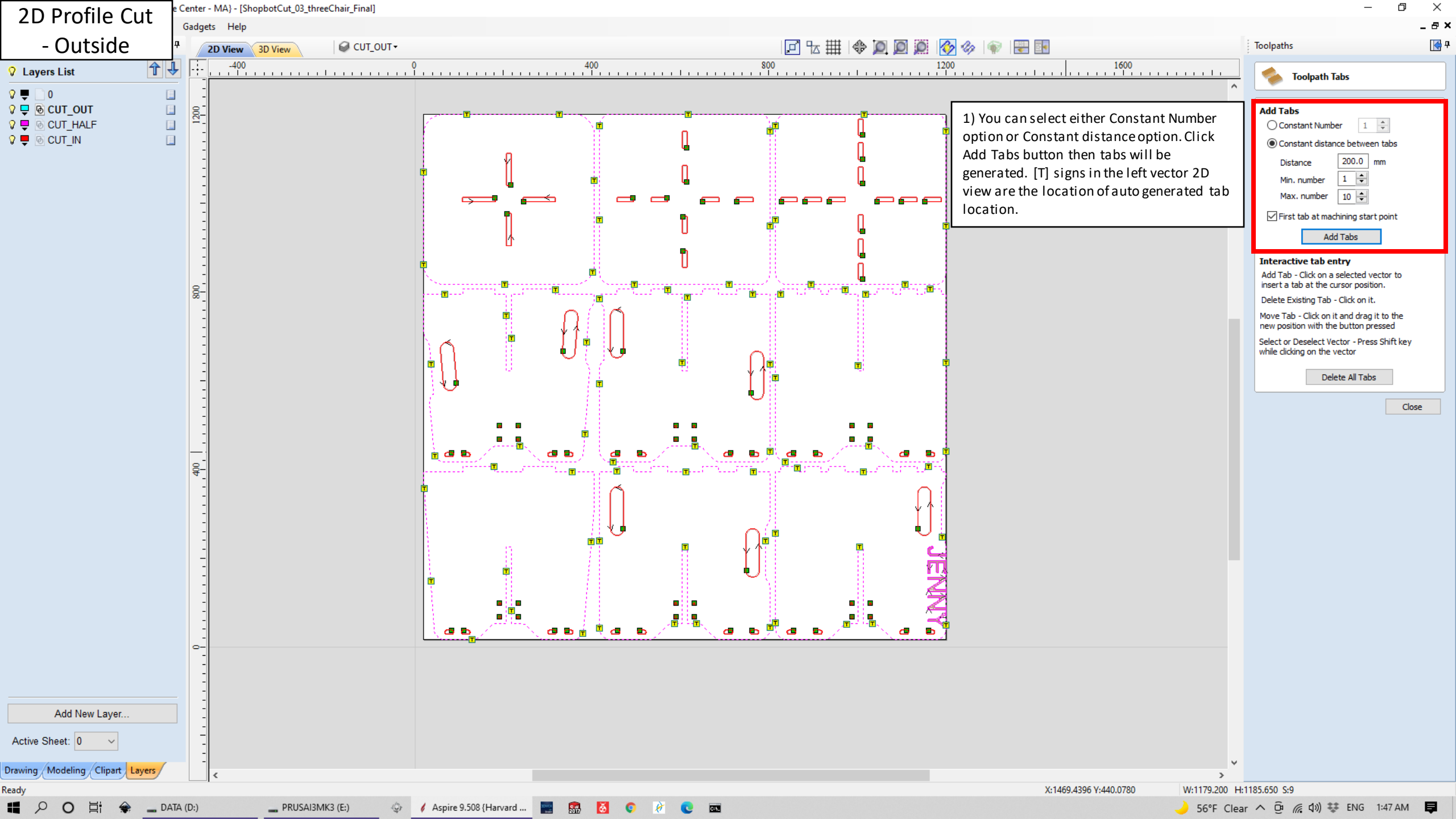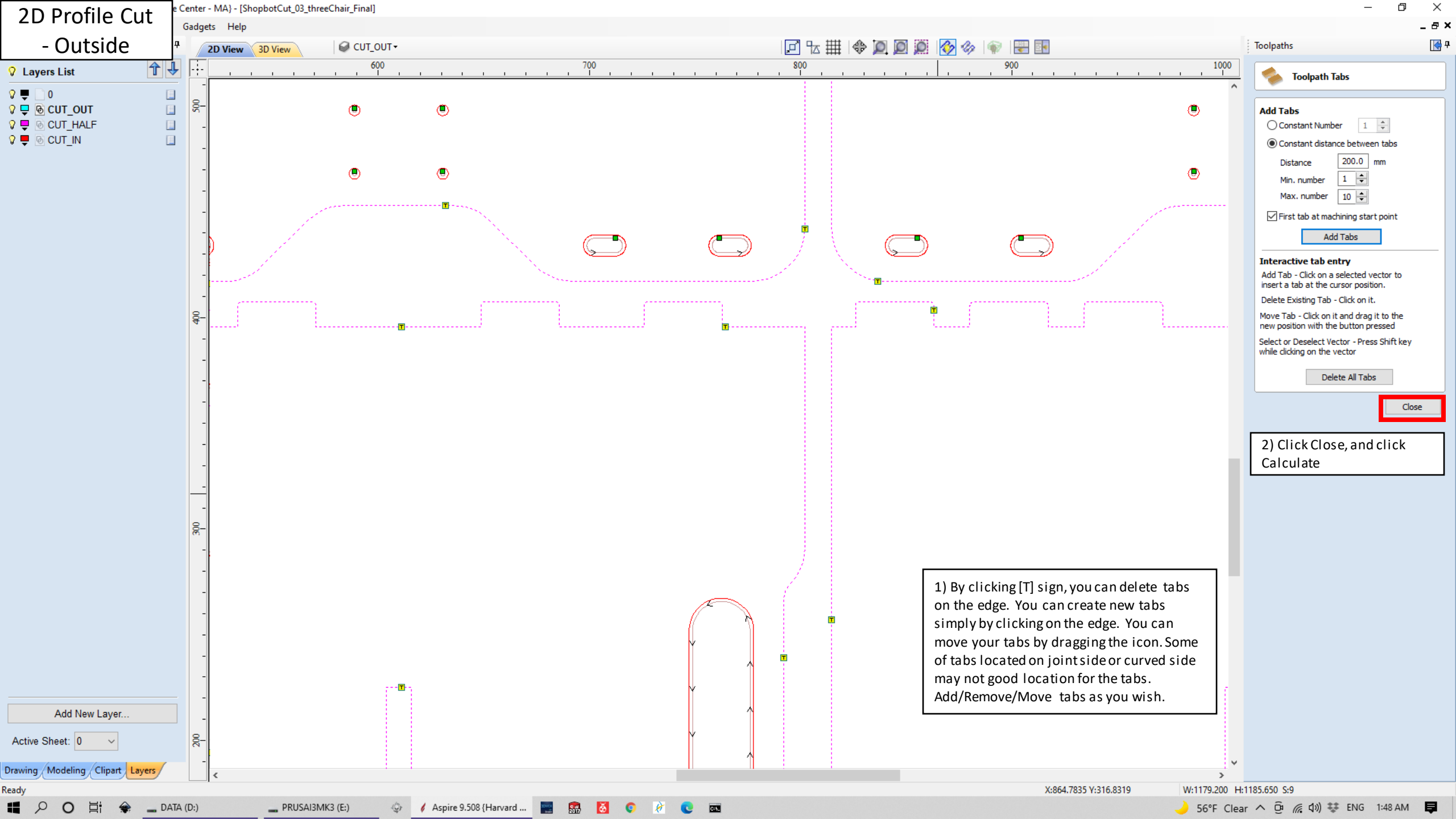
3) Set cut depth.

4) Set Tool

5) IMPORTANT, set Outside/Right when you cut outer edges of your part

6) Check Add tabs to toolpath, then set Length and Thickness for your tab. I found that 5mm/2mm works well. Click Edit Tabs to modify tab location.

7) After you set up tabs, click calculate.   Calculate   Close

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Toolpath Tabs

Add Tabs

- ○ Constant Number | 1 |
- ● Constant distance between tabs

Distance	200.0	mm
Min. number	1	
Max. number	10	

☑ First tab at machining start point

Add Tabs

1) You can select either Constant Number option or Constant distance option. Click Add Tabs button then tabs will be generated. [T] signs in the left vector 2D view are the location of auto generated tab location.

Interactive tab entry

Add Tab - Click on a selected vector to insert a tab at the cursor position.

Delete Existing Tab - Click on it.

Move Tab - Click on it and drag it to the new position with the button pressed

Select or Deselect Vector - Press Shift key while clicking on the vector

Delete All Tabs

Close

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN

Add New Layer...

Active Sheet: 0

Drawing / Modeling / Clipart / Layers

Toolpath Tabs

Add Tabs

○ Constant Number   1 ▲▼

⦿ Constant distance between tabs

Distance   200.0   mm

Min. number   1 ▲▼

Max. number   10 ▲▼

☑ First tab at machining start point

[Add Tabs]

Interactive tab entry

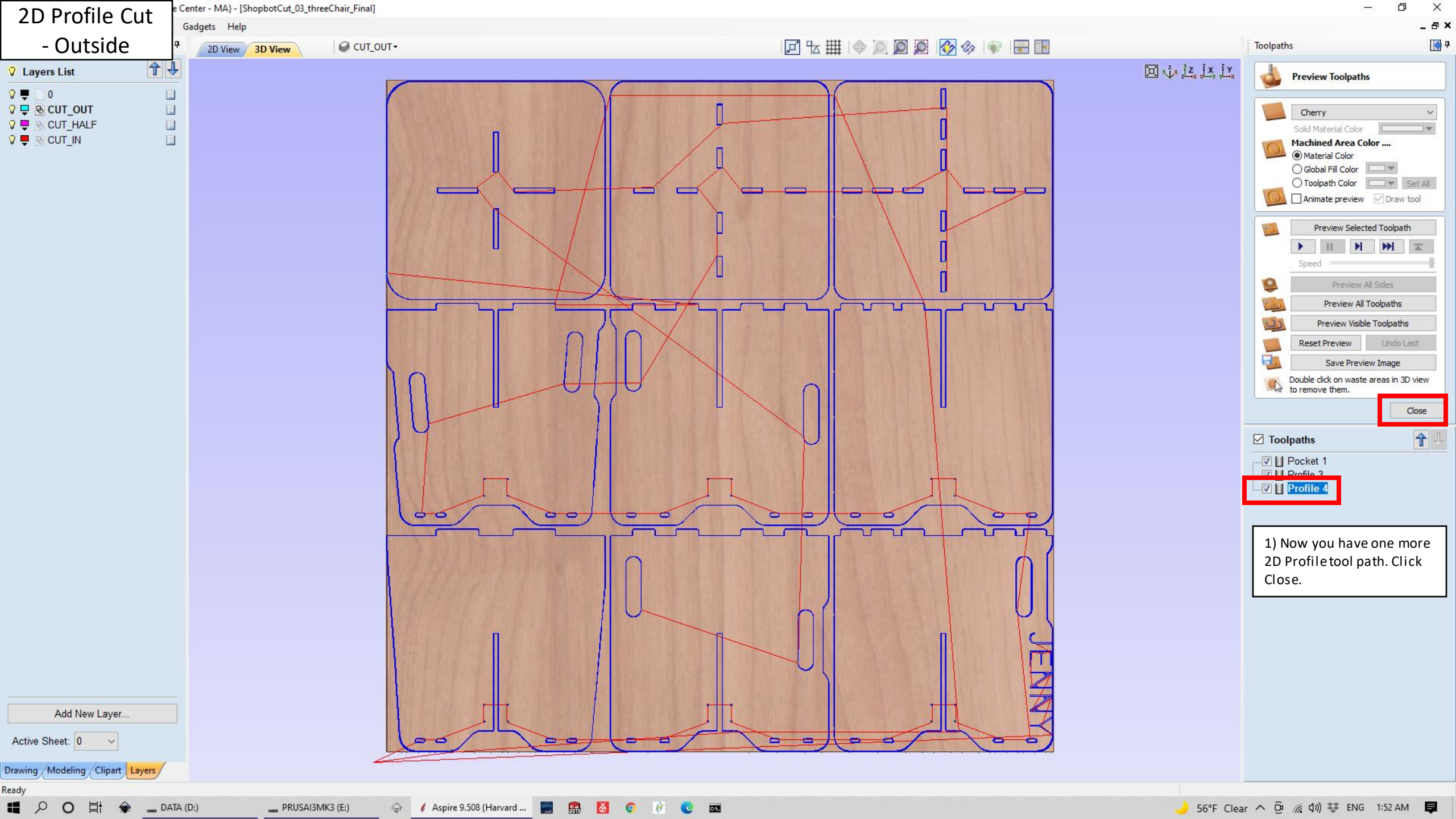Add Tab - Click on a selected vector to insert a tab at the cursor position.

Delete Existing Tab - Click on it.

Move Tab - Click on it and drag it to the new position with the button pressed

Select or Deselect Vector - Press Shift key while clicking on the vector

[Delete All Tabs]

[Close]

2) Click Close, and click Calculate

1) By clicking [T] sign, you can delete tabs on the edge. You can create new tabs simply by clicking on the edge. You can move your tabs by dragging the icon. Some of tabs located on joint side or curved side may not good location for the tabs. Add/Remove/Move tabs as you wish.

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN

[Add New Layer...]

Active Sheet: 0

Drawing | Modeling | Clipart | Layers
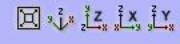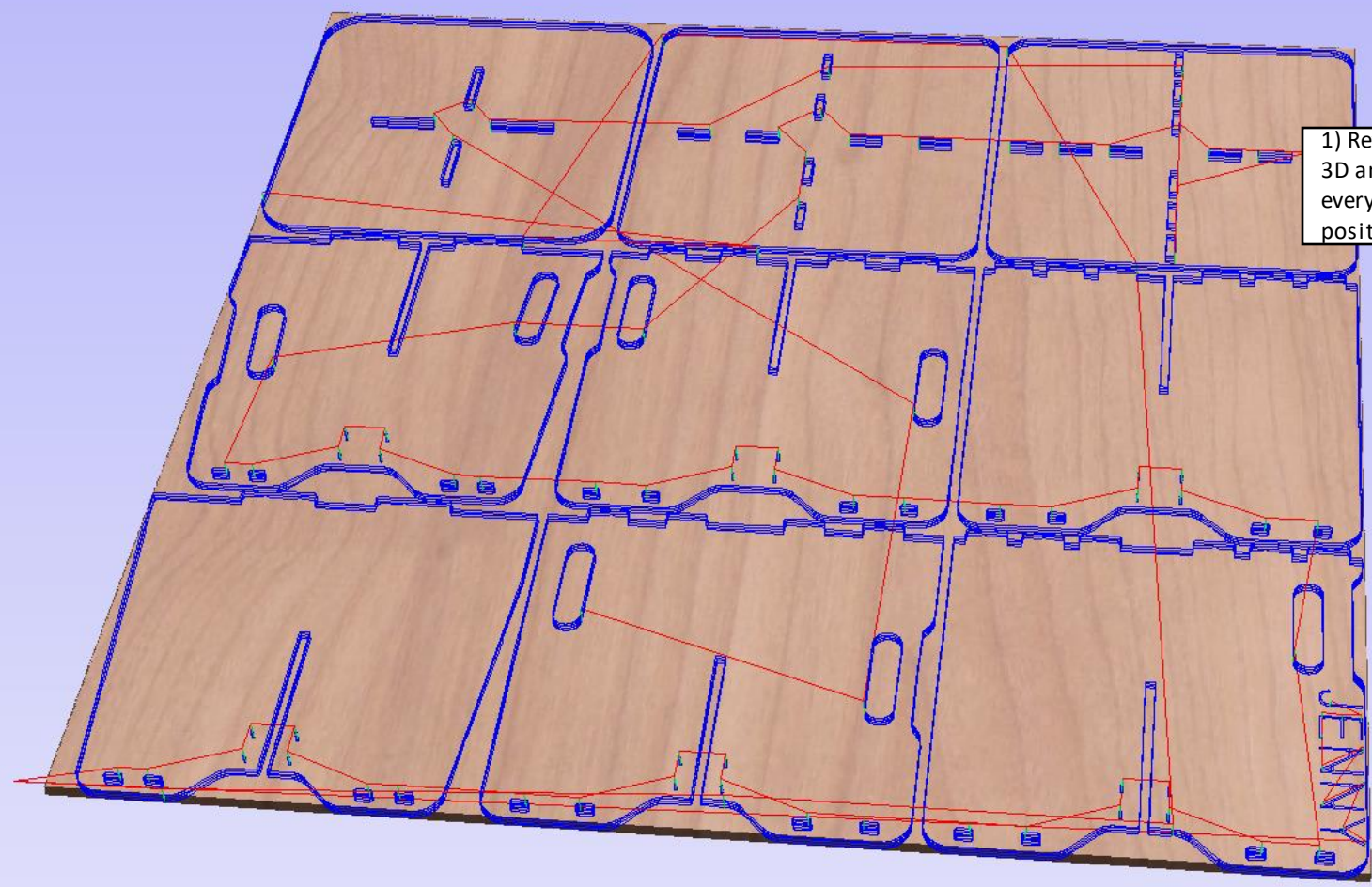
e Center - MA} - [ShopbotCut_03_threeChair_Final]

Gadgets   Help

2D View   **3D View**   CUT_OUT ▾

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN

Add New Layer...

Active Sheet: 0

Drawing / Modeling / Clipart / **Layers**

Toolpaths

Preview Toolpaths

Cherry

Solid Material Color

Machined Area Color ....
- ● Material Color
- ○ Global Fill Color
- ○ Toolpath Color   Set All

☐ Animate preview   ☑ Draw tool

Preview Selected Toolpath

Speed

Preview All Sides

Preview All Toolpaths

Preview Visible Toolpaths

Reset Preview   Undo Last

Save Preview Image

Double click on waste areas in 3D view to remove them.

Close

☑ **Toolpaths**
- ☑ Pocket 1
- ☑ Profile 3
- ☑ **Profile 4**

1) Now you have one more 2D Profile tool path. Click Close.

Ready

56°F Clear   ENG   1:52 AM

Export Toolpath

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN

Add New Layer...

Active Sheet: 0

Drawing / Modeling / Clipart / Layers

2D View   3D View   CUT_OUT

Toolpaths

Material Setup

Set ...   Z 0   5.08mm   12.0mm

Home Pos: X:0.0 Y:0.0 Z:20.32

XY Datum

X: 20.0
Y: 16.755

Toolpath Operations

1) Review your tool path in 3D and 2D view. If you find everything placed in right position, click save icon.

Toolpaths

- Pocket 1
- Profile 3
- Profile 4

Ready

X:1013.5080 Y:548.7016 Z: 0.0000
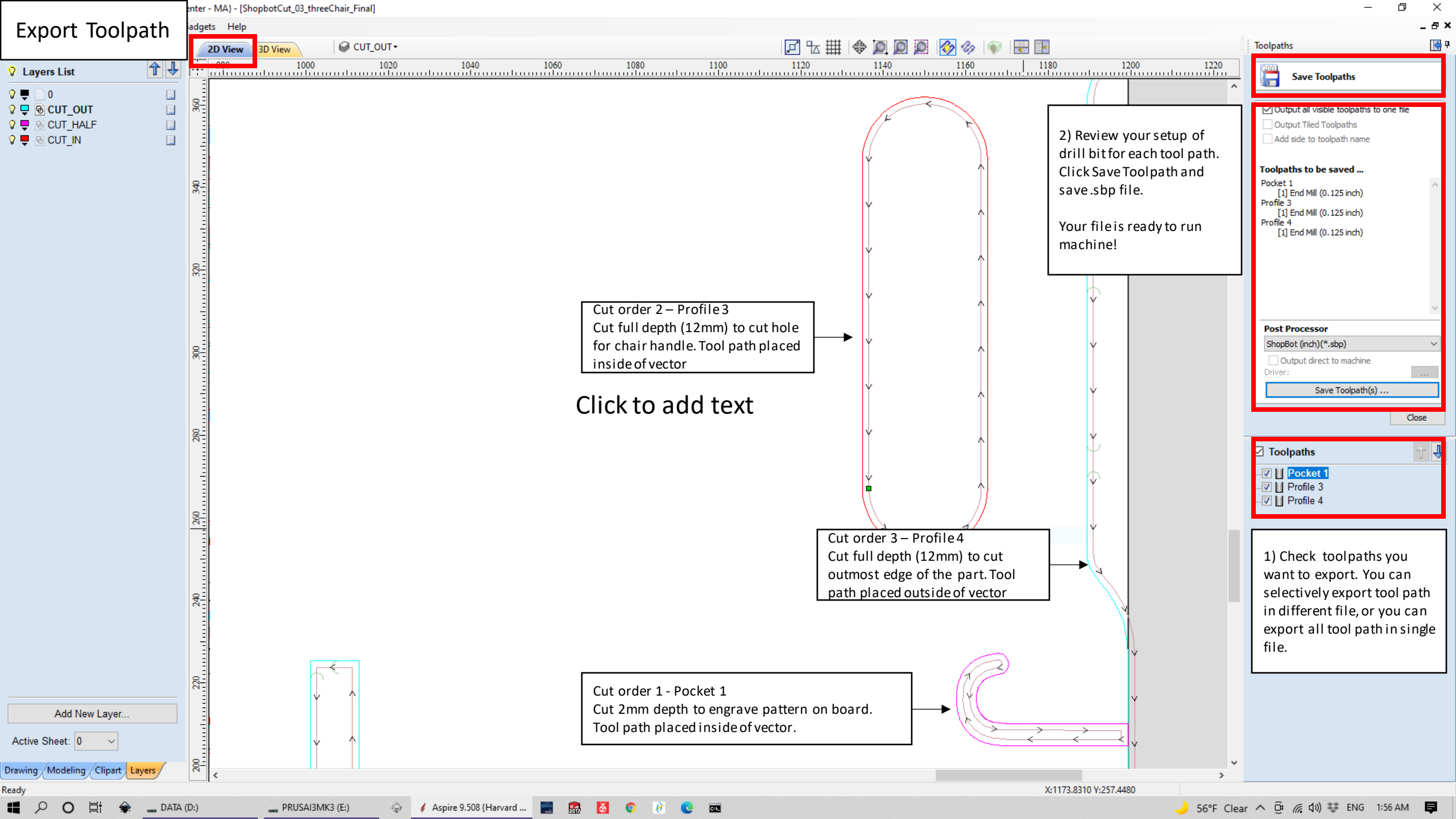
enter - MA} - [ShopbotCut_03_threeChair_Final]

adgets   Help

DATA (D:)   PRUSAI3MK3 (E:)   Aspire 9.508 {Harvard ...

56°F Clear   ENG   1:53 AM

Export Toolpath

2D View | 3D View | CUT_OUT ▾

Layers List

- 0
- CUT_OUT
- CUT_HALF
- CUT_IN

Add New Layer...

Active Sheet: 0

Drawing | Modeling | Clipart | **Layers**

Cut order 2 – Profile 3
Cut full depth (12mm) to cut hole for chair handle. Tool path placed inside of vector

Click to add text

Cut order 3 – Profile 4
Cut full depth (12mm) to cut outmost edge of the part. Tool path placed outside of vector

Cut order 1 - Pocket 1
Cut 2mm depth to engrave pattern on board. Tool path placed inside of vector.

Toolpaths

Save Toolpaths

☑ Output all visible toolpaths to one file
☐ Output Tiled Toolpaths
☐ Add side to toolpath name

Toolpaths to be saved ...

Pocket 1
    [1] End Mill (0.125 inch)
Profile 3
    [1] End Mill (0.125 inch)
Profile 4
    [1] End Mill (0.125 inch)

Post Processor

ShopBot (inch)(*.sbp)

☐ Output direct to machine
Driver:

Save Toolpath(s) ...

Close

2) Review your setup of drill bit for each tool path. Click Save Toolpath and save .sbp file.

Your file is ready to run machine!

Toolpaths

- ☑ Pocket 1
- ☑ Profile 3
- ☑ Profile 4

1) Check toolpaths you want to export. You can selectively export tool path in different file, or you can export all tool path in single file.

Ready

X:1173.8310 Y:257.4480

56°F Clear | ENG | 1:56 AM