



RhinoCAM® at the MSU School of Architecture!

Students at [MSU's School of Architecture](#) (Bozeman Montana) learn how to design the spaces and structures where people live, work and play. The Design & Fabrication Shop at MSU provides students with hands-on experience using the *State-of-the-art* CAD/CAM software tools that they will encounter in industry during their careers.

Bill Clinton has been teaching graduate-level design, construction and materials classes at the School of Architecture since 2003 and is the Fabrication Shop Manager as well as the Equipment and Facilities Manager for the School of Architecture. Bill has created a Digital Technology Room which houses laser cutters, a rapid prototype machine, a 3D digitizer and two 3-axis CAMaster® CNC machines.

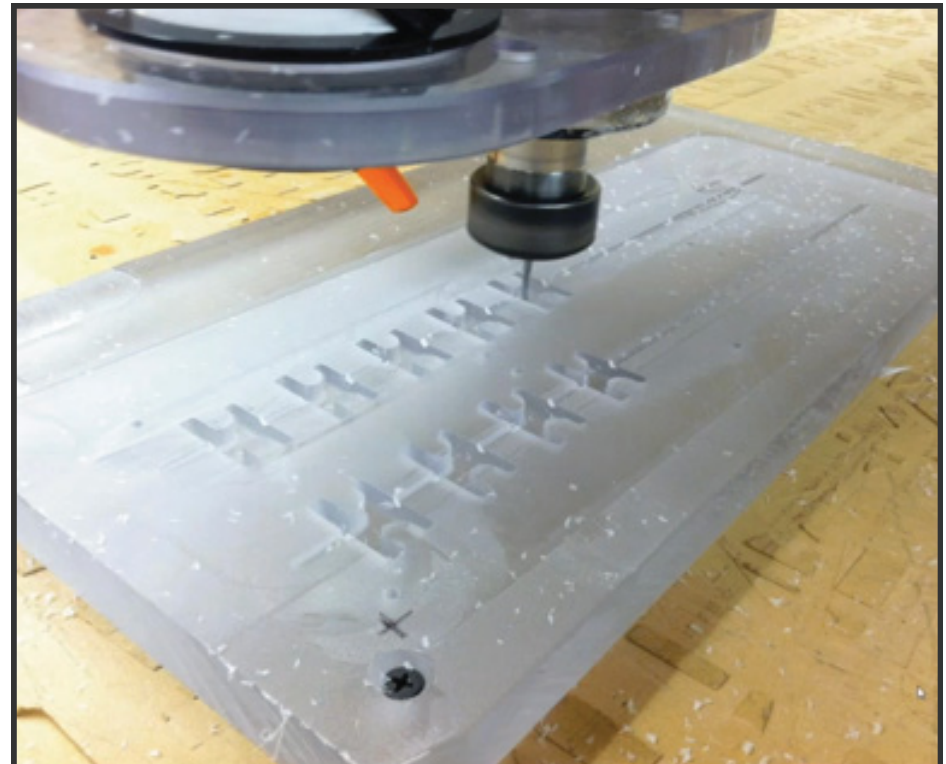


Figure 1 – One of MSU's CAMaster® CNC machines cuts mold cavities from G-code generated from RhinoCAM® 2016 for a student design that requires molded rubber components.

About 350 students in the *MSU School Of Architecture* learn CNC laser cutting and 2½ - 3 axis milling, Additive Manufacturing & Rapid prototyping.



I started teaching design classes in 2003 and in 2006 we purchased our first CNC machine which launched us into the world of digital fabrication. We started out using MasterCAM[®] but that lasted less than a year! I found MasterCAM[®] too cumbersome and difficult to teach students how to use it. RhinoCAM[®] has been a much more usable tool for us. After just a few hours of watching videos 80% of my students get it right the first time!

The Structure Improvisation Class at MSU

One of the classes Bill teaches at MSU is called *Structure Improvisation* in which students learn *the mathematical and metaphorical connection between music and architecture!* Students are instructed to design and build a musical instrument using *Rhino 5.0* and *RhinoCAM[®] 2016*. Upon completion of the project Bill along with his students perform a concert using their newly designed instruments. Bill's electric guitar design is shown in Figure (c) below.



(a)



(b)

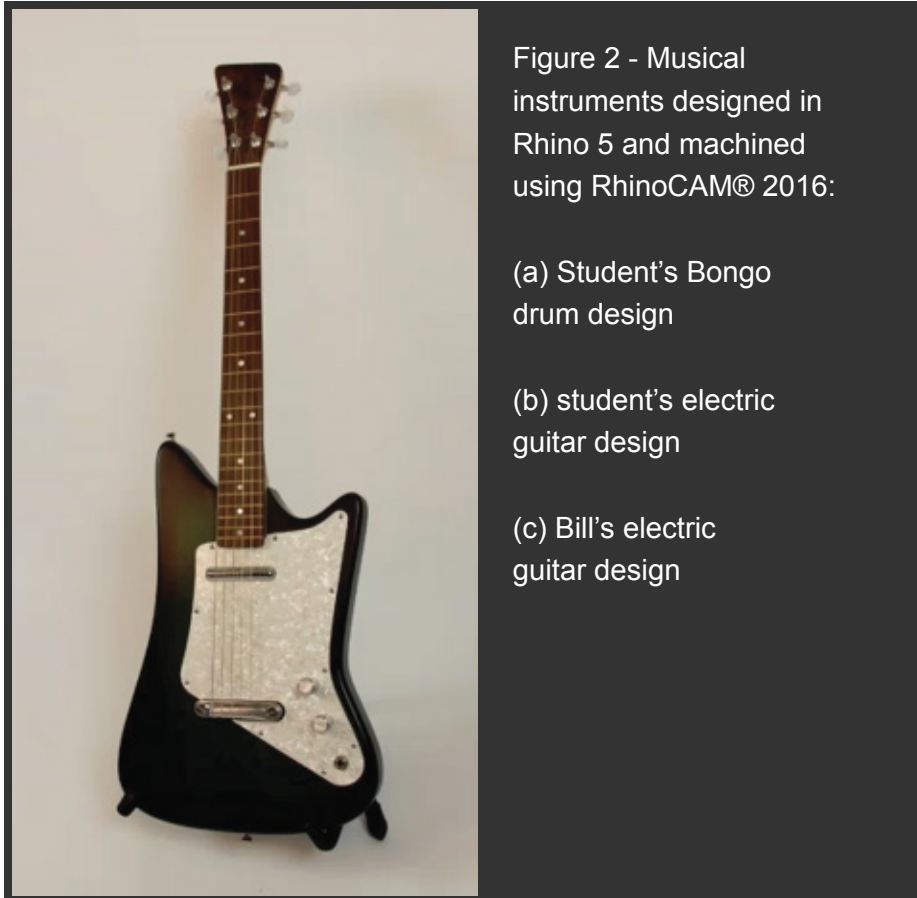


Figure 2 - Musical instruments designed in Rhino 5 and machined using RhinoCAM® 2016:

(a) Student's Bongo drum design

(b) student's electric guitar design

(c) Bill's electric guitar design

(c)

RhinoCAM® 2016 at MSU

The [CampusCAM Licensing Program](#) offered by MecSoft Corporation allows schools and universities unlimited licensing of the **RhinoCAM® 2016** software for student and instructor use. This ensures each and every student equal access to state-of-the-art CAM software during their academic studies. Bill shared with us his electric guitar design project from one of his recent *Structure Improvisation* classes. The final product produced from the toolpaths shown below can be seen in Figure 2(c) above.



RhinoCAM® is perfect for us because it allows interested students to go much further into the software than what is simply required by the class. There are so many different ways to create toolpaths that it keeps it interesting for me as well. When students come to me with unique challenges I'm always learning something new – I love it!

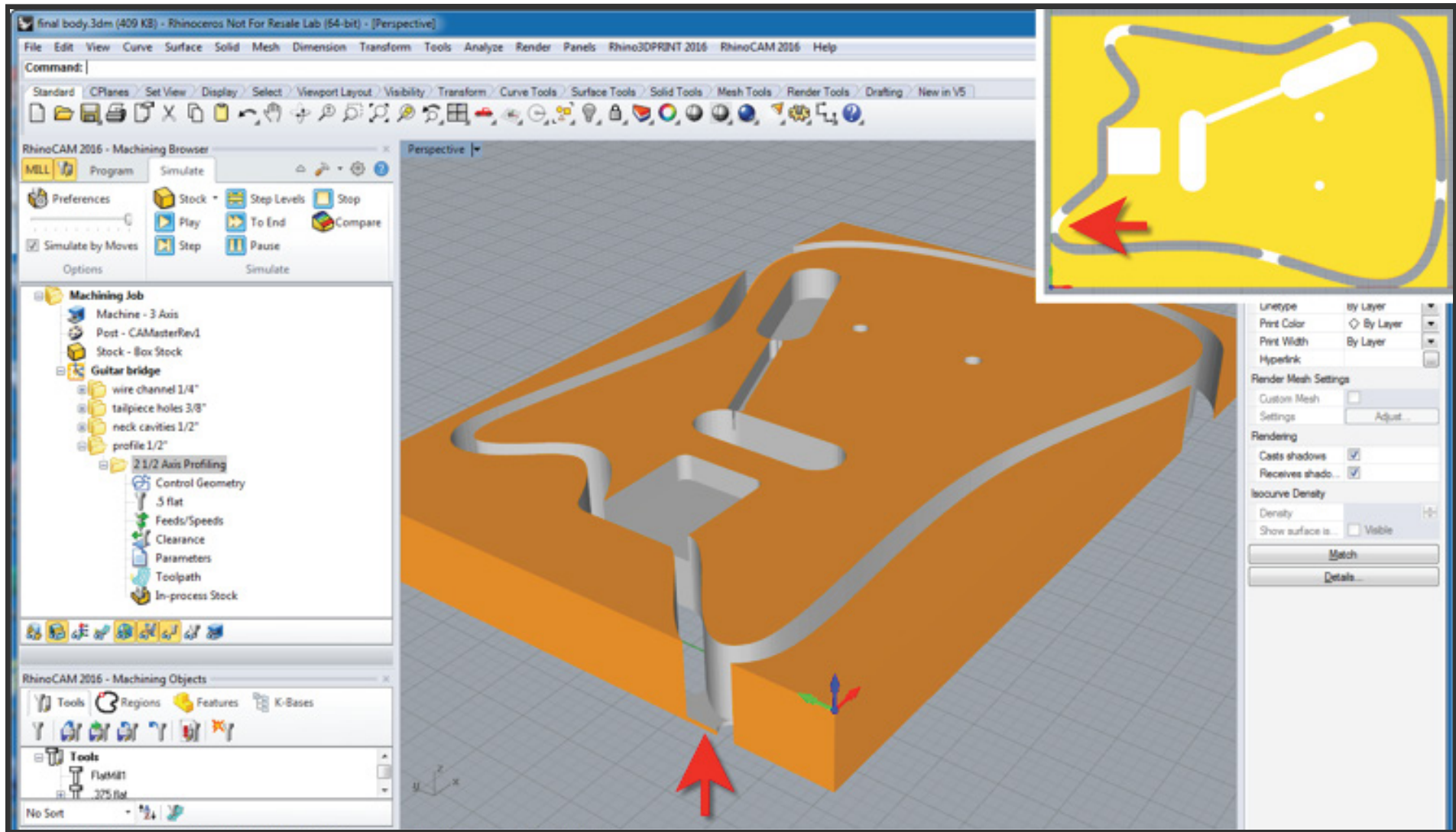


Figure 3 - 2½ Axis Pocketing and Profiling operations in RhinoCAM® 2016 are used here to machine the electric guitar body. Notice the automatic placement of Bridges to assist with holding the part to the stock during machining. Bridges can also be placed manually when more precise location control is needed.

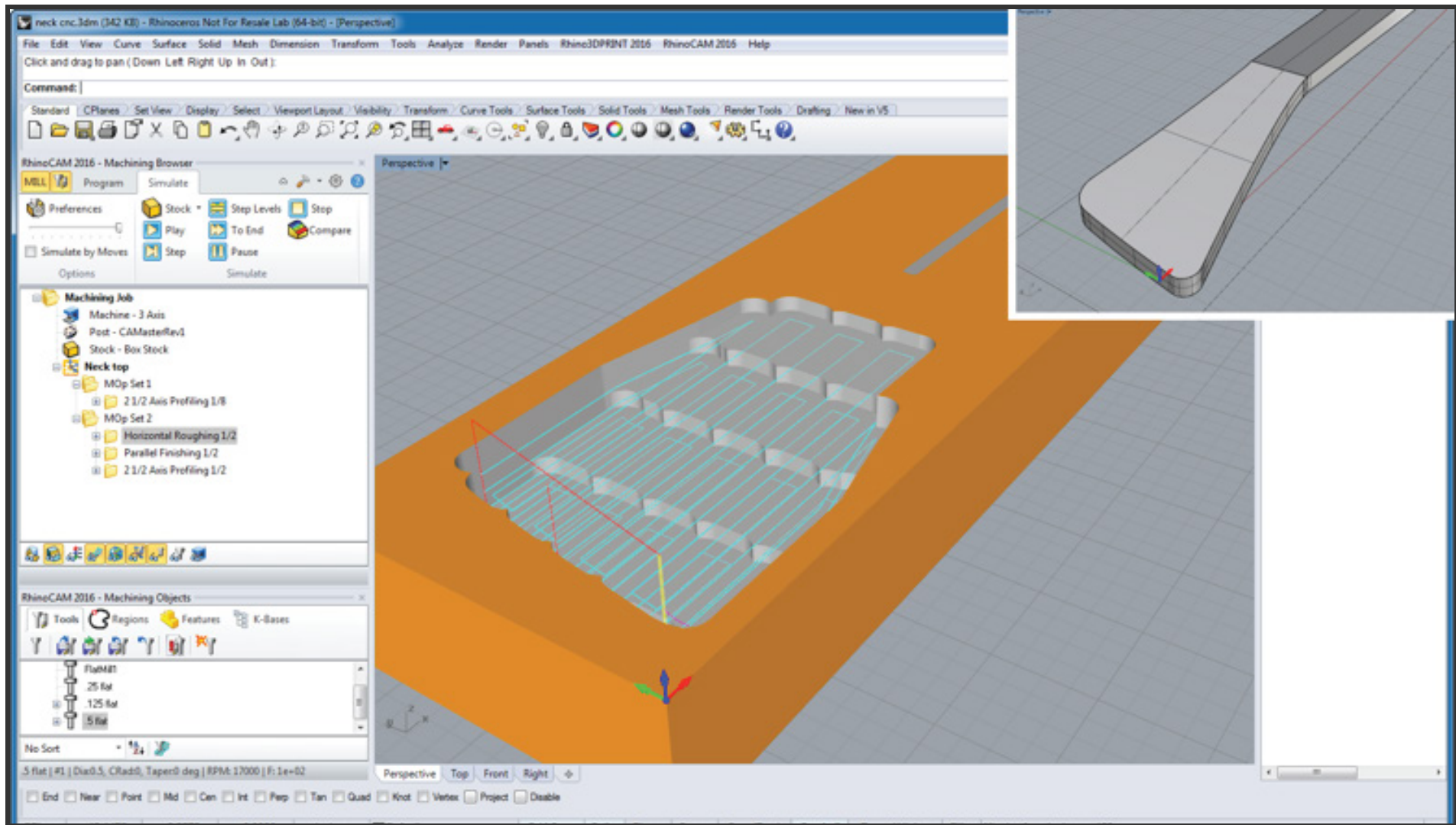


Figure 4 – In the Guitar’s Neck design, 3-axis Horizontal Roughing (also referred to as Roughing in Levels) is used as a clearing operation to remove stock in preparation for other 3-axis Finishing operations. This toolpath strategy supports full X, Y and Z containment and a variety of Cut Patterns. The Linear Cut Pattern is used in this example. The Rhino 3D model is shown inset top-right.

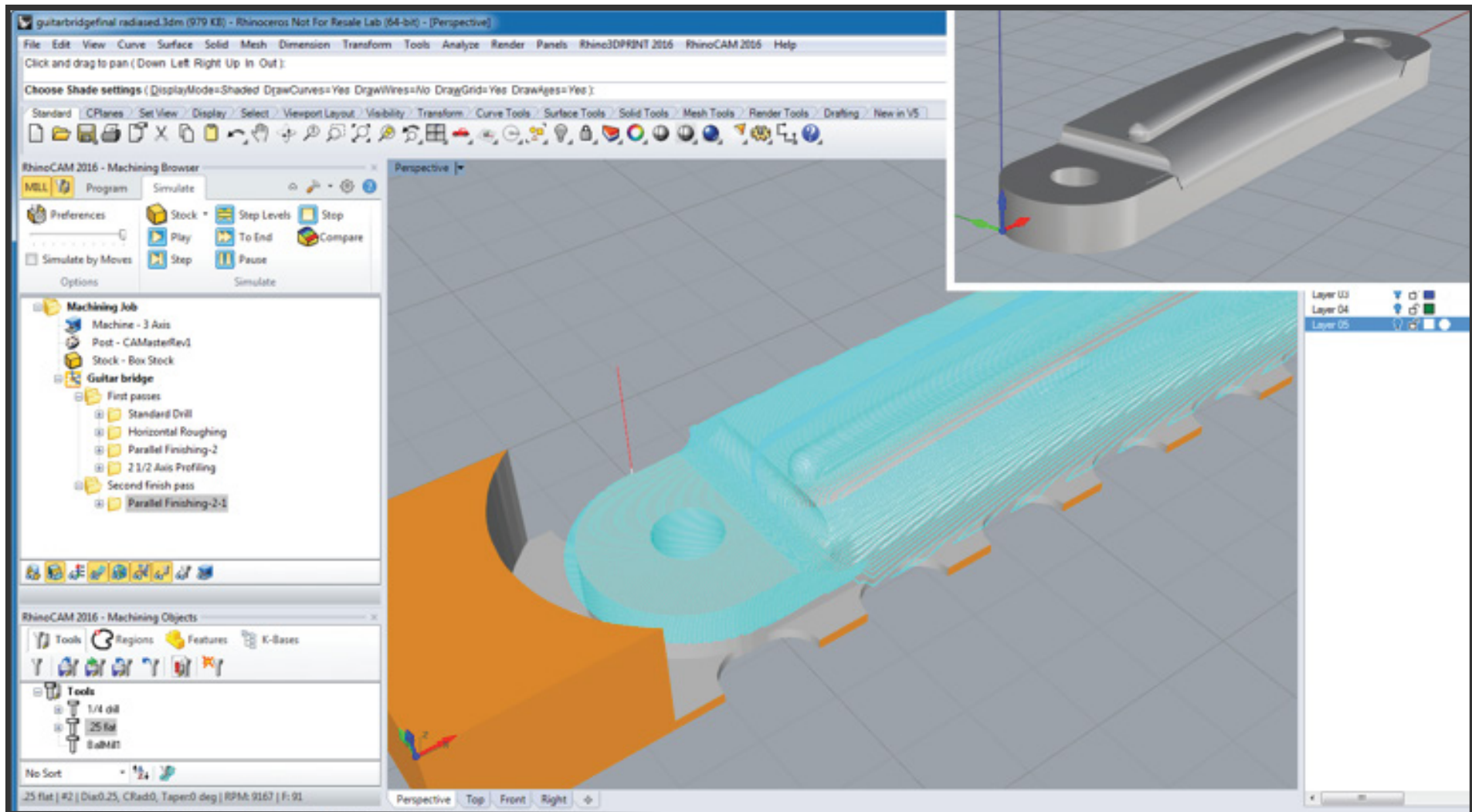


Figure 5 – In the guitar’s Bridge design, 3-axis Parallel Finishing (finishing in parallel planes) is used as a surface finishing operation after stock has been cleared using one or more of the Roughing operations. This toolpath strategy supports full X, Y and Z containment as well as cut control parameters including Cut Direction and Cut Angle. Notice the location of Bridges left from the previous 2½ axis Profiling operation. The Rhino 3D model is shown inset top-right.

1st runner-up in the 2013 Dwell on Design Furniture Society Show

This student chair design (far right) was manufactured from one sheet of multi-birch plywood and was nominated 1st runner-up in the [2013 Dwell on Design Furniture Society Show](#) in Los Angeles. It was designed in Rhino 5 and machined using the RhinoCAM[®] MILL module. *Courtesy: [MSU School of Architecture](#).*

More about the MSU School of Architecture



“Students at MSU’s School of Architecture learn how to design the spaces and structures where people live, work and play. The School of Architecture empowers students to critically engage with the complexities of society and the natural environment by instilling the fundamental principles of design and inspiring a spirit of exploration and creative experimentation in shaping the built environment.”



See <http://www.arch.montana.edu/index.php> for details. For more information about Bill Clinton and his work at MSU see http://www.arch.montana.edu/faculty_staff/staff/clinton.html.

More about RhinoCAM[®] and the CampusCAM License Program

For a complete list of RhinoCAM[®] 2016 features by product configuration see <http://mecsoft.com/rhinocam-mill/> for details. [RhinoNEST[®]](#), [RhinoART[®]](#) and [Rhino3DPRINT[®]](#) modules are also available. MecSoft's MILL and TURN modules also run as plug-ins within [VisualCAD[®] 2016](#) and [SolidWorks 2010-2016](#). For more information about MecSoft's CampusCAM License Program see <http://mecsoft.com/cad-cam-education/>.