



## MecSoft – Enabling Small Businesses

### RhinoCAM<sup>®</sup> Helps Startup Dream Come True!!

Confucius once said: “Find a job you love and you’ll never work a day in your life.” Such is certainly the case with Tanner Murchison of [Murchison Made Guitars, LLC](#). With a love for both music and wood working, Tanner is bringing his dream to life in each finely crafted musical instrument born from his shop in New Prague, Minnesota.

While working in a local music store Tanner knew that achieving his dream of designing and building his own guitars would require some serious determination and training. So he enrolled and graduated with a 2-year degree in guitar building from Southeast Tech and followed that up with a year of training in wood finishing school before opening his shop in 2011.



Figure 1 – The Murchison

*“What’s been really cool is the CNC aspect of crafting my guitars. After learning **Rhinceros CAD** in school, a friend of mine insisted that I had to take a look at **RhinoCAM!** He said I could create toolpaths and post G-Code directly to my CNC machine from Rhino and that it was easy to use. He was right!”*

While being taught to use Rhino in school, Tanner was unhappy with his early experiences with CAM software including, being limited in features which made it difficult to work with his Rhino design files.

Having already learned Rhino and the basics of CNC, Tanner says that he was up and running with **RhinoCAM** and posting his first G-code in just a few days!

## The Murchison Design

Tanner's goal was to create a guitar design that was aesthetically and acoustically appealing to both himself and his clients. Tanner was happy to share his latest product with us named *Arco*. This represents the 4<sup>th</sup> generation of design and production all original to Murchison Made Guitars.

The body is asymmetrical for ergonomic purposes and to provide a rich and balanced sound. The truss like bracing system, made possible by CNC machining, allows for the maximum strength to weight ratio which is crucial for a good sounding guitar. The fingerboard is cantilevered over the guitar top to create a continuous flat playing surface. The "floating" portion of the fingerboard is supported by a plate of uni-directional carbon fiber.

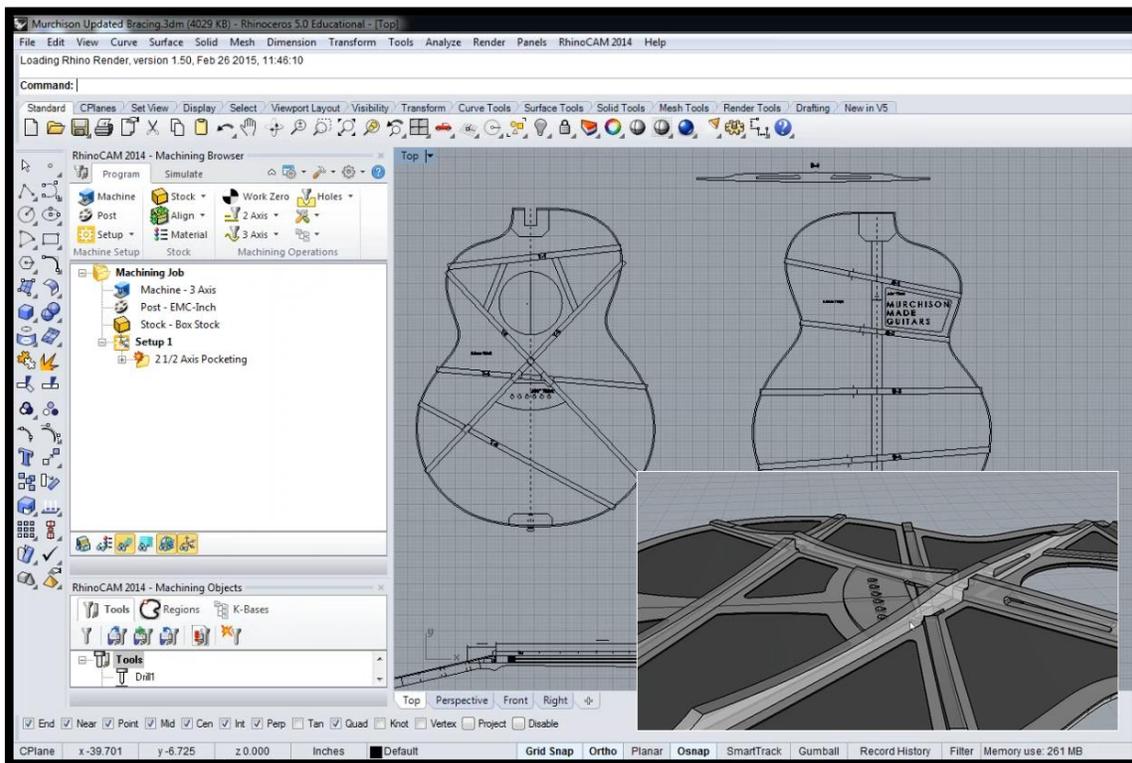


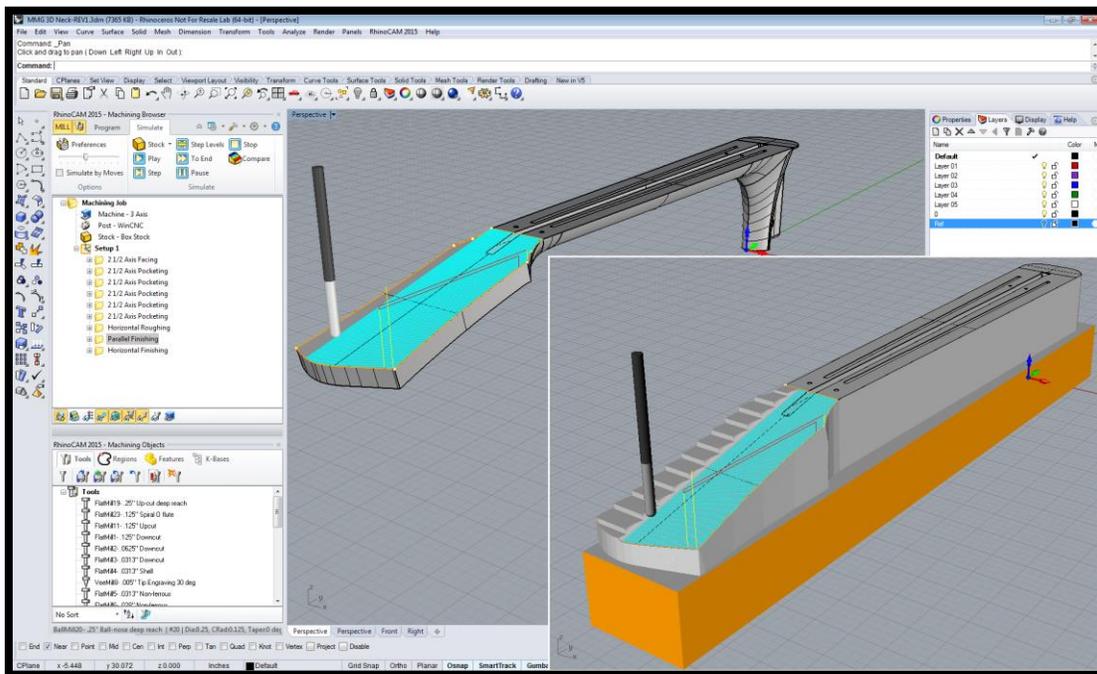
Figure 2a – The Bracing Design

**Figure 2a and b** – The *truss-like* the bracing design within the *sound box* is used to enhance the dynamics of bass and treble. These braces are glued to the top but do not make contact with each other! They each vibrate independently, contributing to the overall sound affect. The additional objective is to make the design as strong and as light as possible to emit the maximum velocity from the sound box. Note the thru-pockets in the brace cross-section eliminating weight without sacrificing strength. The inset image shows a 3D assembly of how the braces interlock, complete with weight reduction pocketing.



**Figure 2b – The Bracing Production**

The neck of the guitar is curved slightly to allow room for the strings to oscillate. There is a truss rod embedded within the neck beneath the finger board that runs through a carbon fiber reinforced channel from the base of the head stock angle down through the heel to the body. This is shown in Figure 5 below. This allows for adjustments to be made during assembly achieving the proper “up bow” or “back bow” curvature. Additional adjustments would only be needed in future if the neck experiences minor warpage. This is why it is extremely important that you keep a guitar in a constant 40% humidity environment. Changes in humidity will cause wood to expand and/or contract causing required adjustments to be made.



**Figure 5 – CAM Toolpaths for the Neck (Top Side A)**

## Production Materials

The materials used in The Murchison include quality woods from around the world including Sitka Spruce, Peruvian Walnut, Sapele as well as Indian Rosewood. With a medium or standard body guitar, using Mahogany for the neck is softer than Maple and will adsorb more string vibration reducing treble, making the overall sound of the guitar mellow. Because traditional woods are becoming scarce, more exotic woods are seeing their way into the production process. Product materials will also depend on customer specifications as well as the type of sound Tanner is looking to achieve.



Figure 6 – The Murchison Body Styling

## The Murchison:

- **Top wood:** *Sitka spruce*
- **Back and sides:** *Peruvian walnut*
- **Neck:** *Sapele*
- **Fingerboard and Bridge:** *Ebony*
- **Head Plate:** *Crotch Black Walnut*
- **Body binding:** *Indian Rosewood*
- **Rosette:** *Black Walnut*
- **Logo inlay:** *Gold Mother of Pearl*
- **Nut and Saddle:** *Bone*
- **Nut width:** *1- 3/4"*
- **Scale length:** *25.34"*
- **Frets to the body:** *14*
- **Fingerboard radius:** *16"*
- **Two-way Truss Rod**

## For more information

- For more information about [RhinoCAM<sup>®</sup>](https://www.rhinocam.com) and other CAD, CAM and 3DPRINT solutions offered by MecSoft Corporation, you can visit their website at <https://www.mecsoft.com>.
- If you are interested in learning more about Murchison Made Guitars, LLC, and The Murchison acoustic guitar you [can visit them on facebook](#).