

RhinoCAM & Laguna Tools at Oskayak High School!

[Oskayak High School](#) (Saskatoon, Saskatchewan, Canada) is a [First Nations and Metis indigenous](#) school focused on helping students keep their high school academic careers alive. The school is collaboratively governed between representatives of the Kitotiminawak Council, the Saskatoon Catholic School Board and Saskatchewan's Department of Education.

[Click here to learn more...](#)

Anthony Prima is a teacher at OHS. Anthony interned with and assisted his predecessor [Marc Gobeil](#) in the development of the virtual design and fabrication guitar building program there at OHS. Marc Gobeil is one of two recipients from the Greater Saskatoon Catholic Schools to receive the [Prime Minister's Award for Teaching Excellence](#) for this program!

Being a very well funded school, Anthony and Marc could have chosen any CAD, CAM & CNC solution available today. We recently sat down with Anthony to discuss his STEM class and to ask why they chose to use [Rhinoceros CAD](#), MecSoft's [RhinoCAM](#), and the [Laguna iQ Desktop series CNC machine](#) for the program there at Oskayak High School.





Where is Saskatoon?

Saskatoon is a city on the South Saskatchewan River in Saskatchewan, Canada. North along the riverside Meewasin Trail is Wanuskewin Heritage Park, with exhibitions exploring indigenous culture. On the trail's southern stretch, native wildlife inhabit the prairie grasslands of Beaver Creek Conservation Area. Regina, the provincial capital, is home to the Royal Saskatchewan Museum, with exhibits on natural history and the people of Canada's First Nations.

About the OHS STEM Class

The aim of the course is to teach students the basics of drafting, CAD, and woodworking, culminating in their final project of building an electric guitar! The lab and course are set up to act as a maker space to give students the opportunity to design and build. The class provides a practical and fine arts credit. It is a survey course so the students have to take three fine arts classes and draw an outcome from all three, including Computer Design & Drafting, Construction Carpentry and Electronics. The program has garnered some highly deserved recognition from Canada's leading institutions and [Prime Minister Justin Trudeau](#) himself!

Check out these videos and links, Keep up the Great Work Anthony!



[Saskatoon high school program blends music with virtual design. \(Global News Canada\)](#)



[The Laguna iQ Desktop - Oskayak High School Program Showcase \(STF - The Teacher Project\)](#)



[Trudeau fields tough questions from saskatoon students \(PANOW\)](#)



[Recipient of the Prime Minister's Award for Teaching Excellence in STEM](#)



Student Electric Guitar Body Designs created at Oskayak High School



Anthony Prima



Marc Gobeil

“Marc Gobeil and myself created the program here at OHS in 2014/2015 when I was an intern with him. Marc’s idea was to set up a program that could incorporate aspects of a shop class while administered in a computer lab. We both had lots of shop experience, and Marc had even built a few guitars himself. We needed software to perform both design and set up the CAM machining process. We also needed a CNC machine that fit well in our computer lab. We are very pleased with our decision to go with Rhino, RhinoCAM and Laguna Tools!”

*Anthony Prima,
Teacher & Technology Instructor
Oskayak High School, Saskatoon, Saskatchewan,
Canada*

The Laguna iQ Desktop CNC Router

For the STEM computer lab environment at [Oskayak High School](#) Anthony and Mark turned to [Laguna Tools](#) based in Irvine, California and the [Laguna iQ Desktop Series](#) 3 Axis router. [Click here](#) to learn more about Laguna Tools in Education!

Wildly popular among hobbyists, the iQ series of desktop CNC routers consists of space-saving machines at affordable prices. As excellent starter models, these CNC routers can produce a wide variety of designs with tremendous precision. Within the iQ series, you will find work and hobby CNC routers that feature:

- All-welded, one-piece steel frames for quick assembly and accurate alignment from the start.
- 3HP spindle with liquid cooling, which keeps the spindle at a constant temperature maintaining longevity.
- Handheld controllers with screens displaying the tool path and the G-code during machining.
- Automatic Tool Change, where machines can automatically change between three tools during one program.



CNC Routers for Several Applications

The desktop CNC routers from Laguna Tools aren't limited to just one application. Looking to design a picture frame from wood? These machines do just that with outstanding precision. Planning to cut signage from plastic? Laguna tabletop CNC routers can make it happen. Working with aluminum? Because of their large work envelopes, Laguna CNC routers are a better option to use on aluminum than a metal-working machine.

Learn More from the Laguna CNC Experts

Trying to figure out which desktop CNC router is right for you?

[Contact the team at Laguna Tools to learn more about how their tools can craft anything you have in mind.](#)

[Find Out if The iQ is Right For You](#)

Laguna Tools, based in Irvine, California, has been leading the industry in woodworking innovations for 36 years and continues to challenge the industry with new advancements.

 LAGUNA

“At Laguna Tools, we aim to be “globally local” as we are involved in many community outreach programs in which we offer our time, support, products, and services.”

Follow Laguna Tools Online:



Machining a Guitar Body with RhinoCAM and the Laguna iQ Desktop at OHS!

The guitar bodies at OHS are designed in [Rhino](#), the CAD design and modeling software from [McNeel & Associates](#). The CAM toolpaths and g-code program files are generated using the [RhinoCAM plug-in](#) from [MecSoft Corporation](#). The designs are machined on the school's [Laguna iQ series desktop 3 Axis CNC Router](#). Because machining is done right in the computer lab, Anthony and Marc needed a CNC machine that was compact yet rugged, highly accurate and easy to operate. [Learn more about the Laguna iQ Desktop here!](#)

The stock material is either ash, spruce, or poplar measuring $13\frac{7}{8}$ " x $20\frac{5}{8}$ " x $1\frac{3}{4}$ ". The stock is machined from 2 sides (top and bottom) using two $\frac{3}{8}$ " locator pins for alignment. Some body designs require 2 Axis toolpath operations only while others require additional 3 Axis roughing and finishing toolpath strategies. The neck and remaining hardware are purchased items with each student completing the final assembly. Details about a typical guitar body machining process are provided below. Each student is also taught how to setup the completed guitar, including bridge height and truss rod adjustments, setting up inclination etc.



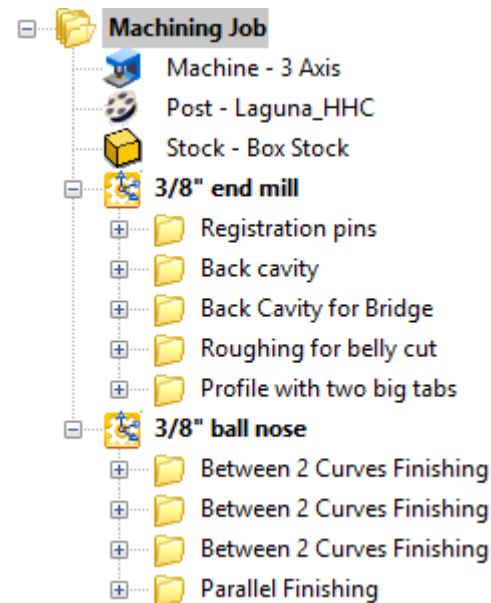
The screenshot displays the RhinoCAM 2019 software interface. The main window shows a 3D model of a guitar body with a cyan-colored toolpath. A blue and yellow tool is positioned at the top of the model. The interface includes a menu bar (File, Edit, View, Curve, Surface, Solid, Mesh, Dimension, Transform, Tools, Analyze, Render, Panels, RhinoCAM 2019, Help), a toolbar, and a left-hand panel with 'Machining Job' and 'Toolpath' sections. The 'Machining Job' section shows a tree view of operations, including 'Machine - 3 Axis', 'Post - Laguna_HHC', 'Setup (2 Axis)', 'Pickup cavities', '2 1/2 Axis Profiling', 'Tone Control Cavity Bottom', 'Neck Pocket', 'Jack Pocket', 'Bridge plate', 'Arm cut Rough', 'Setup (3 Axis)', 'Parallel Finishing', 'Between 2 Curves Finishing', 'Control Geometry', '375 Ball End', 'Feeds/Speeds', 'Clearance', and 'Parameters'. The 'Toolpath' section shows a tree view of toolpaths, including '375 Ball End'. The 'Toolpath' section also includes a 'No Sort' dropdown and a '375 Ball End | #2 | Dia:0.375, Cfilad:0.188, Taper:0 deg' label. The right-hand panel shows 'General settings' and 'Grid & Axis settings'. The 'General settings' section includes options for 'Active view...', 'Display m...', 'Shaded', 'General settings', 'Backgr...', 'Use A...', 'Flat Sh...', 'Shade...', 'Shadows', 'Surfac...', 'Surfac...', 'Tange...', 'Tange...', 'Mesh...', 'Curves', 'Lights', 'Clippin...', 'Text', 'Annot...', 'Points', 'Pointc...', 'Transp...'. The 'Grid & Axis settings' section includes options for 'Grid', 'CPlane...', 'Z Axis', 'World I...'. The bottom status bar shows 'Grid Snap Ortho Planar Onsnap SmartTrack Gumball Record History Filter Absolute tolerance: 0.001'.

Here we see the *The Stratmaster* guitar body design in Rhino. The RhinoCAM plugin is loaded and the Machining Job is displayed on the far left showing two setups, one for the 2 Axis operations and another for the 3 Axis operations. To the right of the Machining Job the Toolpath Viewer/Editor is displayed listing each tool motion in the 3 Axis Between 2 Curves toolpath operation. In this 3 Axis strategy, the toolpath is calculated to flow between 2 3D curves. In this case the two curves are located at the top and bottom edges of the outer perimeter fillet.

The Bottom Side Machining Job

The bottom side of the guitar body is machined first. The complete Machining Job tree is shown here on the right. The operations are divided into two setups. The 3/8" end mill setup performs all operations that require a 3/8" end mill. All are 2 Axis operations except for the Roughing for belly cut operation which is a 3 Axis Horizontal Roughing toolpath.

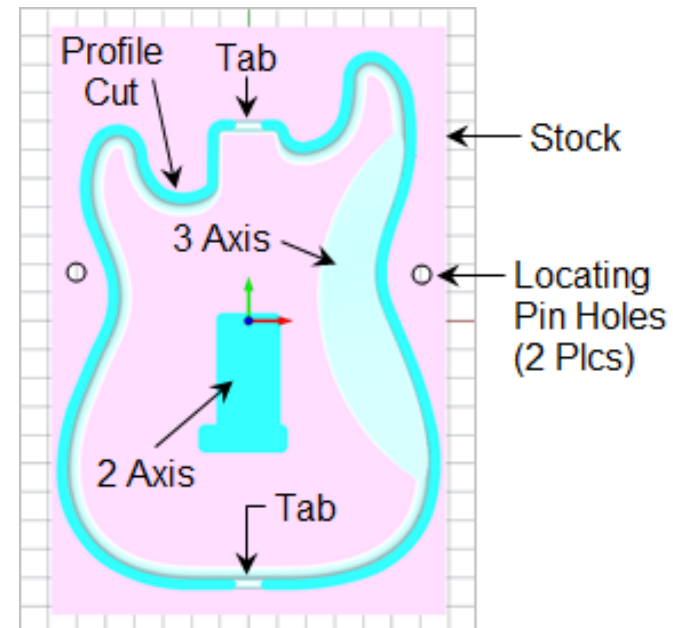
The first is 2 Axis Hole Pocketing to machine the two registration pin holes used when the stock is flipped over to machine the top side. The 3/8" ball nose setup contains all of the 3 Axis finishing operations comprised of three Between 2 Curves Finishing toolpaths and one Parallel Finishing toolpath. These operations are illustrated further in the images below.

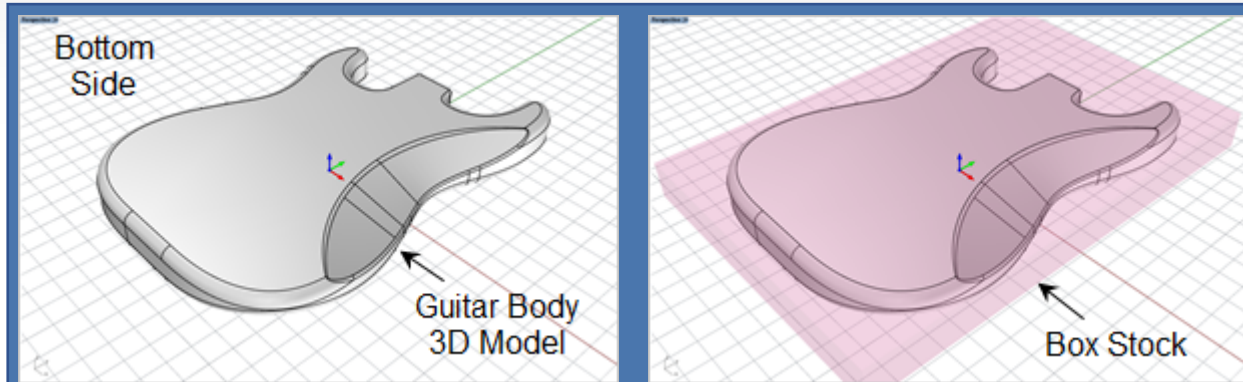


Operation Details (Bottom)

In image (A) below we see the guitar body 3D model (bottom side up) displayed in Rhino. It is comprised of a polysurface (solid) model. While we only show the solid model, there are actually other 2D and 3D curves derived from the model that are used as containment. For simplicity, we have hidden the wireframe geometry. Image (B) shows the box stock highlighted over the part model.

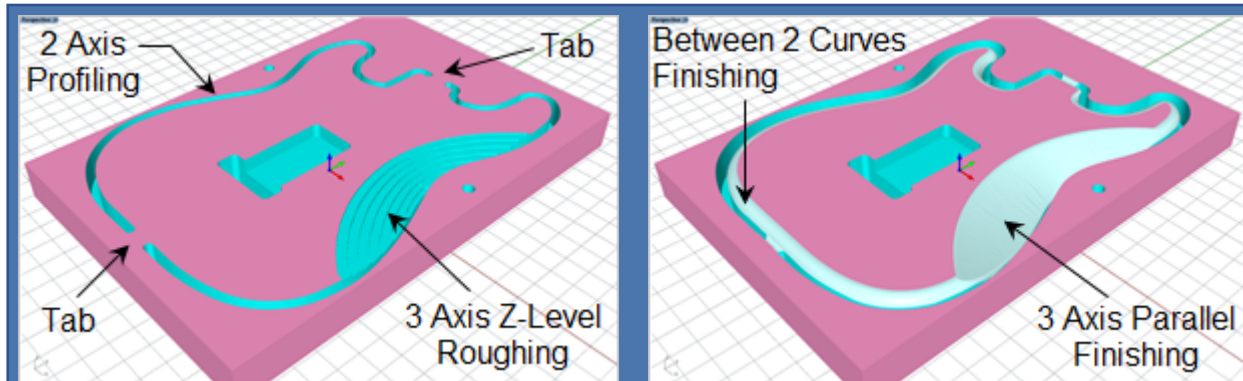
In image (C) we see the cut material simulation after the $\frac{3}{8}$ " end mill setup. The *Registration pins* is a 2 Axis Hole Pocketing machining operation used when the stock is flipped over to machine the top side. The two *back cavity* machining operations (listed in the machining job tree above) are 2 Axis Pocketing operations located in the middle of the body. The 3 Axis Horizontal Roughing operation can be clearly seen. Of particular interest is the machining operation named *Profile with two big tabs*. This is a 2 Axis Profiling operation using two 2D curves. The distance between the endpoints of the two curves controls the width of the tabs. In image (D) we see the machining operations contained in the $\frac{3}{8}$ " ball nose setup. The *Between 2 Curves* machining operations perform the finishing for the upper fillets around the perimeter of the guitar body. The *Parallel Finishing* machining operation finishes the back *belly* contour.





(A) (B)

On the left we see the 3D polysurface (solid) model of the guitar body.
On the right we see the box stock defined in RhinoCAM.



(C) (D)

On the left all operations using the $\frac{3}{8}$ " flat end mill. These include 2 Axis Hole Pocketing, Pocketing, Profiling and 3 Axis Horizontal Roughing. On the right we see the operations using the $\frac{3}{8}$ " ball nose cutter. These include 3 Axis Between 2 Curves Finishing and Parallel Finishing.

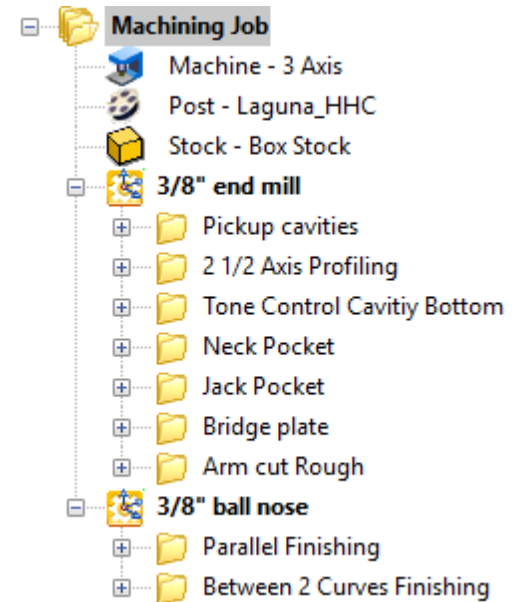
The Top Side Machining Job

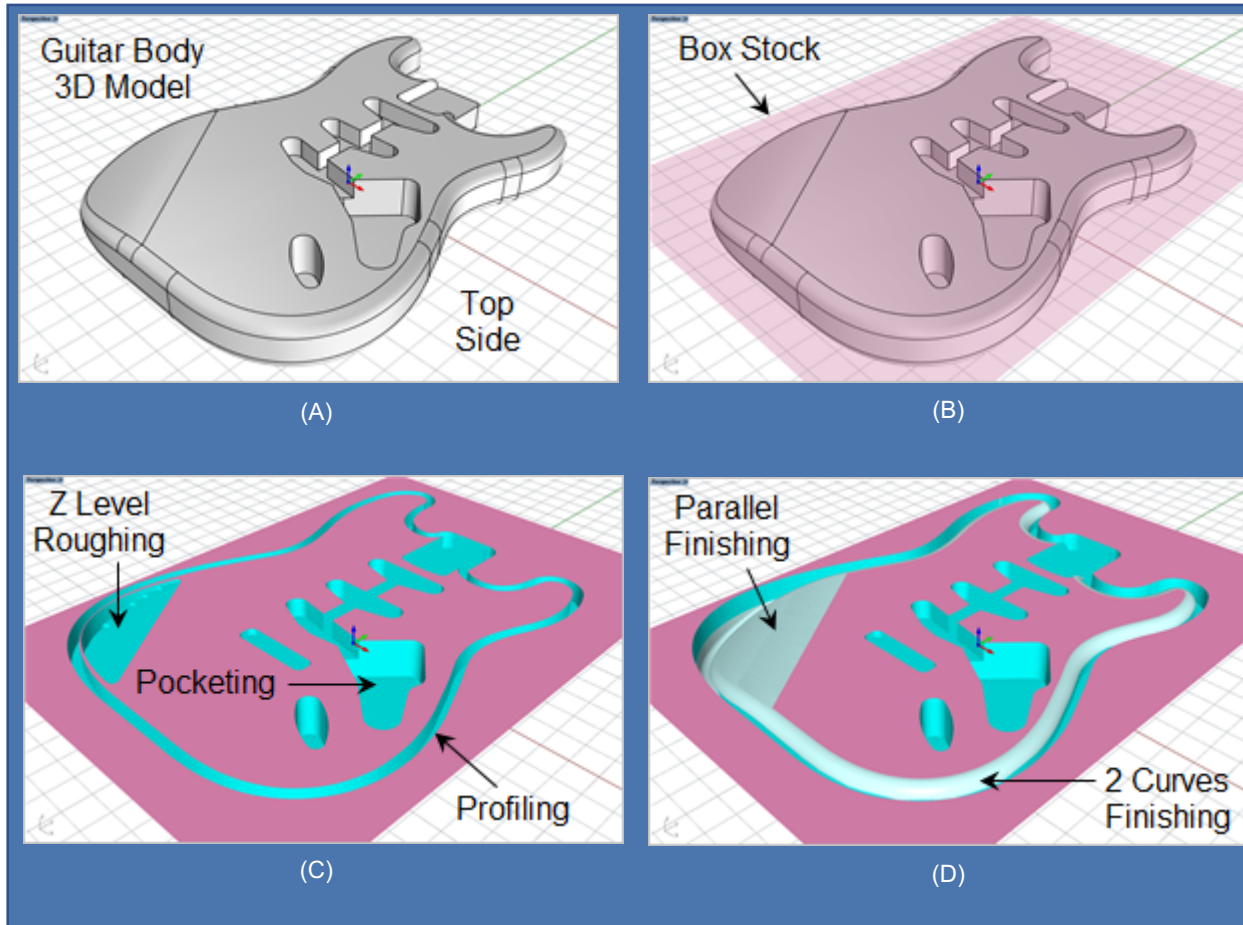
After the bottom side is machined, the stock is removed and the registration pins are mounted. The inprocess stock is then flipped over mounted on the registration pins and secured. The complete Machining Job tree for the top side is shown here on the right. Again, the operations are divided into two setups, one for the $\frac{3}{8}$ " end mill and a second for the $\frac{3}{8}$ " ball mill (also referred to as a ball nose cutter). All are 2 Axis operations except for the Arm cut rough machining operation which again is a 3 Axis Horizontal Roughing machining operation.

The $\frac{3}{8}$ " ball nose setup again contains all of the 3 Axis finishing machining operations comprised of Between 2 Curves Finishing and Parallel Finishing. These operations are illustrated further in the images below.

Operation Details (Top Side)

In images (A) and (B) below we see the 3D guitar body model (top side up) as well as the box stock displayed in RhinoCAM. In image (C) we see the operations completed in the $\frac{3}{8}$ " end mill setup. The 2 Axis Pocketing cavities are shown in the interior as well as on the neck. The 2 Axis outer perimeter Profile cut as well as the 3 Axis Horizontal Roughing is clearly shown. In image (D) we see the 3 Axis finishing operations contained in the $\frac{3}{8}$ " ball nose setup. Again, Parallel Finishing is used for the contoured arm access area and Between 2 Curves finishing for the top perimeter fillet.

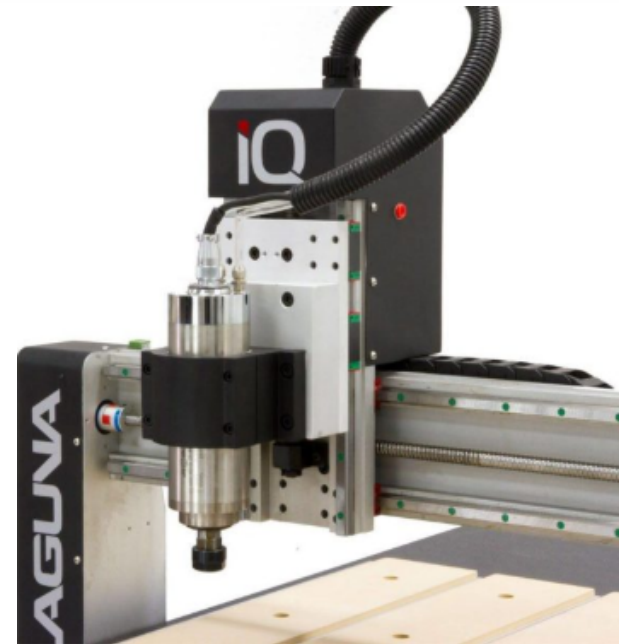




More about Laguna Tools

[Laguna Tools](#) was founded in 1983 by Torben Helshoj who saw an opportunity to bring high-quality European woodworking machinery to the US. The first tools to be introduced were combination machines which soon led to Laguna Tools' most iconic machine, the Italian Bandsaw. Over the years, Laguna Tools has built an extensive line of woodworking machinery before moving forward with development of their own CNC Automation.

Laguna Tools launched their line of CNC Machines with the [SmartShop](#) and soon followed up with the [Swift Series](#) and [iQ Series](#) machines. After innovating on the CNC Router end, Laguna Tools came out with even more advanced machinery such as [CO2 Lasers](#) and [Plasma Cutters](#). Laguna Tools now has a wider range of machinery available than ever before, all to help their customers achieve their goals to improve the way they do business.



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More about Oskayak High School

“Oskayak” translates to “*young people*” in the native aboriginal culture of Canada. Established in 1980, Oskayak High School is a [First Nations and Metis indigenous](#) school focused on helping students keep their high school academic careers alive. The school is collaboratively governed between representatives of the Kitotiminawak Council, the Saskatoon Catholic School Board and Saskatchewan's Department of Education. In 1987, the school celebrated its first graduates; one student entered university the following year. Tribal elders bring students the *Sacred Circle*, a cultural symbol of the Aboriginal people in Canada to help the young people find mental, spiritual, physical and emotional balance.

[Click here to learn more...](#)



More guitar designs from
Oskayak High School



Canadian Prime Minister Justin
Trudeau at Oskayak High School



Electric Guitar presented to Prime Minister Justin
Trudeau from Oskayak High School

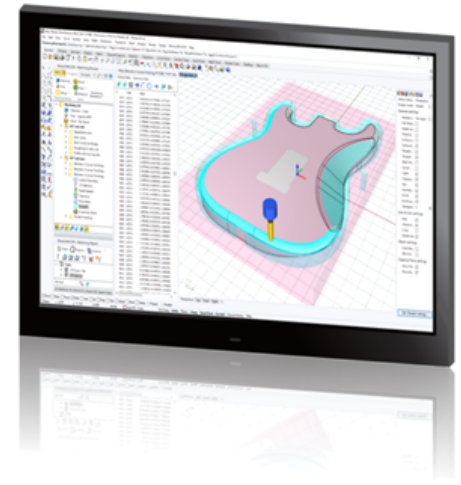
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More about RhinoCAM

RhinoCAM - MILL is available in five different configurations (Express, Standard, Expert, Professional and Premium). The part shown here was programmed using the Professional 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.





Oskayak
High School

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For the complete features list, we invite you to visit the

[RhinoCAM Product Page:](#)

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