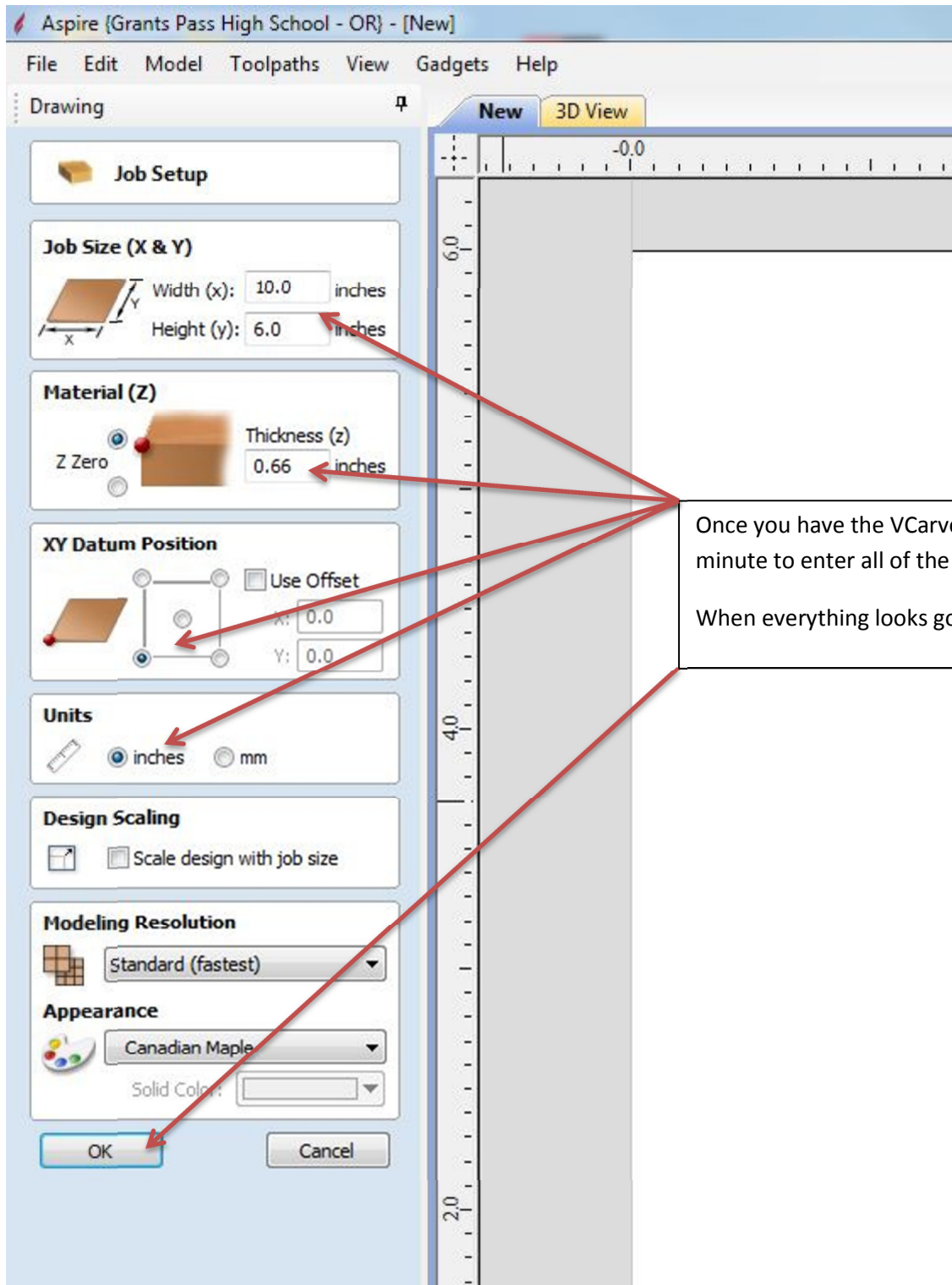




Welcome to the 6 x 10 wooden sign tutorial. The first item on the agenda is to open the CAD software you will be using today. One of the most user friendly (easiest) software packages we have available to us is called VCarve Pro. Quite simple to get up and running with (perfect for educators) and it's a lot of fun to use.

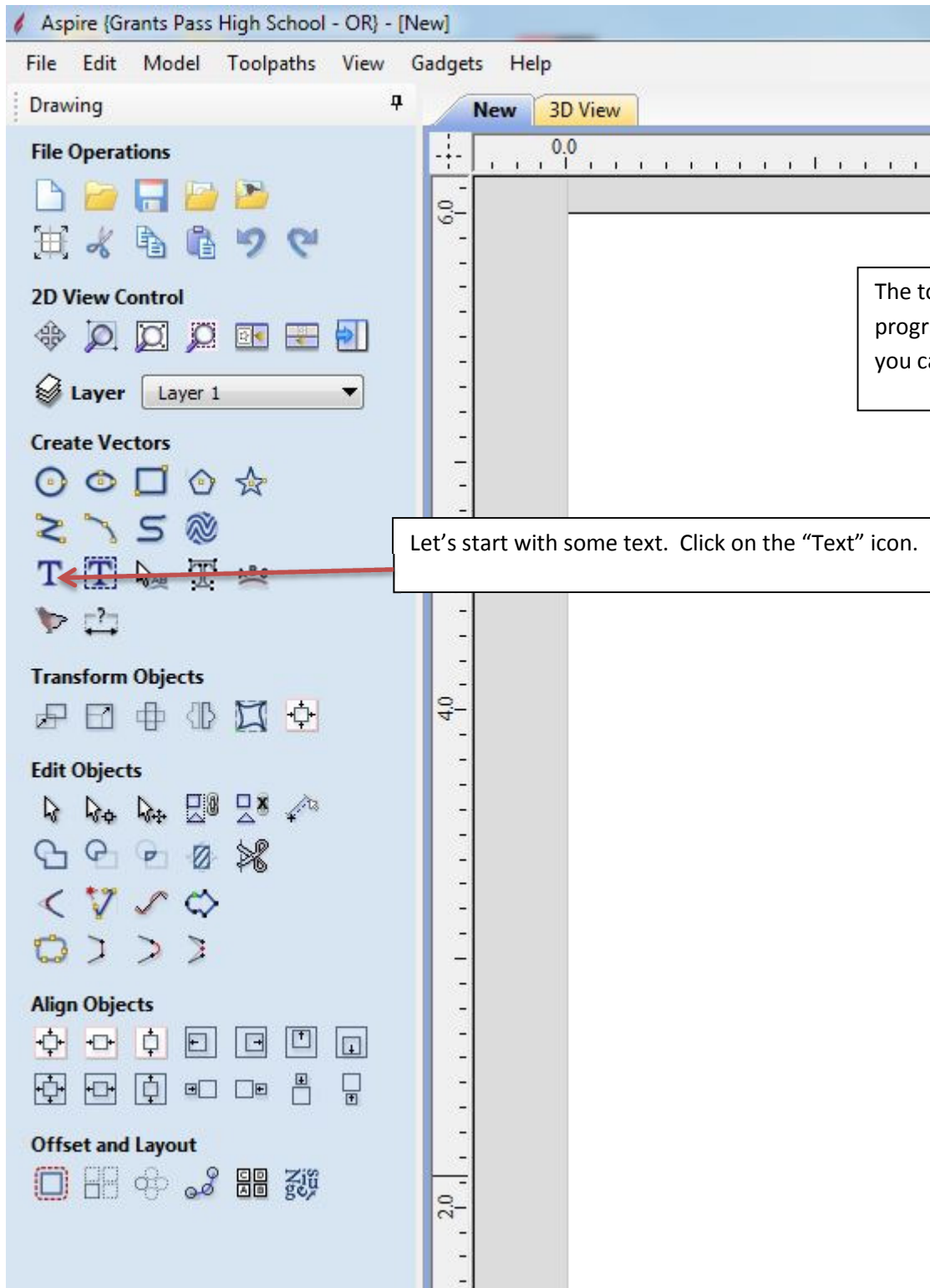
So...the first thing you need to do is find this program. VCarve Pro. It may not be an icon on your desktop so you may need to look for it in the programs list on your PC.

Just a quick bit of info for you up front. We are going to be designing a very simple project that you will take over to the shop and machine. Although it is simple, there are opportunities for you to make alterations in order to create something more complex than is described in this tutorial. We encourage you to ask questions and explore the software to your hearts content. Even if you do not get your work machined today, we will make sure it gets done and delivered to you very soon. The idea is that you learn something today that you may be able to take back to your classroom and use. This is truly a hands-on introduction to STEM education and we hope you enjoy your morning as much as possible.



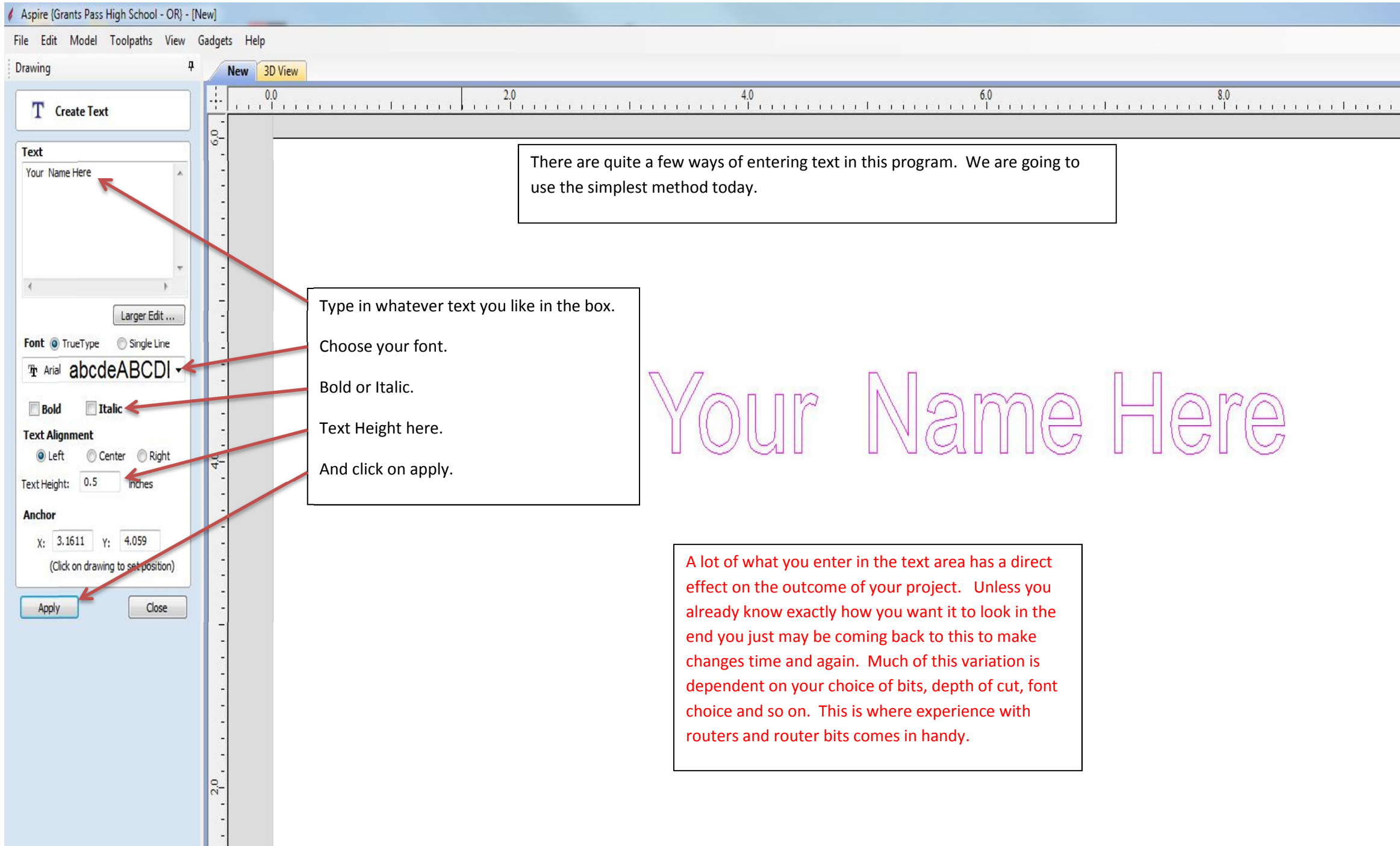
Once you have the VCarve software open, we need to set the job up. Take a minute to enter all of the parameters exactly as you see them here.

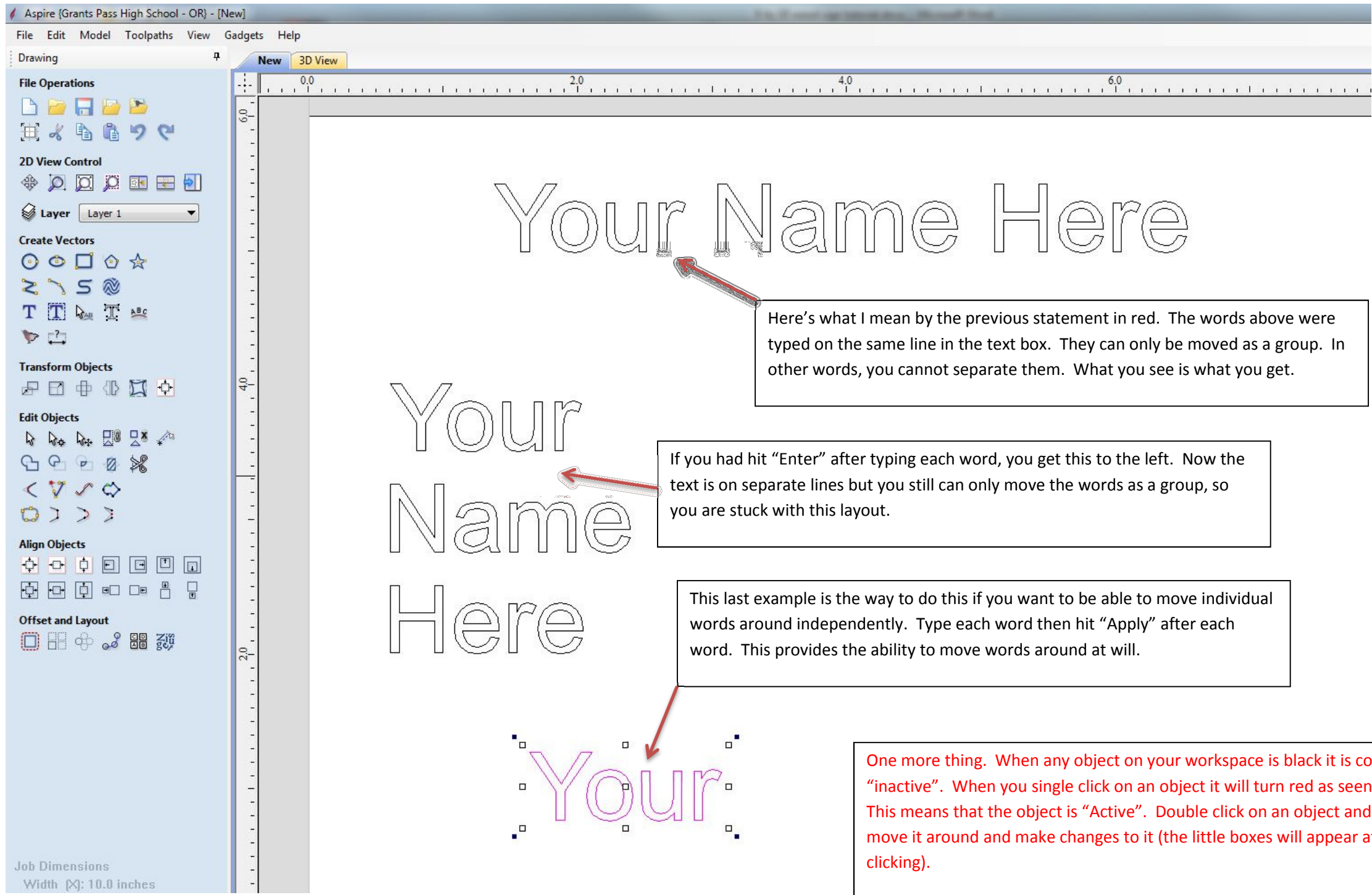
When everything looks good, click "OK"



The tool bar seen on the left is where you do all of your design work in this program. We are going to do a simple name sign although if you would like to, you can get a bit more creative than that. Just ask.

Let's start with some text. Click on the "Text" icon.



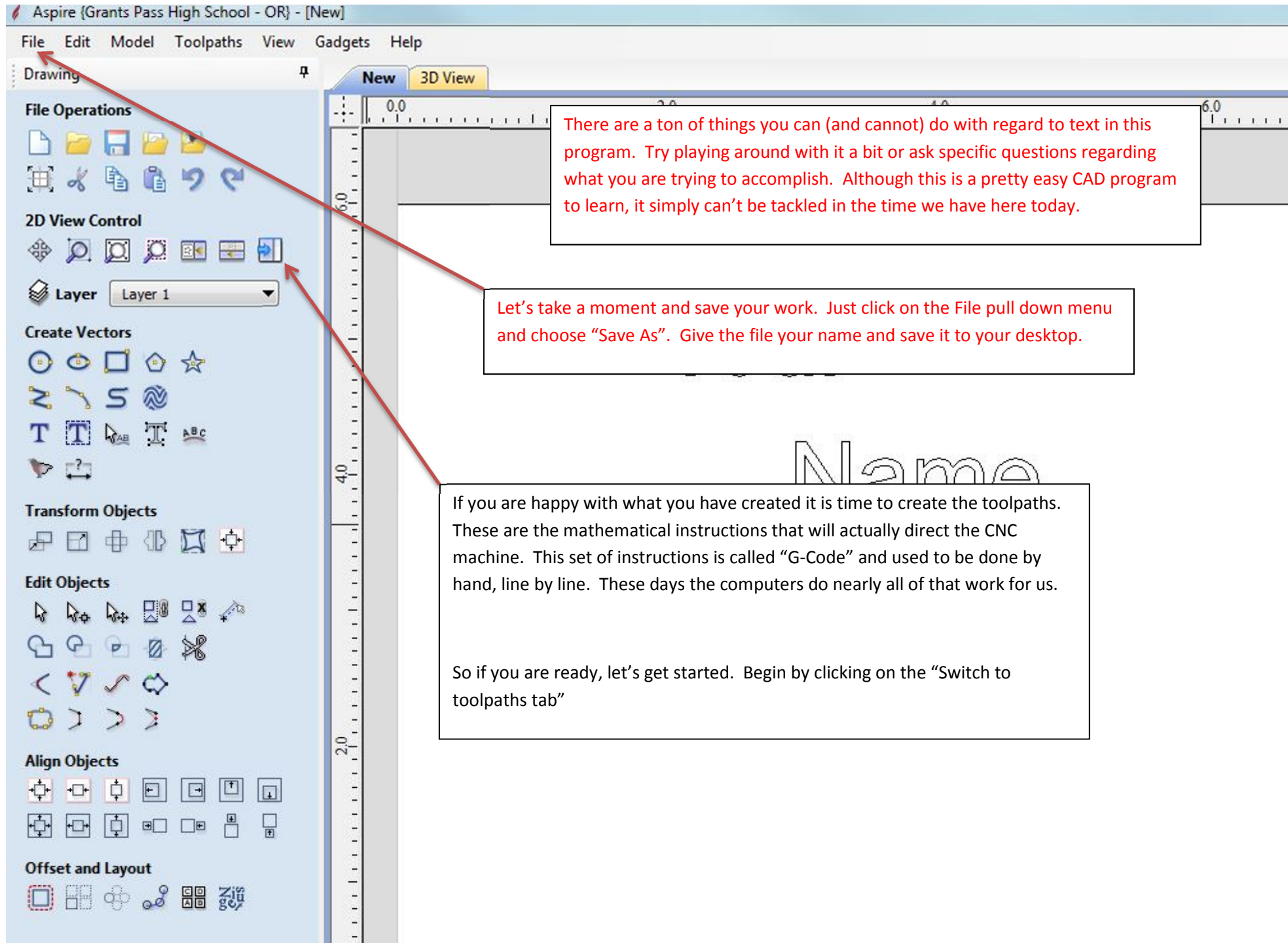


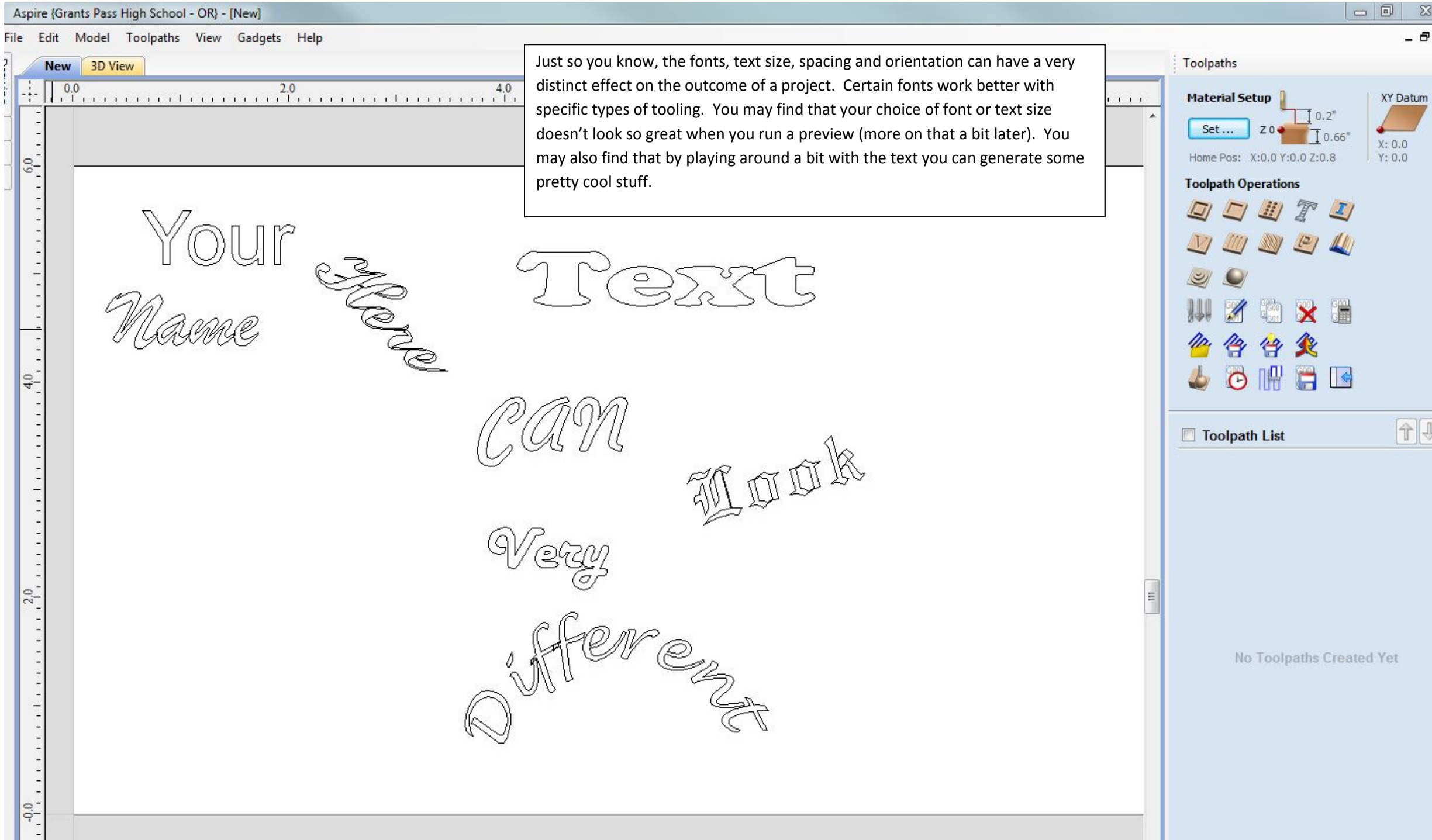
Here's what I mean by the previous statement in red. The words above were typed on the same line in the text box. They can only be moved as a group. In other words, you cannot separate them. What you see is what you get.

If you had hit "Enter" after typing each word, you get this to the left. Now the text is on separate lines but you still can only move the words as a group, so you are stuck with this layout.

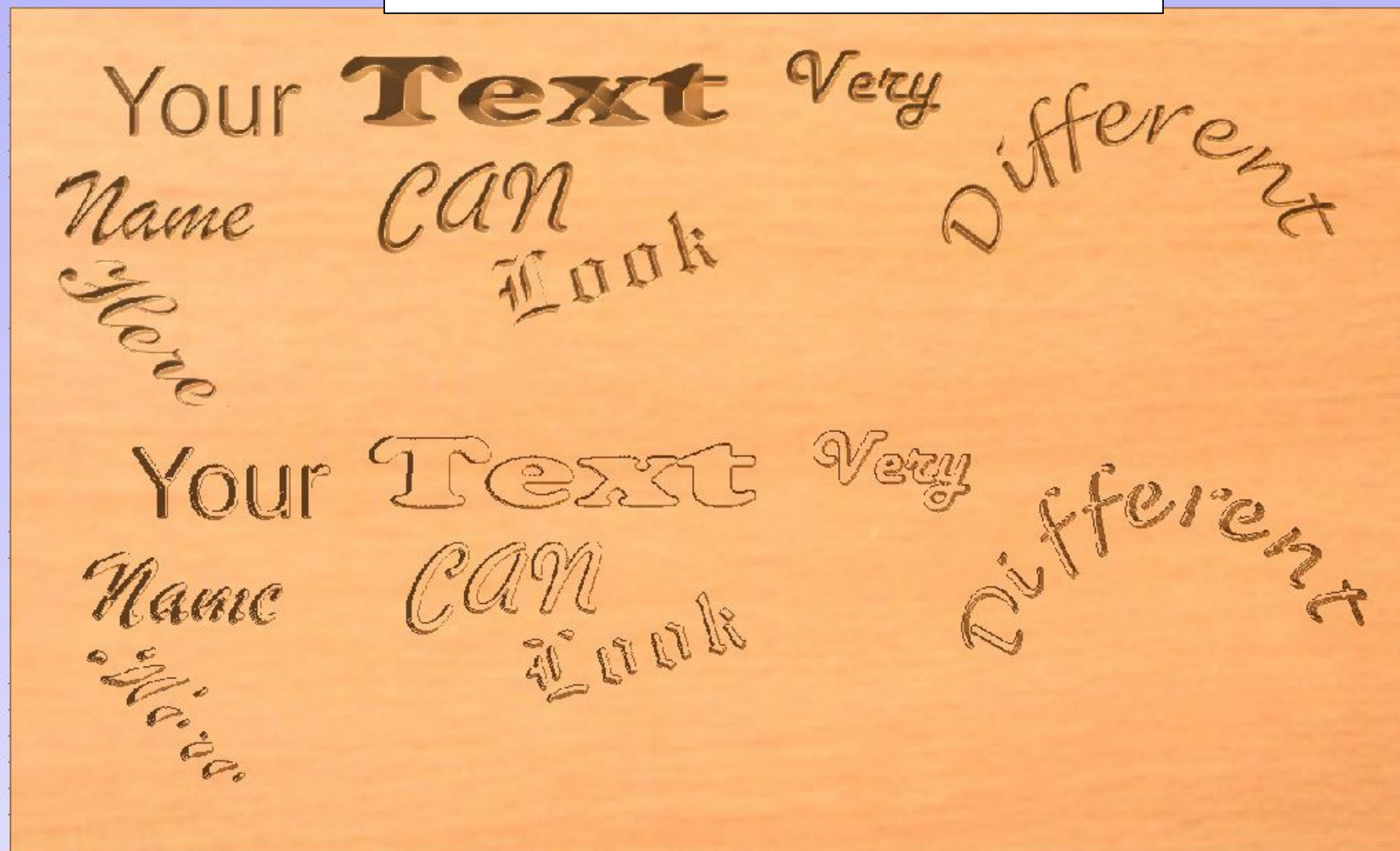
This last example is the way to do this if you want to be able to move individual words around independently. Type each word then hit "Apply" after each word. This provides the ability to move words around at will.

One more thing. When any object on your workspace is black it is considered "inactive". When you single click on an object it will turn red as seen to the left. This means that the object is "Active". Double click on an object and you can move it around and make changes to it (the little boxes will appear after double clicking).





Here is an example of differences in tooling. The upper wording was machined using a 60 degree v-bit while the lower was machined using a 0.03125 end mill. That small diameter end mil cannot get in-between all of the small spaces in some of the lettering so it is a poor choice for this sort of work. We generally use that particular bit for our guitar fretboard inlay work.



Toolpaths



Preview Toolpaths



Beech Dark

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 Toolpaths



Preview Visible Toolpaths



Reset Preview

Undo Last



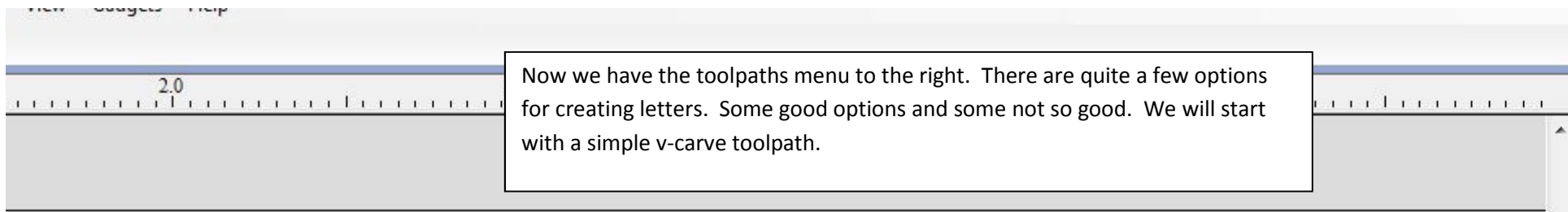
Save Preview Image



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

Close

☐ Toolpath List☐ Pocket 1☐ V-Carve 3

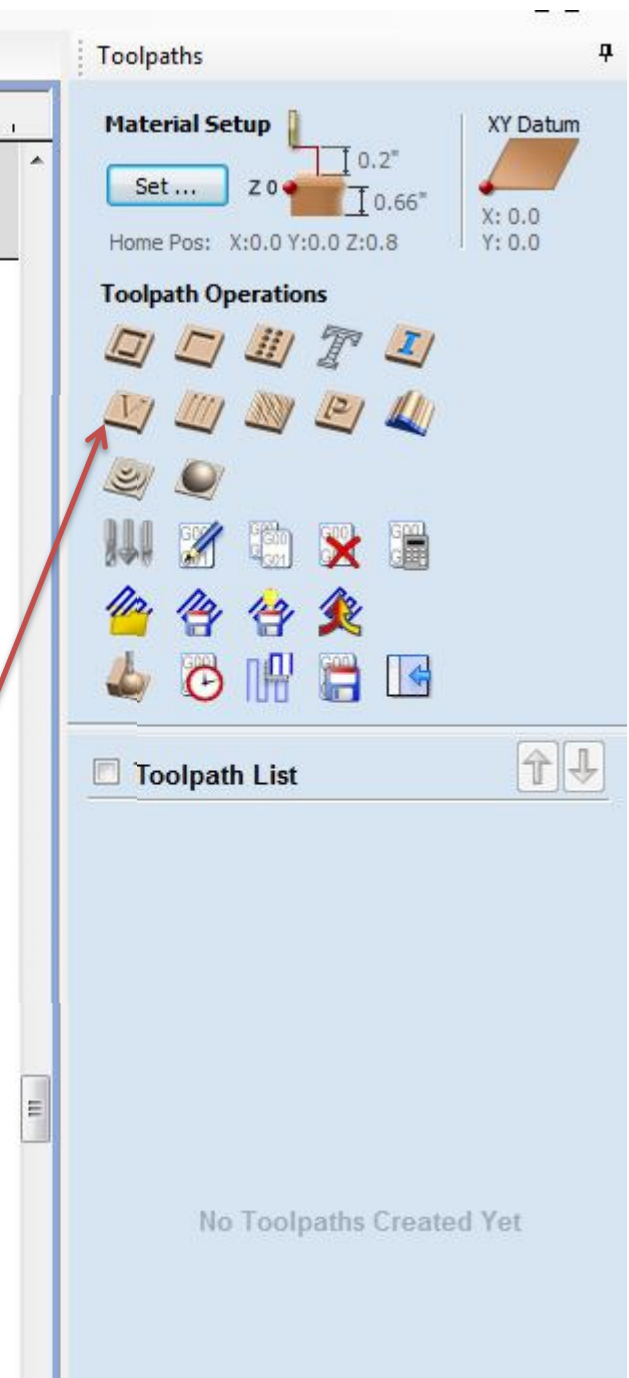


Now we have the toolpaths menu to the right. There are quite a few options for creating letters. Some good options and some not so good. We will start with a simple v-carve toolpath.

Your
Name
Here

First, you need to make sure that your text is active. Click anywhere on your text and it should turn red. If the words were entered individually you will need to hold the shift key and click on each word to make all of them active.

Once your text is active click on the “V Carve / Engraving Toolpath” option.



2.0

4.0

6.0

8.0

Your

Name

Here

The panel to the right is where we will set the desired parameters for the V-carve work. Do you have any knowledge / experience with router bits? If not, then wow, too bad. Guess you're not going much further than this. Pack it up and head on out (just wanted to see if you were actually reading all of this junk).

Actually, we are going to walk you through this in the event you have no idea what you are doing. Basically, a V-carve is a little like it sounds. A "V" shaped cutter is used to remove material (subtractive manufacturing) and create the desired shapes / effects. We have several different V-bits that we can use and most are defined by the angle of the cutting edges. We have 90, 60, 30 and even 15 degree cutters.

So...let's start by choosing our cutting tool. Just click on the "Select" button over here.

Toolpaths



V-Carve / Engraving Toolpath

Cutting Depths

Start Depth (D) 0.0 inches
☐ Flat Depth (F) None inches

Tool: V-Bit (60 deg 0.25")

Select ...

Edit ...

☐ Use Flat Area Clearance Tool

Not using area clear tool

Select ...

Edit ...

Flat Area Clearance ...

☒ Offset ☐ Raster

Cut Direction

☒ Climb☐ Conventional

Raster Angle 0.0 degrees

☐ Ramp Plunge Moves

Distance 1.0 inches

☐ Use Vector Start Points☐ Use Vector Selection Order

Safe Z 0.2 inches

Home Position X:0.00 Y:0.00 Z:0.80

☐ Project toolpath onto 3D model

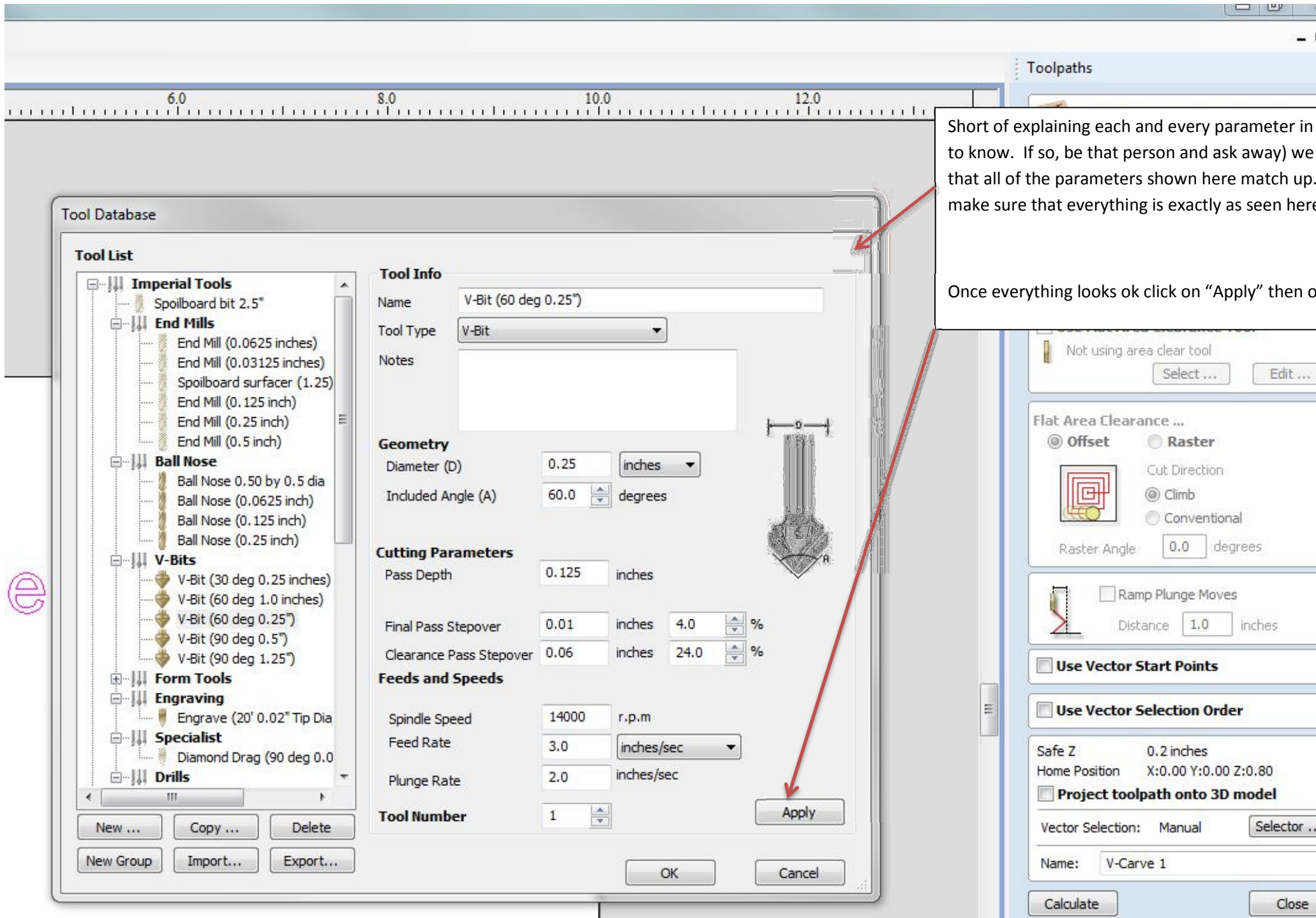
Vector Selection: Manual

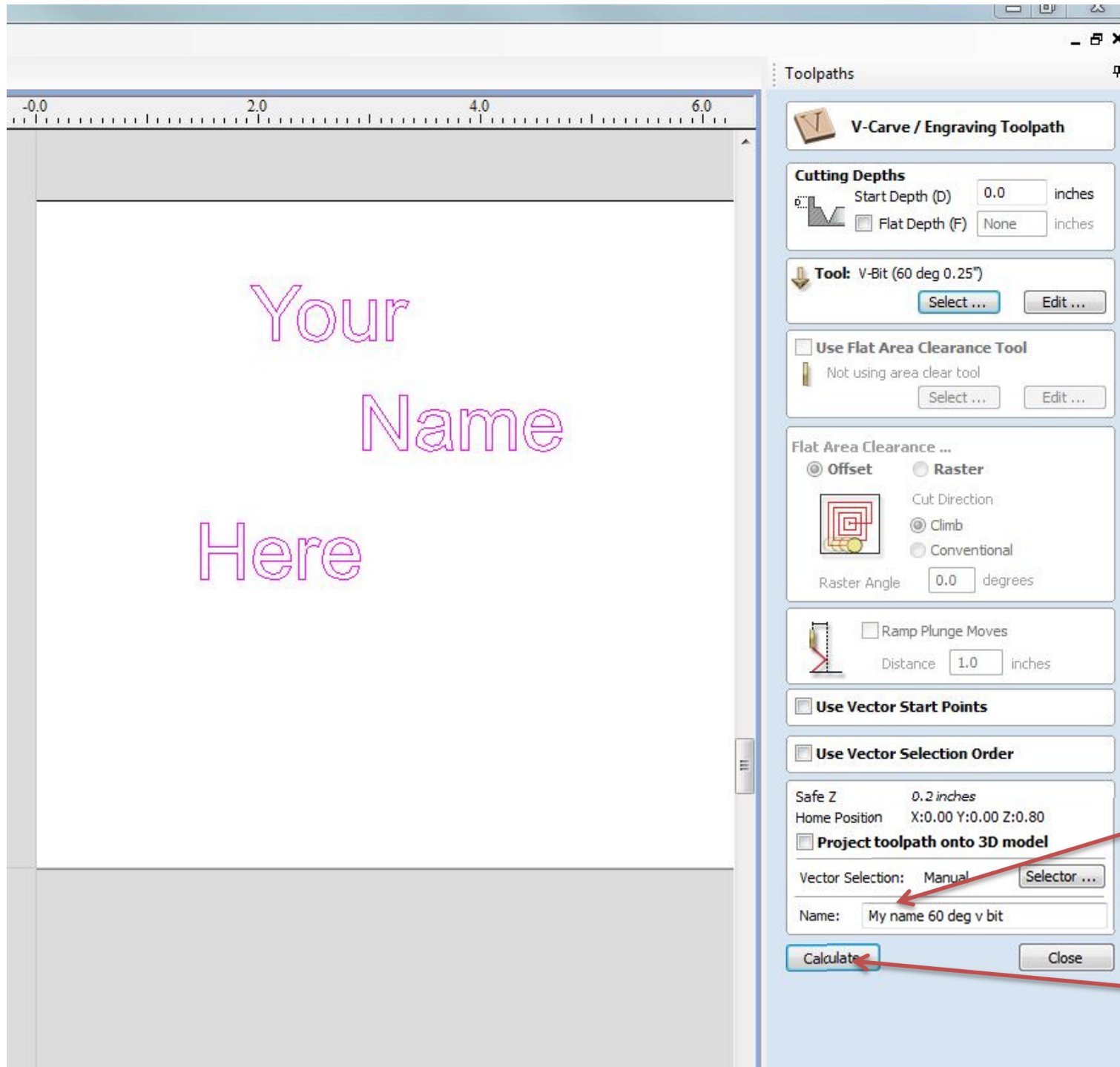
Selector ...

Name: V-Carve 1

Calculate

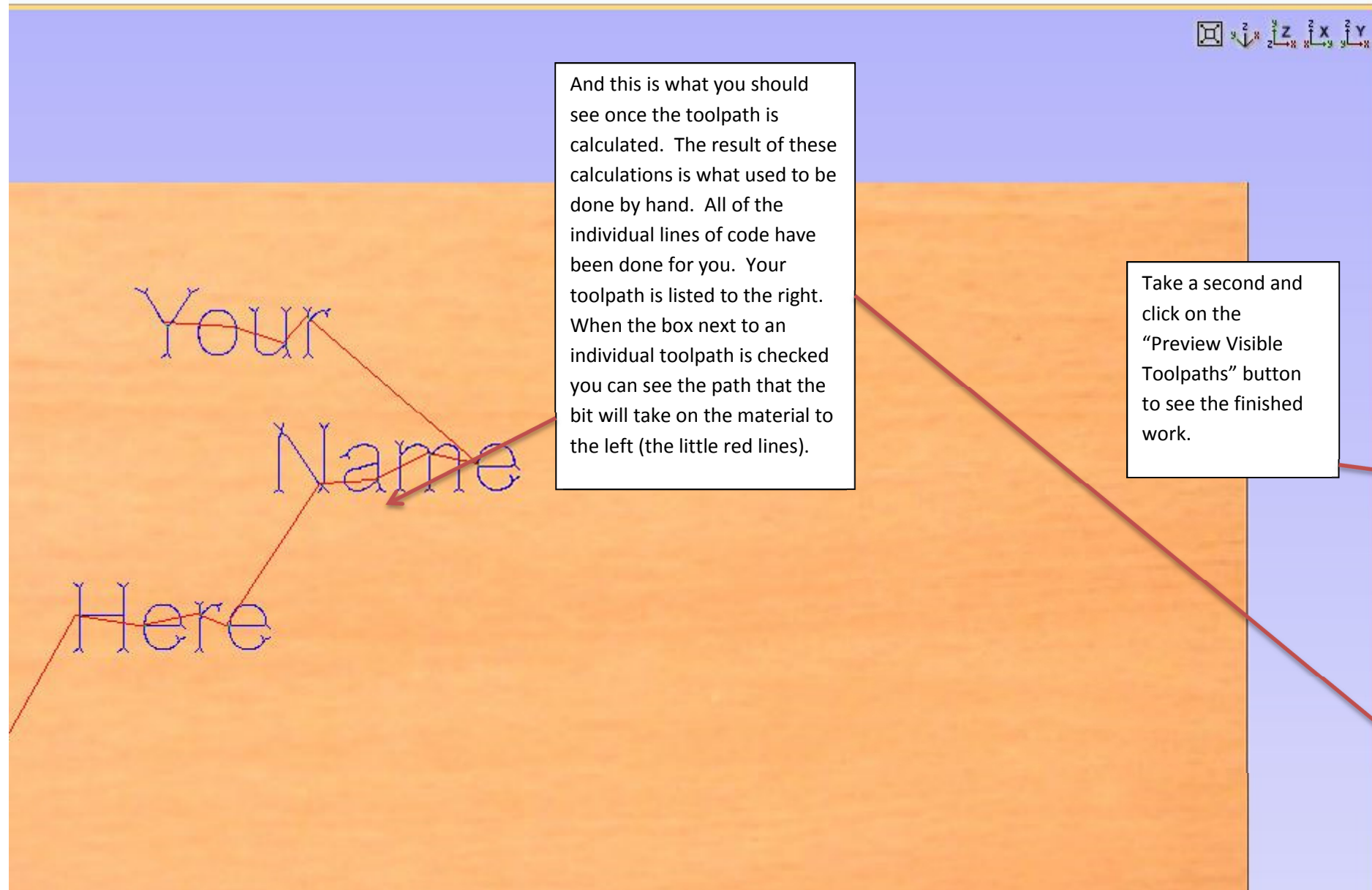
Close





Make sure that everything to the left matches what you have on your project and give the toolpath a name (your name is preferable) and add the tool that will be used for that particular work.

Once you have done this just click on "Calculate".



Toolpaths



Preview Toolpaths



Beech Dark

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 Toolpaths

☒ Preview Visible Toolpaths

Reset Preview

Undo Last



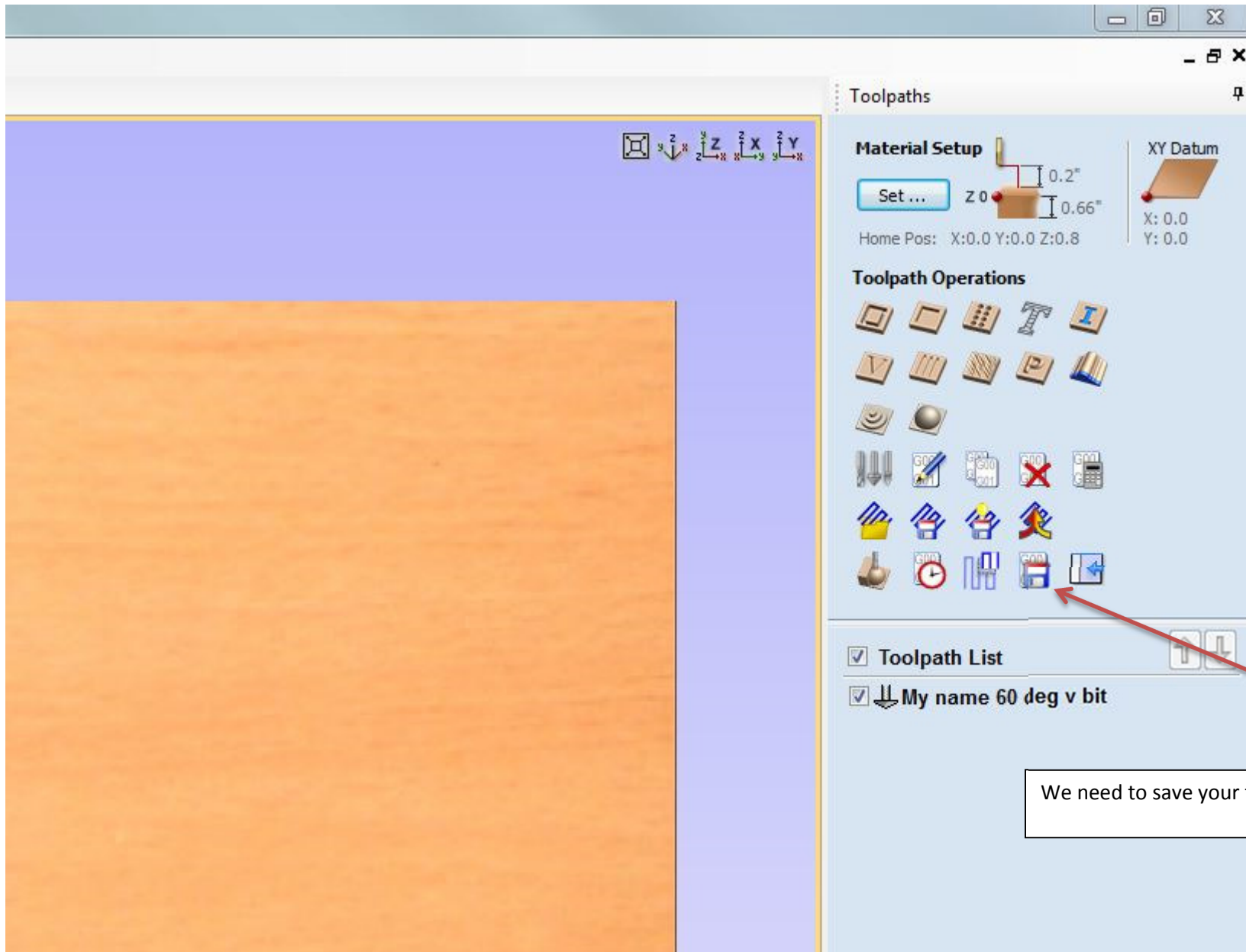
Save Preview Image



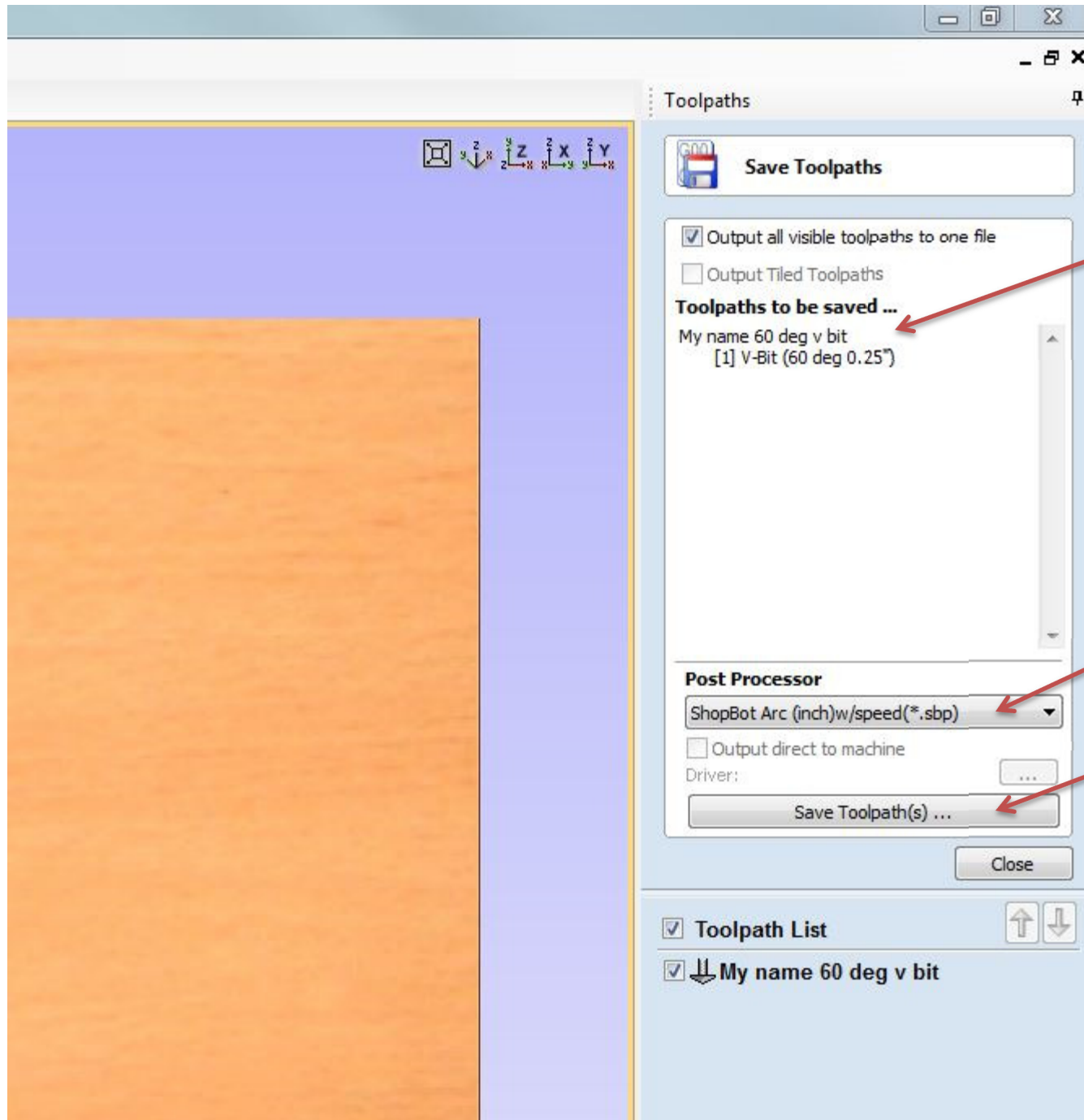
Double click on waste areas in 3D view to remove them.

Close

☒ Toolpath List☒ My name 60 deg v bit



We need to save your toolpaths, so click on the "Save Toolpath" icon.



You should see your named toolpath here.

Double check that the Post Processor being used is the same as the one here.

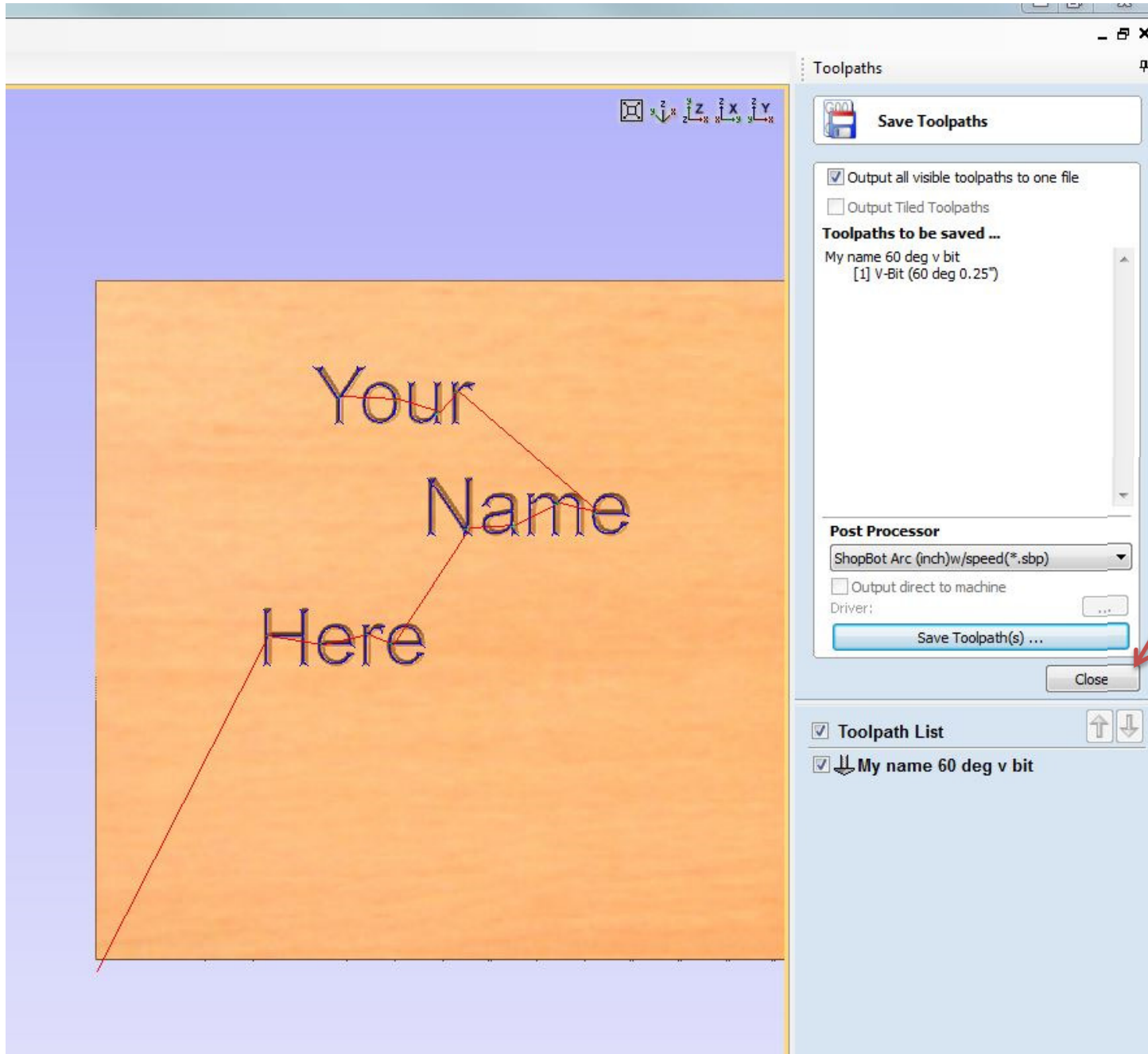
Now click on the "Save Toolpath" button and save the file to your desktop.


```
My name 60 deg v bit.sbp - ShopBot Edit
File Edit View Tools Help
SB-Preview SB-Cut
1 'My name 60 deg v bit
2 'File created: Wednesday March 14 2018 - 01:30 PM
3 'From Vectric
4 '
5 'SHOPBOT FILE IN INCHES
6 IF *(25)=1 THEN GOTO UNIT_ERROR 'check to see software is set to standard
7 C#,90 'Lookup offset values
8 '
9 TR,14000,1
10 '
11 '
12 'Turning router ON
13 SC,1,1
14 PAUSE 2
15 '
16 'Toolpath Name = My name 60 deg v bit
17 'Tool Name = V-Bit (60 deg 0.25")
18 MS,2.99,1.99
19 JZ,0.800000
20 J2,0.000000,0.000000
21 J3,1.518034,2.861266,0.200000
22 M3,1.518034,2.861266,-0.068694
23 M3,1.514745,2.852625,-0.062998
24 M3,1.513101,2.846515,-0.060150
25 M3,1.511457,2.831764,-0.057302
26 M3,1.511457,2.629172,-0.057302
27 M3,1.478374,2.596088,0.000000
28 M3,1.511457,2.629172,-0.057302
29 M3,1.544540,2.596088,0.000000
30 M3,1.511457,2.629172,-0.057302
31 M3,1.511457,2.831764,-0.057302
32 M3,1.513101,2.846515,-0.060150
33 M3,1.514745,2.852625,-0.062998
34 M3,1.518034,2.861266,-0.068694
35 M3,1.526499,2.861266,-0.059896
36 M3,1.535792,2.861266,-0.053298
37 M3,1.544540,2.861266,-0.051099
38 M3,1.804431,2.861266,-0.051099
39 M3,1.813179,2.861266,-0.053298
40 M3,1.822472,2.861266,-0.059896
41 M3,1.830937,2.861266,-0.068694
42 M3,1.834226,2.852625,-0.062998
43 M3,1.835870,2.846515,-0.060150
44 M3,1.837514,2.831764,-0.057302
45 M3,1.837514,2.629172,-0.057302
46 M3,1.804431,2.596088,0.000000
47 M3,1.837514,2.629172,-0.057302
48 M3,1.870597,2.596088,0.000000
49 M3,1.837514,2.629172,-0.057302
50 M3,1.837514,2.831764,-0.057302
51 M3,1.835870,2.846515,-0.060150
52 M3,1.834226,2.852625,-0.062998
```

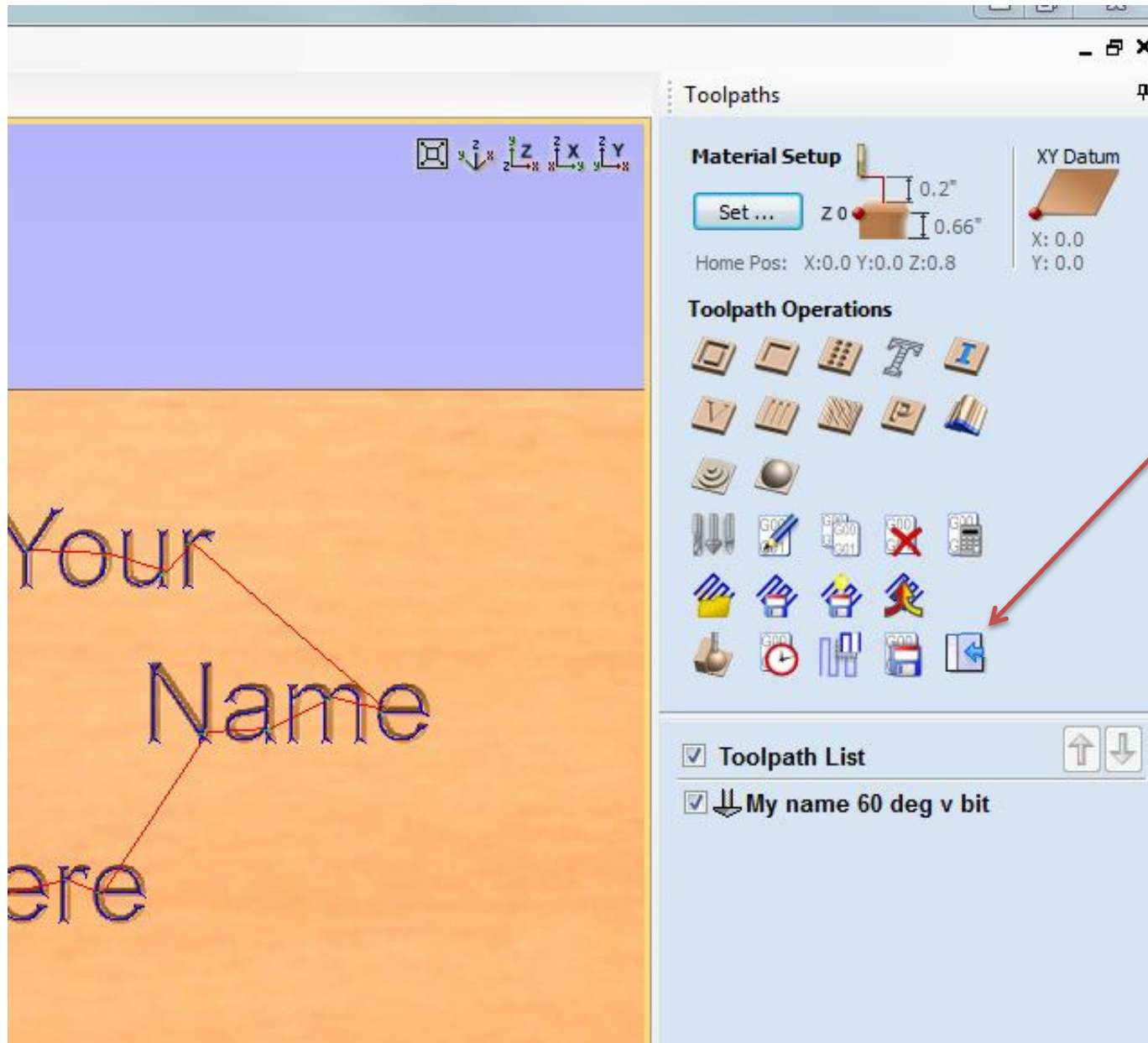
What you see to the left are all of the instructions that the “Calculate” button generated. This is known as “G-Code” and for the most part, it is all mathematical instructions for the machine based on the Cartesian coordinate system (x, y and z-axis movement). The cool thing is that you can physically edit this code or any of the other instructions contained in the file and these changes will be carried over to the machine when you run the file.

What really blows most kids minds is this. That simple “Your Name Here” carving that is represented by the code seen here? It takes well over a thousand lines of code to instruct the machine how to cut this simple job. We have run files in the shop that have over a million lines of code before. The file for just the seat on one of our Sam Maloof rocking chairs has over 156000 lines of code. One of our guitar necks takes over 15000 lines of code. Imagine having to write all of that by hand, line by line.

```
-----
1330 M3,2.148743,4.971967,-0.059998
1331 M3,2.153031,4.968952,-0.063833
1332 J3,2.153031,4.968952,0.200000
1333 JZ,0.800000
1334 J2,0.000000,0.000000
1335
1336 'Turning router OFF
1337 SC,1,0
1338 END
1339 UNIT_ERROR:
1340 C#,91 'Run file explaining unit error
1341 END
1342
```

Let's complete a couple more things before we move over to the shop to machine our project. First, click on "Close" to get out of the Save Toolpaths window.



Click on the "Switch to Drawing" tab and save your file just as you did earlier by clicking on "File" in the upper left corner and saving your work to the desktop.

At this time, try to get the attention of the so called "Teachers" in the room and ask for a flash drive. We are going to copy your file to said drive so we can take it over to the shop and run it on the CNC.

That is pretty much all we are going to do with this particular tutorial. We will work with you on an individual basis if you want to do anything more complex. Feel free to ask if there is anything more that you would like to do or know.