



RhinoCAM at Calton Cases!

[Calton Cases](#) located in Austin, TX manufactures custom fit musical instrument cases through a world-wide network of instrument dealers. Keith Calton started the company in 1969 - handcrafting well-made, nearly indestructible cases for devoted Musicians and Collectors. As Keith put it, "For Quality & Endurance". With the help of CAD/CAM and CNC machining technology, the company that Keith founded is still thriving today and the cases they produce really are, well, nearly indestructible!

The Cases

Calton Cases manufactures cases for 10 different lines and 350 different types of musical instruments, each custom fit to the customers exact specifications. The 10 instrument case types the company manufactures are shown below.





Electric



Acoustic



Base



Archtop



Banjo



Mandolin



Bouzouki



Ukulele



Violin



Mandocello

The 10 music instrument case styles manufactured at Calton Cases.



The CAD/CAM Technology

Anthony Pelosi has been with Calton Cases for 10 years, first as a fabricator, then a CNC operator and now as a Product Designer and Innovation Lead. Anthony started his career with a 4-year degree in Asian studies but with a love for music and being good with his hands, he started manufacturing musical instruments for various companies. He soon became a hands-on fabricator of many different skills so he decided to go back to school and take some drafting classes.

Today Anthony is spearheading the use of CNC technology at Calton Cases. His CAD software of choice is [Rhinceros from McNeel & Associates](#). The CAM software that Anthony relies on to run his [3 Axis Laguna CNC Machining Center](#) every day is [RhinoCAM from MecSoft Corporation](#). We recently sat down with Anthony to discuss his use of RhinoCAM software.





“At Calton Cases I can use any CAD/CAM software I want and I have used many. I always find myself coming back to Rhino and RhinoCAM because of the freedom it gives me to model and machine the way I want. It’s actually quite liberating!”

*Anthony Pelosi, Product Designer & Innovation Lead
Calton Cases, Austin, TX*

The Mandolin Case (Beautiful & Durable)

Anthony walked us through the process of creating a Calton Case. It begins with two mold cores (i.e., plugs). The cores are machined from a high-density polyethylene similar to a modeling board. The two cores are then used to thermoform 1/8" thick textured ABS cavities, one for the top and one for the bottom of the case. The textured ABS cavity forms are then used to layup the actual top and bottom case components from durable multi-layered reinforced fiberglass.





We should interject here that when Keith Calton started the company in 1969, these cores were hand carved and hand textured in a process that took up to 2 weeks! Today, Anthony can produce a production core mold in 1 hour!

The interior of the case is outfitted with cloth and foam inserts fitting the customers exact mandolin dimensions. The outside is fitted with hardware, sealing and labeling that protect the instrument from all-weather conditions. The end product is a sturdy and durable case that will provide lifelong protection to the instrument enjoyed by Musicians and Collectors alike.

[How durable are Calton Cases? Check out this video!](#)



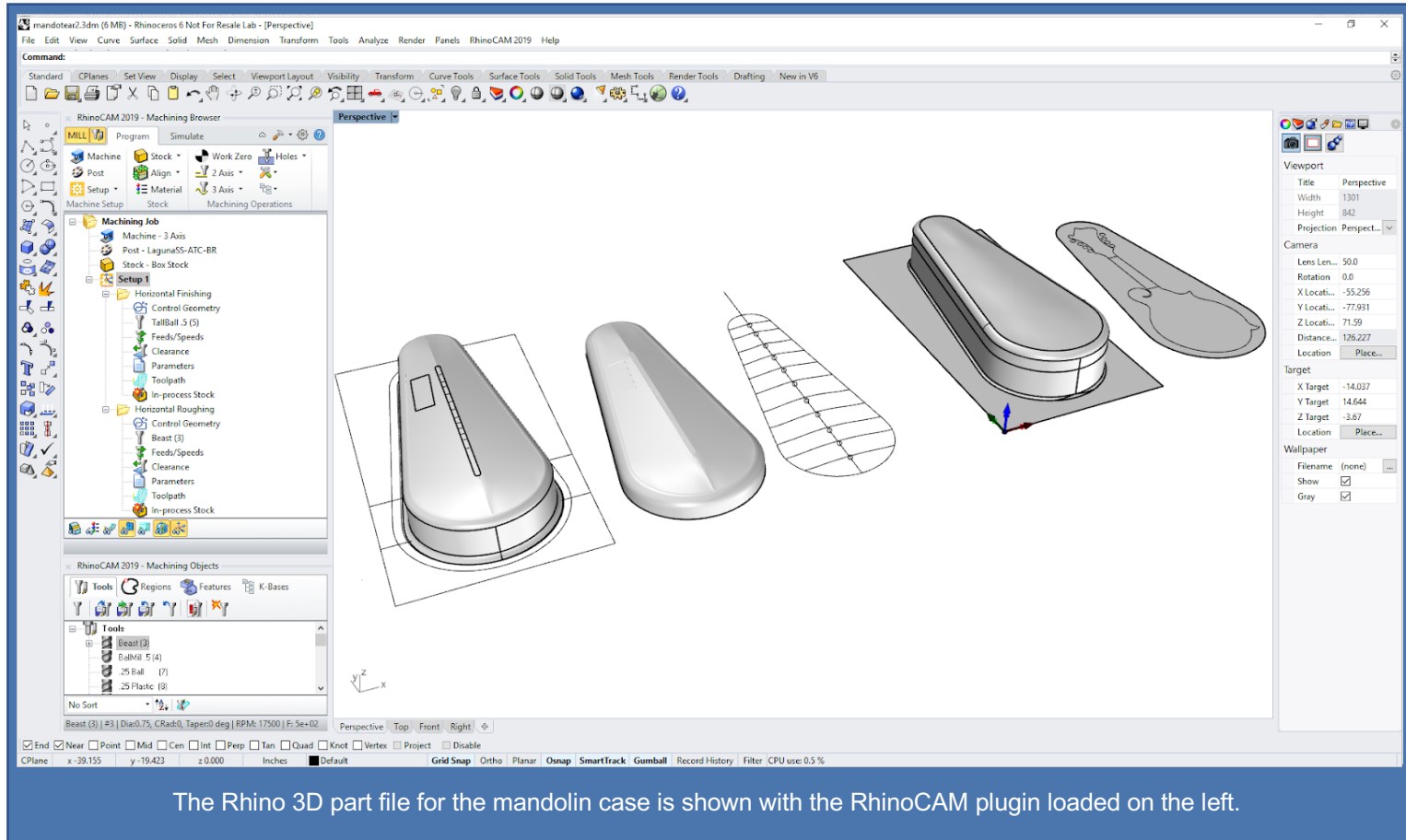
The mandolin case in blue-silver from Calton Cases



Machining the Mandolin Case Mold Cores

The master CAD/CAM part file for the mandolin case mold cores is shown below in [Rhino 6.0](#). It contains the 3D models of the top and bottom core as well as interior instrument templates and other CAD data. An entire mandolin core measuring 18" x 35" is machined from a 3D polysurface model requiring only two RhinoCAM toolpath strategies!

The only RhinoCAM selection is a simple 2D rectangle used to contain the outer boundary of the toolpaths. For bulk material removal a 3 Axis Horizontal Roughing toolpath is used. This removes material in Z levels. Finishing is performed with one 3 Axis Parallel Finishing (or Horizontal Finishing) toolpath! After coming off the CNC Machine the cores are lightly sanded with 120/220 sandpaper and then given a spray coating to withstand the temperatures of the thermoforming process. The Rhino file and the two resulting thermoform core molds are shown below.





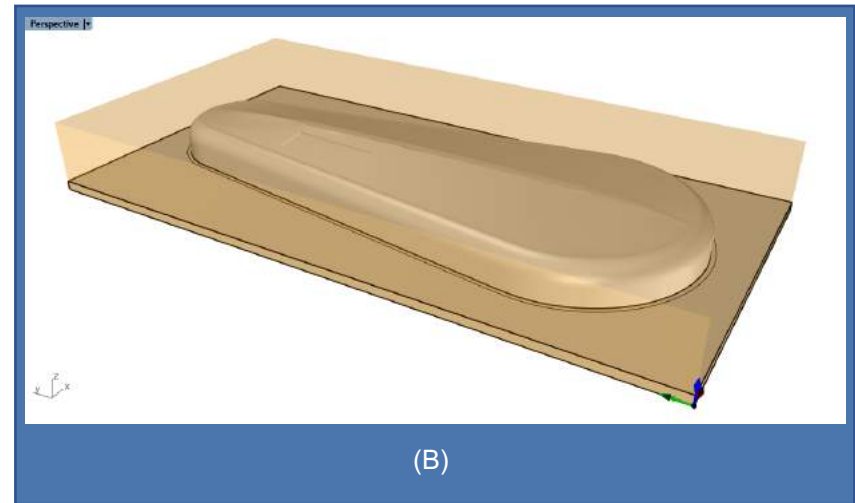
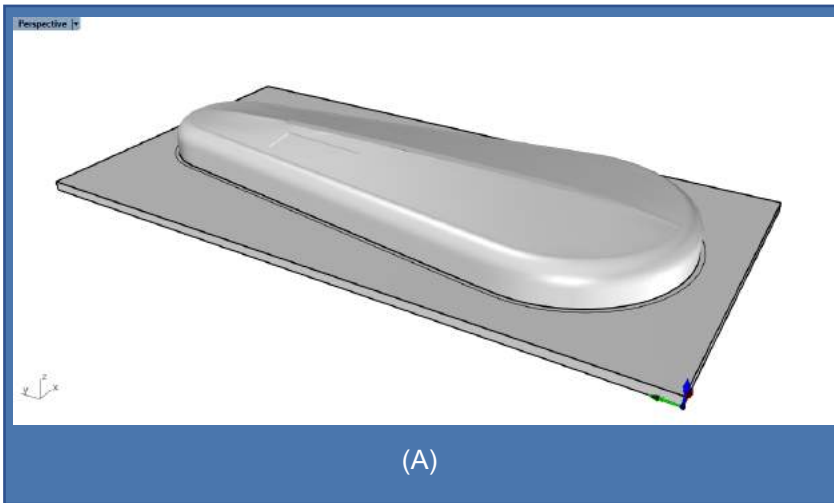
The two mandolin case core molds are shown. The case top is on the left and the bottom is on the right.

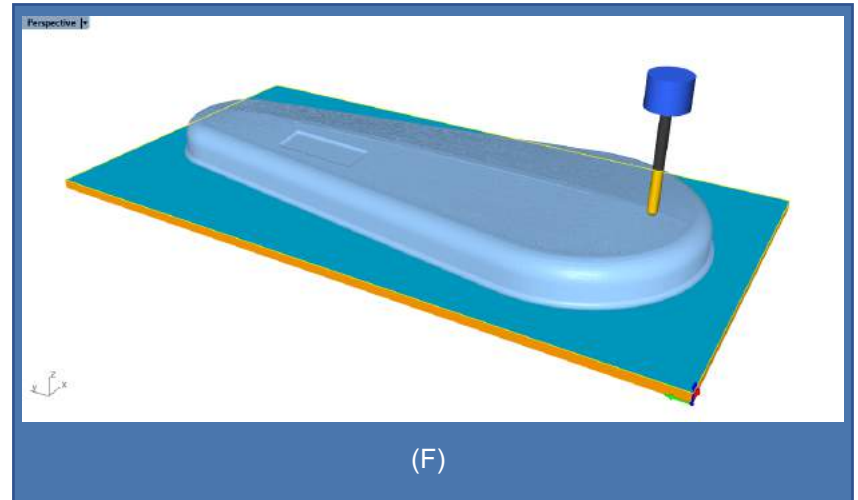
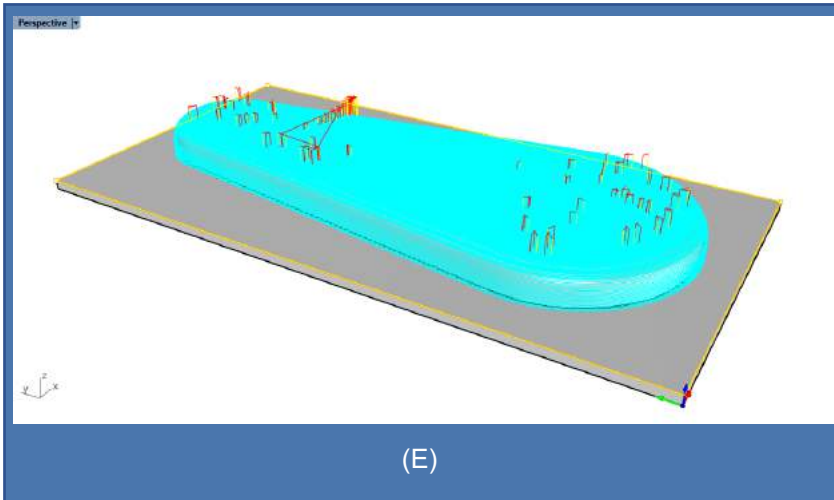
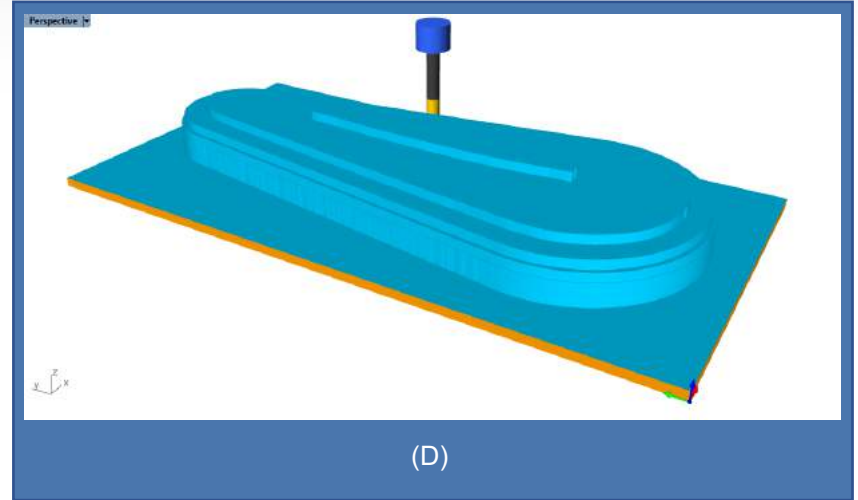
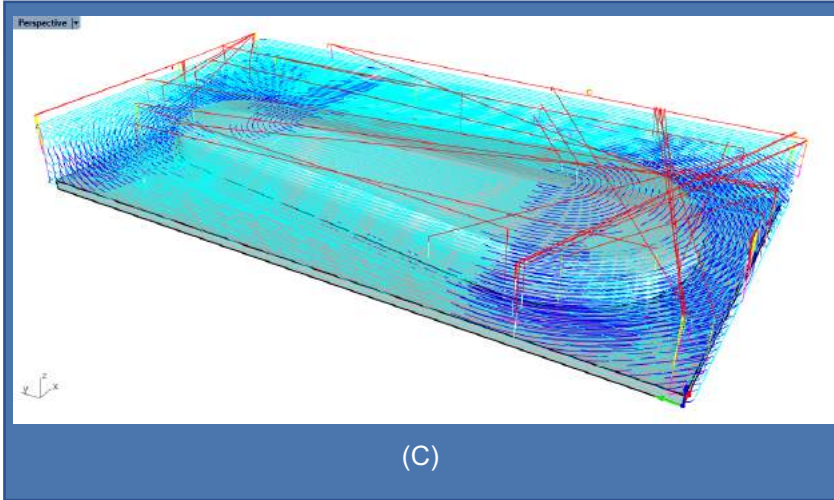
“With just two operations, Horizontal Roughing & Parallel Finishing, we have a master thermoform mold core. It’s really just like magic!”

“People seem to think they are locked into Mastercam, locked into SolidWorks, locked into the addons for SolidWorks. I’m sure these are good programs but I just have to say that I do believe, and this is why I still use MecSoft software, is that Rhino and RhinoCAM for Calton Cases is a genius that works for us!”

*Anthony Pelosi, Product Designer & Innovation Lead
Calton Cases, Austin, TX*

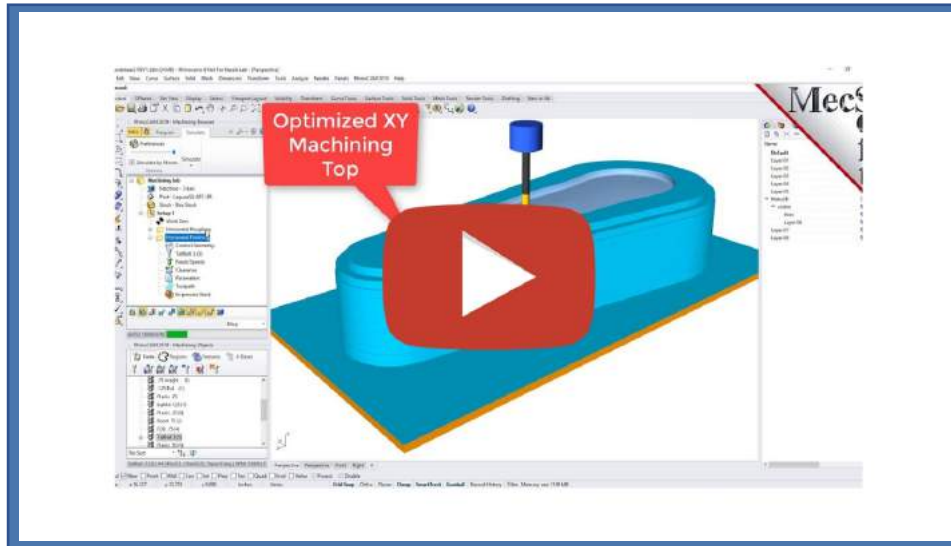
The roughing and finishing toolpaths and cut material simulations for the top case core are shown below. (A) and (B) show the Rhino 3D model and RhinoCAM box stock. (C) and (D) show the 3 Axis Horizontal Roughing toolpath and cut material simulation. (E) and (F) show a 3 Axis Horizontal Finishing toolpath. In (D) you can see that the roughing operation cleared all of the material using a $\frac{3}{4}$ " diameter flat end mill including a finishing pass on the flat bottom surface. In (E) you can see that the finishing operation automatically cuts the vertical sides and top of the core using a $\frac{1}{2}$ " diameter ball mill. The $\frac{1}{4}$ " radius at the base of the core is machined automatically.

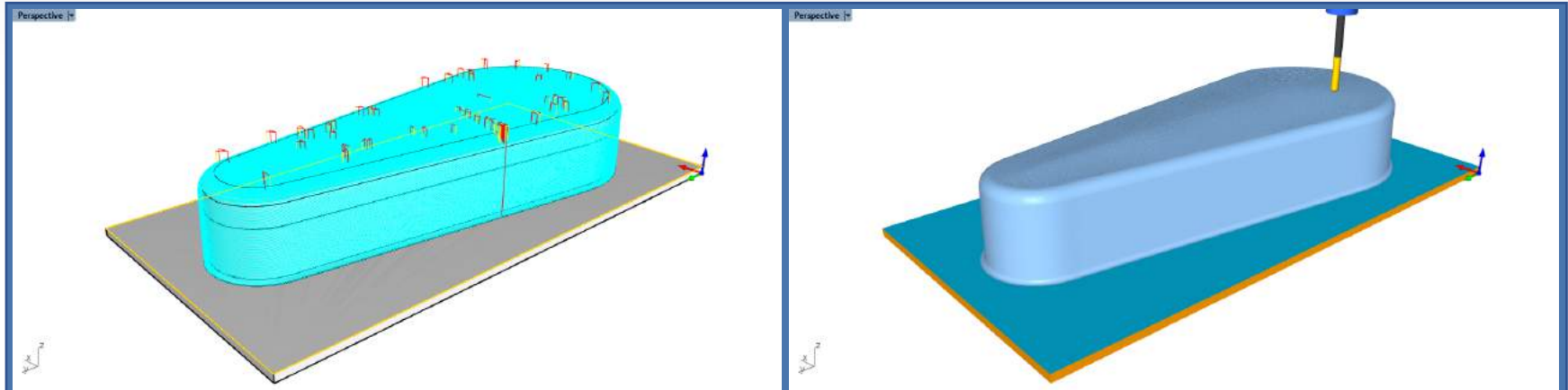




Machining the bottom core uses the same toolpaths as the top just regenerated with the bottom core 3D model displayed!

[Click here to see the cut material simulation video of these two mold cores!](#)

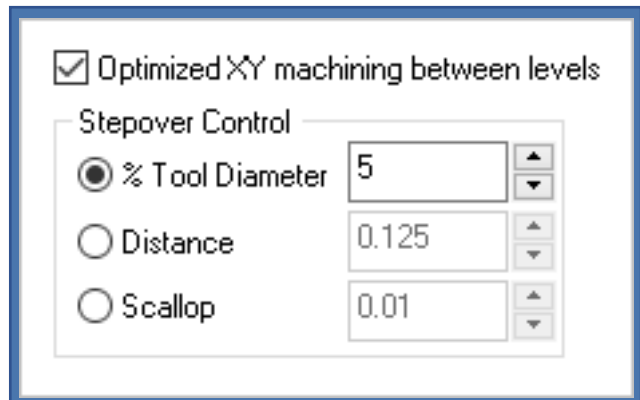




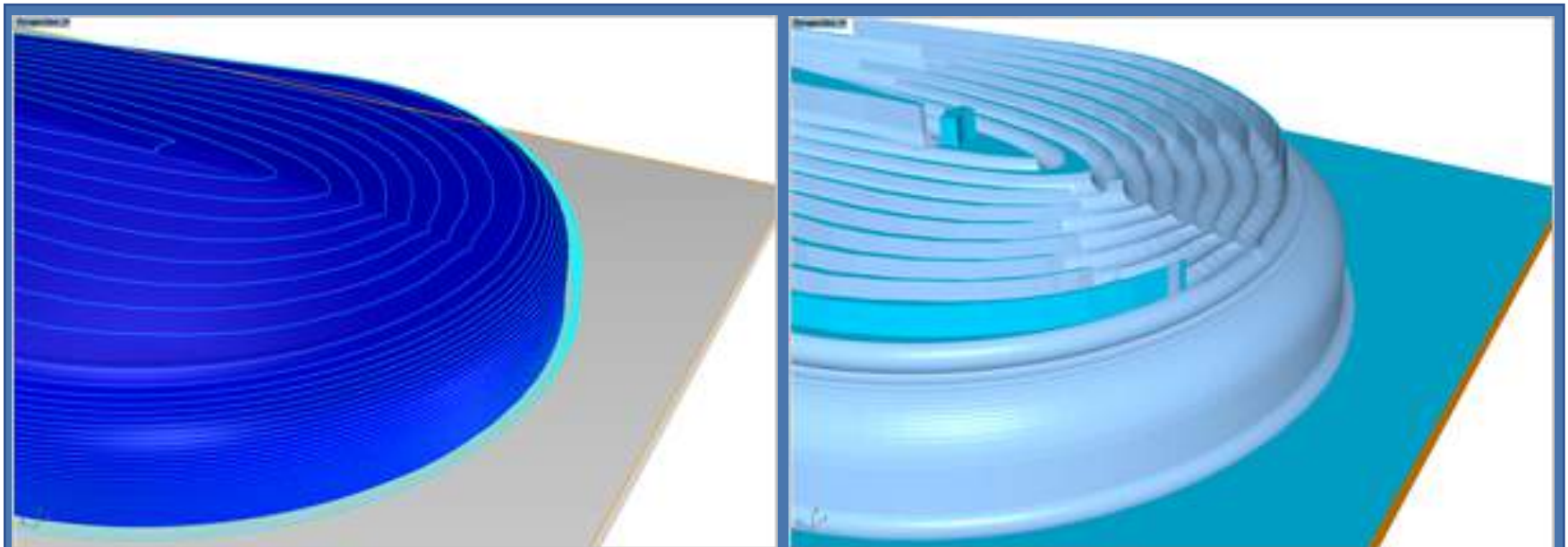
The 3 Axis Parallel Finishing toolpath for the bottom core mold of the mandolin case is shown.

Smart Finishing in RhinoCAM Standard!

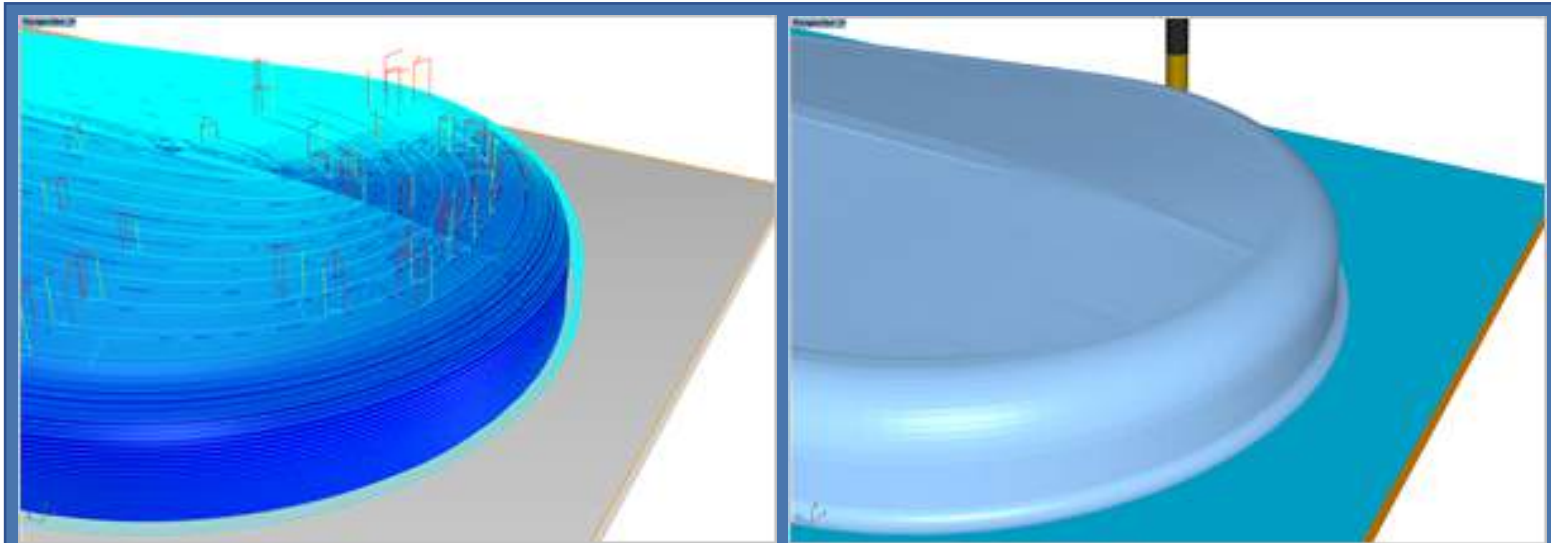
The 3 Axis Horizontal Finishing toolpath strategy for the top mandolin case core is shown below. It illustrates the use of the Optimized Machining controls provided by this toolpath. Horizontal Finishing is a toolpath strategy that cuts in horizontal planes. It is used primarily for near vertical walls like the sides of the core shown below.



However, near horizontal areas like the top would normally require additional re-machining operations due to the wider offsets created. With Optimized XY Machining between Levels enabled (shown in the dialog below), additional toolpaths are added between Z levels in the near horizontal areas to allow full and complete finishing of the core on one operation! 3 Axis Horizontal Finishing is available starting with the Standard configuration of RhinoCAM.



In the images above we have darkened the color of the core surface model on the left so you can better see the 3 Axis Horizontal Finishing toolpaths. Without Optimized XY Machining enabled, the toolpath offsets are greater in the top flatter areas. The cut material simulation on the right shows the uncut material in these areas clearly. This would normally require additional re-machining toolpaths.



In these images, Optimized XY Machining is enabled. Additional toolpaths are automatically added between Z levels in areas that are flatter, eliminating the need for additional machining. RhinoCAM allows you to control the stepover and engage/retract paths in these areas. The result is a completely finished core in one finishing operation! Compare the two images on the right (top and bottom). The cut material simulation shows full coverage on both the top and sides.

Horizontal Finishing


Control Geometry | Tool | Feeds & Speeds | Clearance Plane

Cut Parameters | Cut Levels | **Optimized Machining** | Entry/Exit | Advanced Cut Parameters

Optimized XY machining between levels

Stepover Control

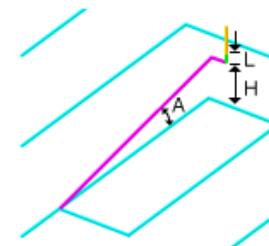
- % Tool Diameter: 5
- Distance: 0.125
- Scallop: 0.01



Engage/Retract for Optimized Cuts

Ramp

- Path: Angle (A): 10
- Linear: Height (H): 0.05, Distance (D): 0.05
- Helix: Radius (R): 0.0625
- Vertical Approach (D): 0



Generate | Cancel | Save | Help

Here we see the Optimized Machining tab of the 3 Axis Horizontal Finishing dialog. Separate stepover and engage/retract controls for the optimized cuts are provided.

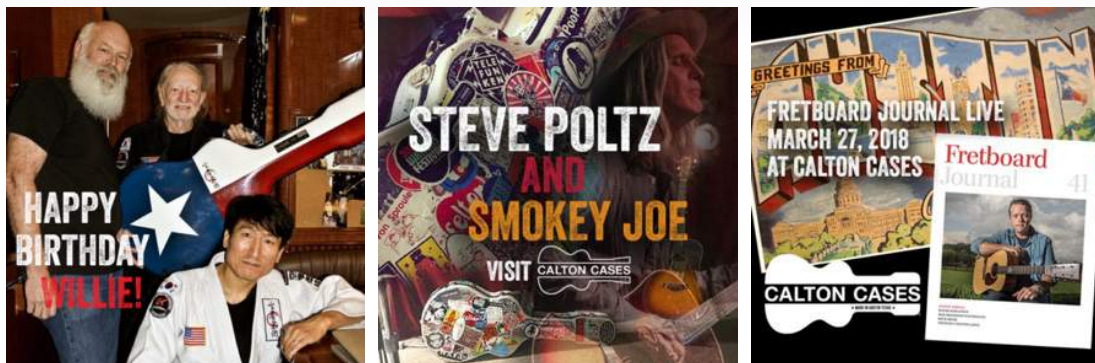


“The MecSoft tech support is fantastic. When I have a problem, I don’t want to be on a user forum! I want someone who is ready and willing to help me with the software. I get responses to emails and phone calls right away and the answers always work! I can’t tell you how much time that has saved. It’s a relationship that works for us and is another reason why I keep using RhinoCAM!”

*Anthony Pelosi, Product Designer & Innovation Lead
Calton Cases, Austin, TX*

More about Calton Cases

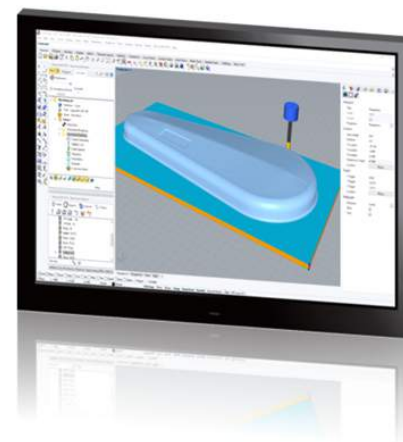
We want to thank Anthony Pelosi and the team at Calton Cases in Austin, Texas for allowing to showcase their work. To learn more about Calton Cases we invite you to visit them at their [home page](#), [Instagram](#), [Facebook](#) and [Pinterest](#).



See more images at www.calton-cases.com

More about RhinoCAM

RhinoCAM - MILL is available in five different configurations (Express, Standard, Expert, Professional and Premium). The parts shown here were programmed using the Standard configuration. Here are some additional details about each of the available configurations. For the complete features list, visit the [RhinoCAM Product Page](#).





- **RhinoCAM MILL Express:** This is a general-purpose program tailored for hobbyists, makers and students. Ideal for getting started with CAM programming. Includes 2 & 3 axis machining methods. Includes ART & NEST modules as well!
- **RhinoCAM MILL Standard:** This configuration includes everything that is in the Express configuration and additional 2-1/2 Axis, 3 Axis & Drilling machining methods. Also now includes 2½ Axis Turning!
- **RhinoCAM MILL Expert:** Suitable for 4 Axis rotary machining. Includes the Standard configuration, plus 4 Axis machining strategies, advanced cut material simulation and tool holder collision detection.
- **RhinoCAM MILL Professional:** Ideal for complex 3D machining. Includes the Standard and Expert configuration, plus advanced 3 Axis machining strategies, 5 Axis indexed machining, machine tool simulation, graphical toolpath editing and a host of other features.
- **RhinoCAM MILL Premium:** Tailored for complex 3D machining with both 3 Axis and full 5 Axis methods. Includes the Standard, Expert and Professional configurations, plus 5 Axis simultaneous machining strategies.

[Try the RhinoCAM-MILL Demo Today!](#)