Chapter 18

3D Surfaces

*MillWrite can **project** your drawing and/or text onto a few 3 D surfaces. You can also use MillWrite to **create** some 3 D surfaces.*

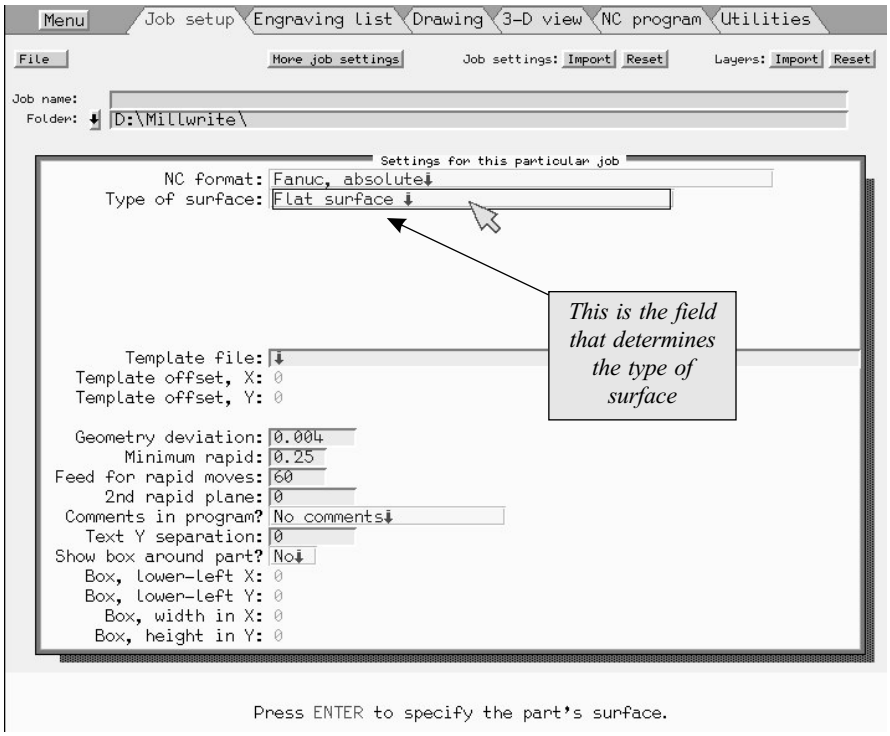

Figure 18-1

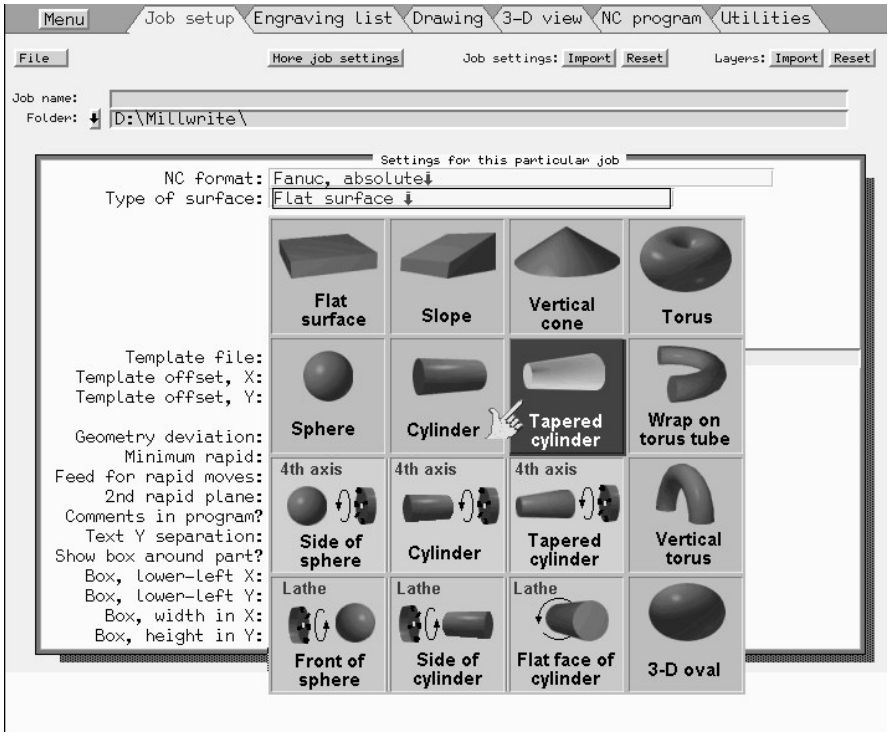

Figure 18-2

Let's assume you want to project your drawing onto a tapered cylinder.

Create your drawing and/or text in the same manner regardless of whether you are putting it onto a flat surface or a 3D surface. The only change you make is at the **Job SetUp** page. As seen in figure 18-1, there is a field called an "**Type Of Surface**."

When you click that field, a menu pops up with the surface options, as seen in figure 18-2. For this example the tapered cylinder is being selected.

After selecting the tapered cylinder, some new data entry fields will appear, as seen in figure 18-3. These fields allow you to specify the size and shape of the tapered cylinder.

These data entry fields are different depending on which surface you select. To help you understand what the fields mean, look at the bottom of the screen for messages. Also, some of the fields will display an image in the lower right corner to further help explain them.

The cursor is at the **Taper In Degrees** field in figure 18-3, and 12 degrees has been entered. As the image in the lower right corner shows, you would enter negative 12 degrees if the cone was sloping towards the negative X axis.

If you later decide to change the surface to a ball, a cylinder, or even back to a flat surface, all you do is change this field at the **Job Setup** page. You do **not** have to make any changes to your drawing.

Locating the drawing on the 3D surface.

In the case of the tapered cylinder, there's a data field called **Value At Centerline**. There is another field that asks for the **Parallel Axis**. These fields tell MillWrite how the tapered cylinder is orientated on the machine's table. For example, if the value at centerline is zero, and if the parallel axis is X , that means the X

axis passes through the middle of the cylinder. That also means that a Y value of zero is at the center of the cylinder.

The view from the **Drawing** page is the view that the tool sees as it looks down towards the part below. Therefore, create your text and drawing as if you are looking down on top of the cylinder. If the cylinder is along with the X axis, then you would put your text in drawing along the X axis also.

For example, in figure 18-4 is some text that is centered on a Y value of 0. Figure is 18-5 shows that this text will be projected onto the top of the tapered cylinder. In figure 18-6 the text is centered on a Y coordinate of 0.25. In figure 18-7 you can see that this text is 0.25 inches off from the center of the tapered cylinder.

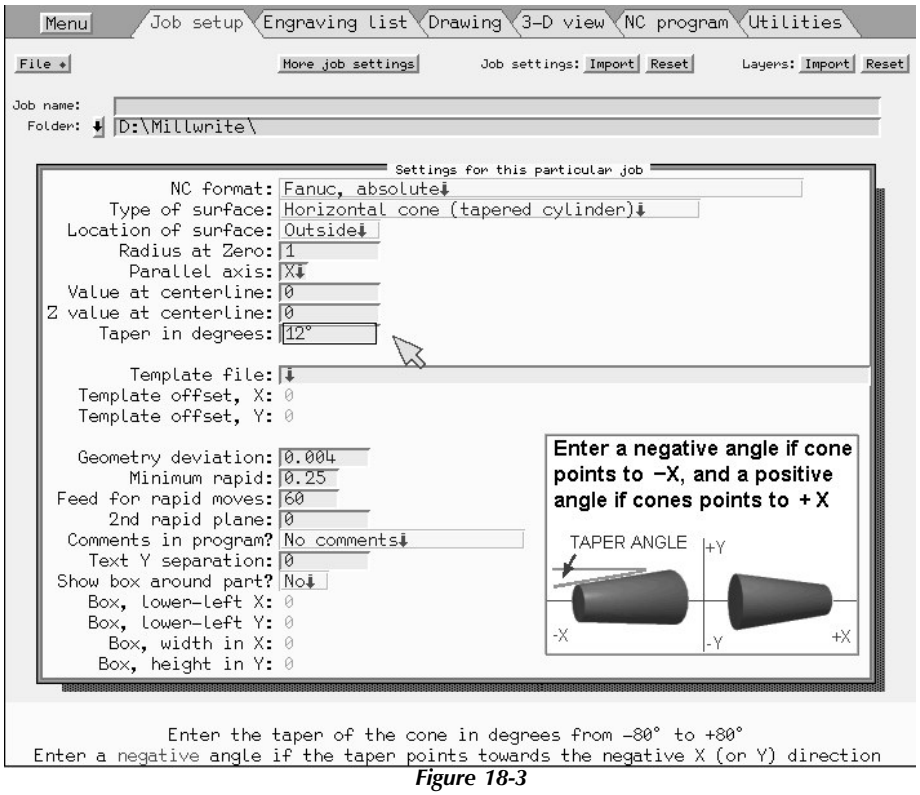

Figure 18-3

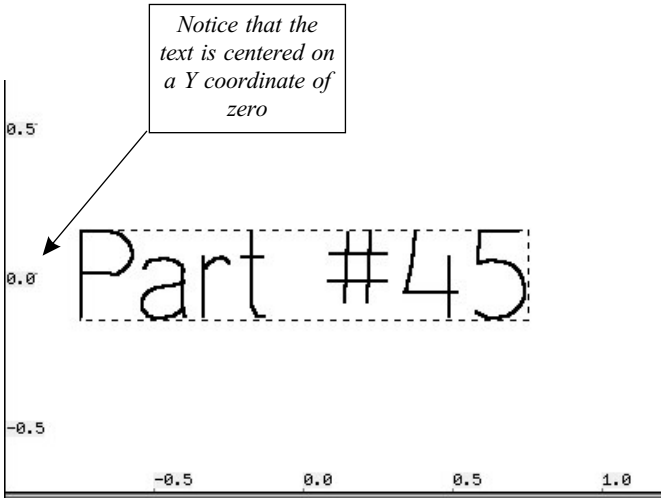

Figure 18-4

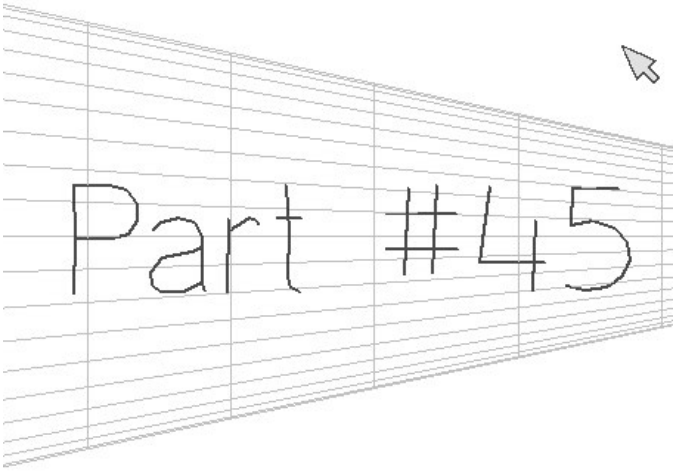

Figure 18-5

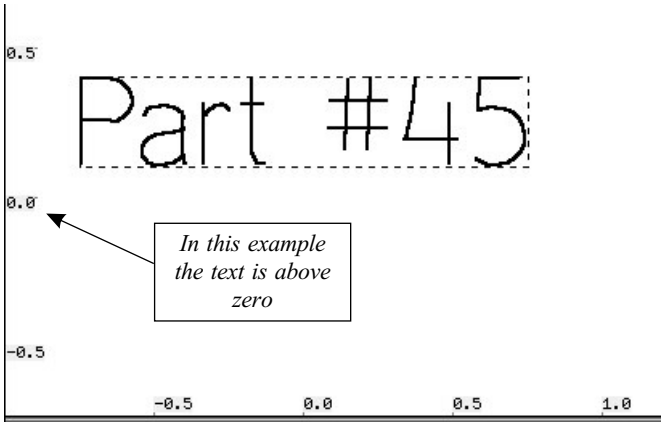

Figure 18-6

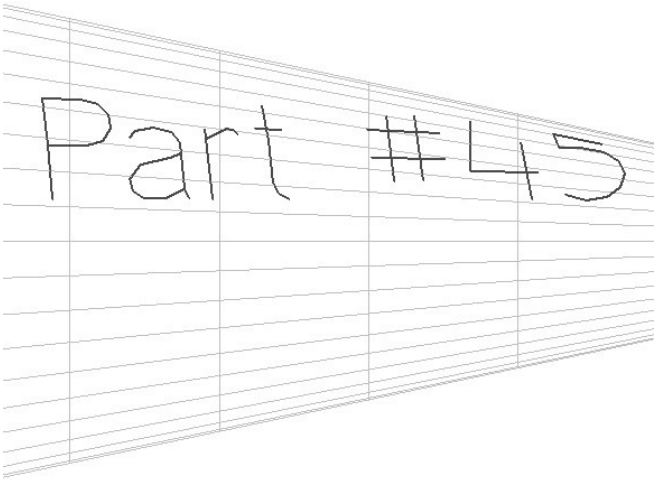

Figure 18-7

Figure 18-8

Using the 4th Axis

Projecting your part onto a cylinder on a 4th axis is the same as projecting the part onto any other 3D shape. Simply select the 4th axis option as the type of surface, and then specify the radius and other parameters.

Important: MillWrite does not yet show a true 3D view of a 4th axis NC program. Therefore, when you proof your NC program by clicking the **Proof** button at the **NC Program** page, you may find it a bit distored. When viewing the tool path at the **3D View** page, you will see only a flat view.

Creating 3D surfaces with MillWrite.

You can use MillWrite to create 3D surfaces, although there are certain limitations. An example of this is seen in figure 18-8. This shows a flat piece of foam that MillWrite cut a cone into, and then the Ford logo was projected onto it. MillWrite did this in one NC program.

First a circle was drawn at the drawing page. The circle was then set to be **spiral pocketed**. The Ford logo was put into the center of the circle. The circle was set to be machined first, followed by the Ford logo. (The **machining order** and **machining group** fields allow you to specify which machine operations occur in which order.)

At the **Job Setup** page a vertical cone was selected as the type of surface. The surface was actually flat, but by telling MillWrite that the surface was a cone, MillWrite created a tool path that follows the shape of a cone. When MillWrite pocketed the circle, and then projected that circle onto the cone, the resulting tool path cuts a cone in the flat material. Figure 18-9 shows the tool path. The circle at the top shows the surface of the part. The cone under it is the tool path. The smaller the tool, the smoother the cone becomes.

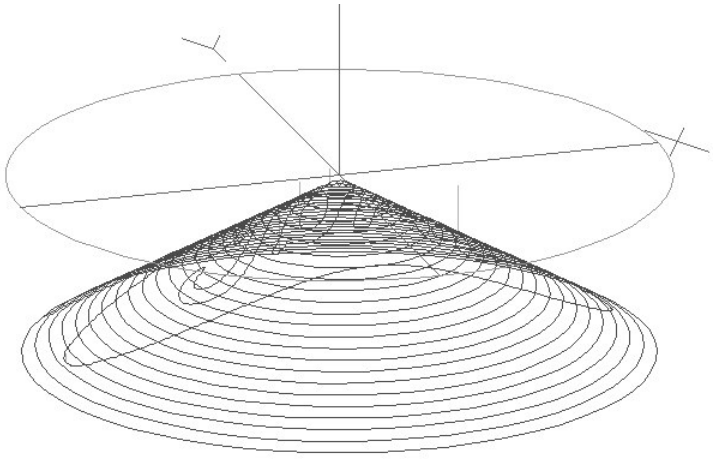

Figure 18-9

This particular material was foam, so MillWrite could cut the entire cone in one pass of the tool. However, this was cone was cut deep, so if this had been metal the tool would likely break when it got near the bottom of the cone because at that point it would be cutting a very large amount of material. Therefore, this technique is not well suited to metal or or hard woods when you cut deep.

You could trick MillWrite into cutting the cone in multiple passes, but this is inefficient because some of the time the tool will be cutting air. You can also cut the cone in multiple passes by changing the tool offset at your machine, and then running the program several times with different offsets. It can waste a lot of time, but if you have no other way to make a 3D surface, this is better than nothing.

To summarize, this technique is useful if you do not need to make deep cuts, or if the material is soft.

Cutting 3D ojbects

If you set different cutting depths for different geometry in your drawing, you can create partial 3D objects. An example is the eagle cut into a piece of wood (Figure 18-10). The eagle is made up of lines, splines, and pocketed regions. By setting them to different depths, and by using ball or tapered tools, the effext is a 3D object. If you cut wood, you can sand the edges so that the edges blend together.

Of course, you have to have some artistic ability to draw something like that eagle. This was created by Ken Ballou. He was carving tree stumps by hand, but now he has a CNC wood router. You can see his wood carvings at:

www.woodenbear.com

Figure 18-10