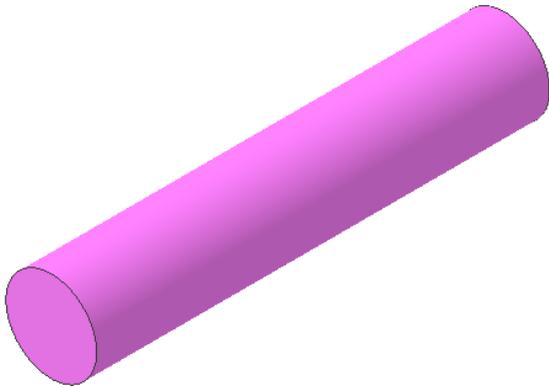


Drawing Turned Objects with Alibre®

By R. G. Sparber

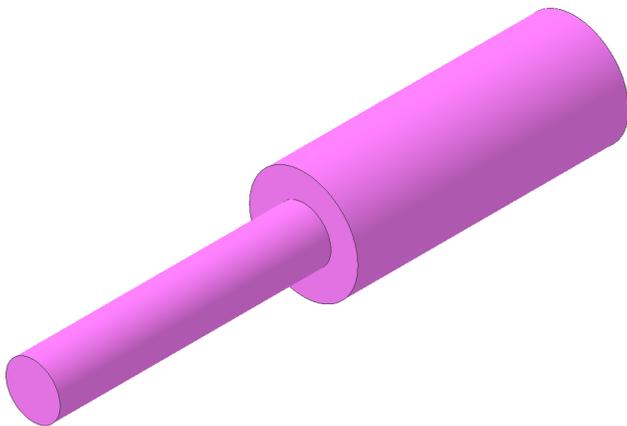
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If you have any experience with a lathe, you understand how to take a length of round stock and turn the end down.

I would chuck up the stock and use a left hand cutter to reduce the diameter. Then by backing out the cutter, I would form my square shoulder. Nothing earth shaking there.

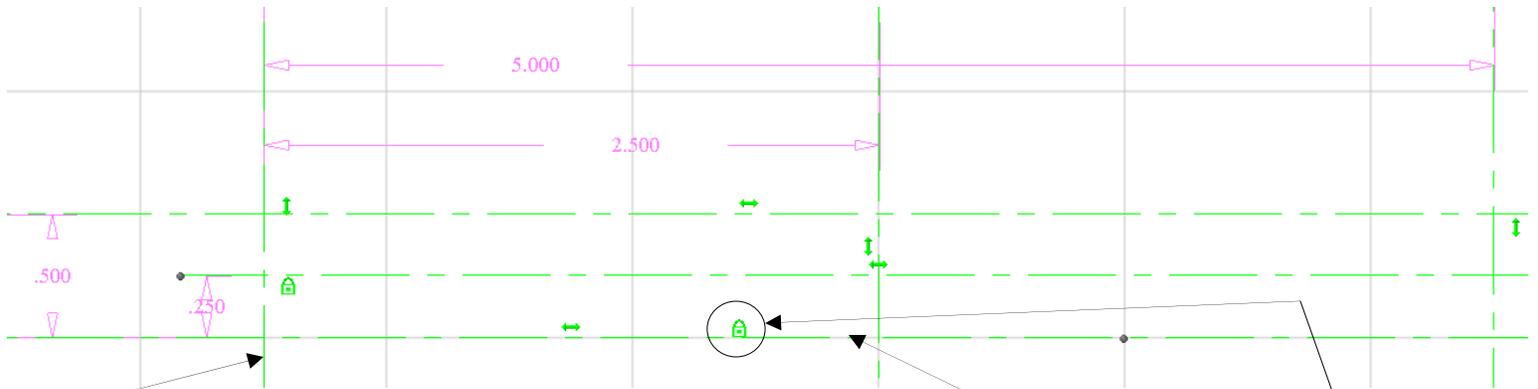
But what is the best way to draw it using my 3D CAD program, Alibre PE?



One way is to draw a cylinder that represents the large outside diameter of the part. Then stack on it a smaller diameter. That is fine if the part is simple. But what if there are many changes in diameter? Then this stacking business becomes time consuming to draw and difficult to change.

When faced with this problem recently, I went back to the basics. Thinking about how I actually machine the round stock, it was clear that I am moving along the longitudinal axis of the part and feeding the cutter in to various depths. Works fine in the real world, so why not inside the CAD program?

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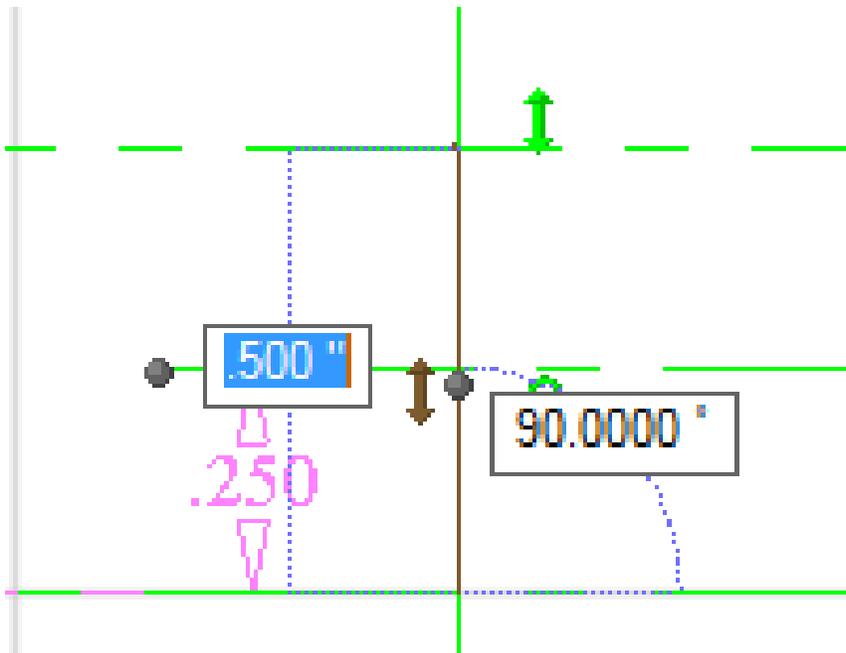


I started by drawing my center of rotation as a reference line parallel to the longitudinal axis. This is the horizontal dashed line at the bottom. Note that it has the lock constraint applied so it does not move. Next I drew a vertical reference line on the left and locked it too. This is my reference end of the round stock.

In this simple example, I will have a part with an overall length of 5" and a turned down section 2.5" long. These dimensions are defined with a vertical reference line at 2.500" and at 5.000". Since they both reference my locked vertical line, all 3 vertical lines are now locked into position.

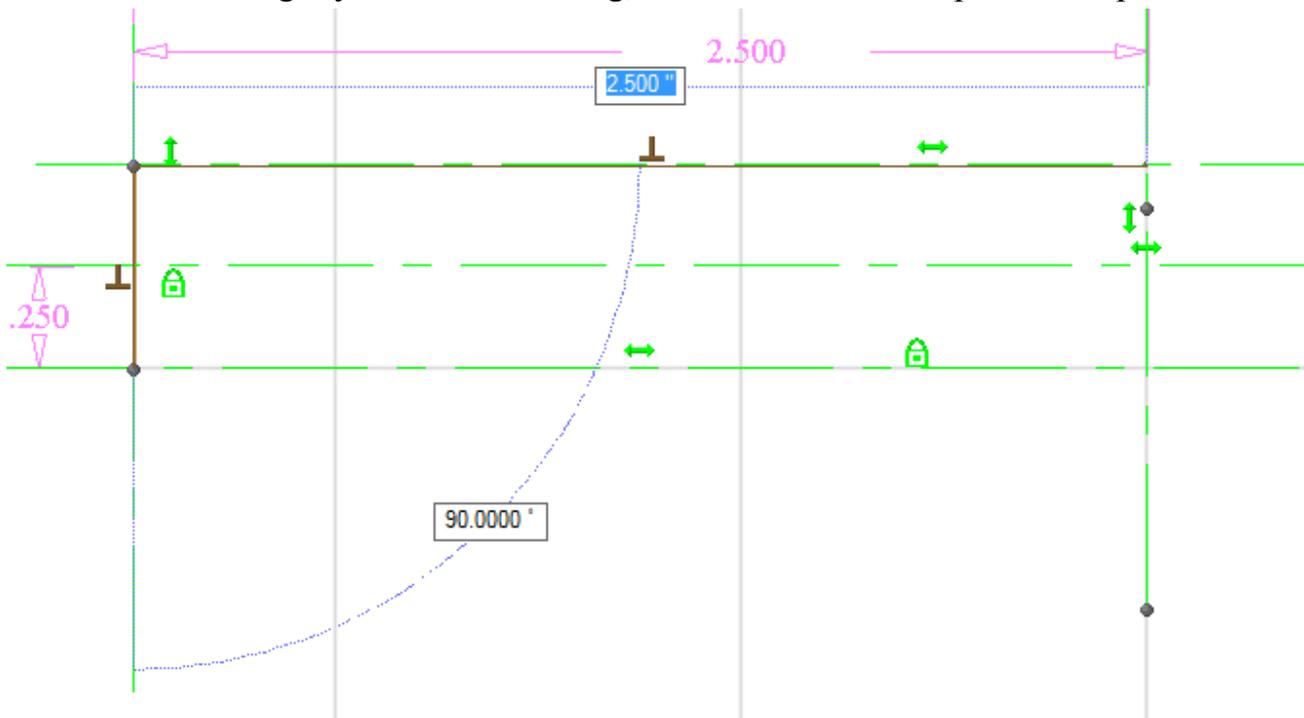
The round stock will be 1" in diameter so I draw a reference line offset from the horizontal center line by the radius, 0.500". A second horizontal reference line is drawn 0.250" from the center of rotation. It will define my 0.500" diameter section.

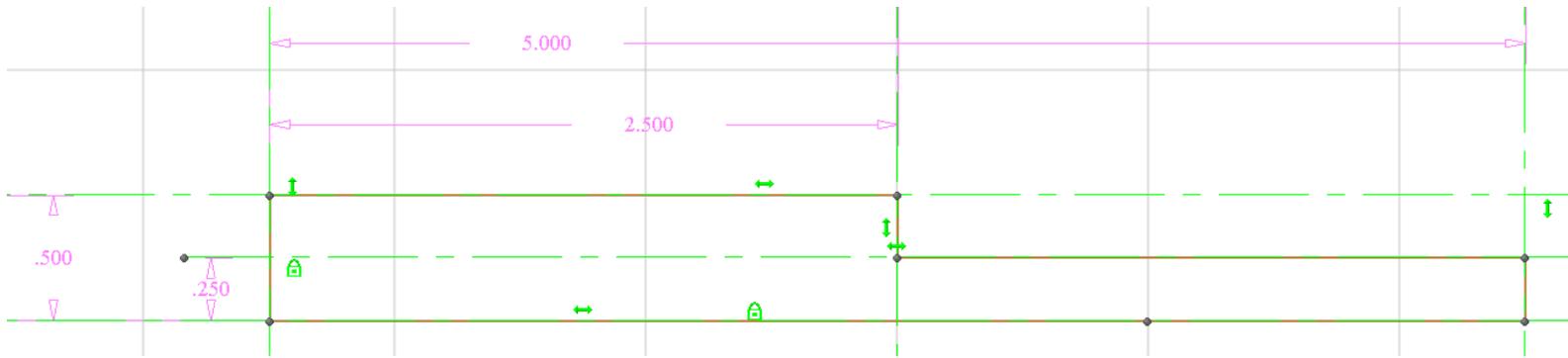
So far I have just constructed the scaffold for my figure. The next step is to draw the profile.



I selected my drawing line tool. Moving the cursor to the intersection of the center of rotation reference line and the vertical reference line, it changes to an X symbol. This tells me it will lock onto the intersection of the two reference lines. I left clicked the mouse to start my line. Then I dragged vertically until I saw a second X symbol at the

intersection of the vertical reference line and the line 0.500" from my center of rotation. I want the end of the part to be square so my line is 90 ° from my center of rotation line. I then left click and start my way along the horizontal reference line that will become my outside diameter. After going 2.500", the cursor again shows an X to tell me I am at the vertical line 2.500" from my vertical reference line and along my OD. Left clicking, I have locked in this part of the profile.

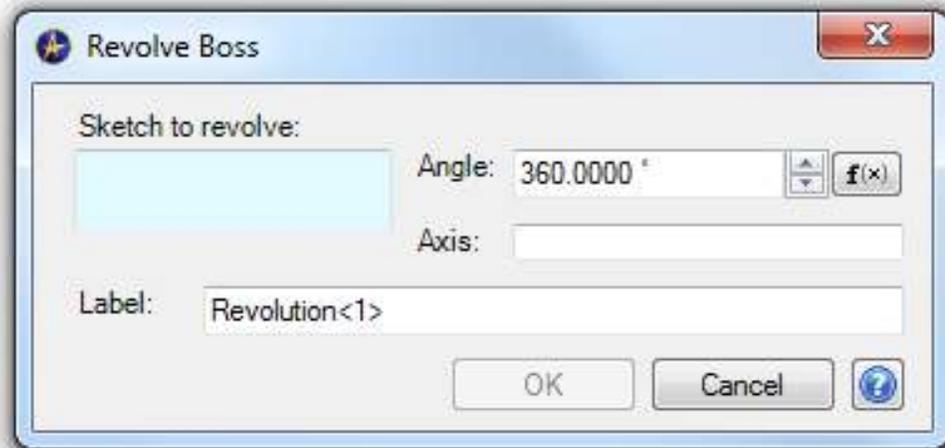




The line was drawn at the 2.500" vertical reference line from the .500" horizontal reference line down to the .250" horizontal reference line. This will be my shoulder. Then I drew along the .250" horizontal reference line until I got to the 5.000" vertical line. This is the end of my part. I drew down to my center of rotation reference line to define solid end of the part. The figure must enclose an area so I drew along the center of rotation reference line back to my starting point.

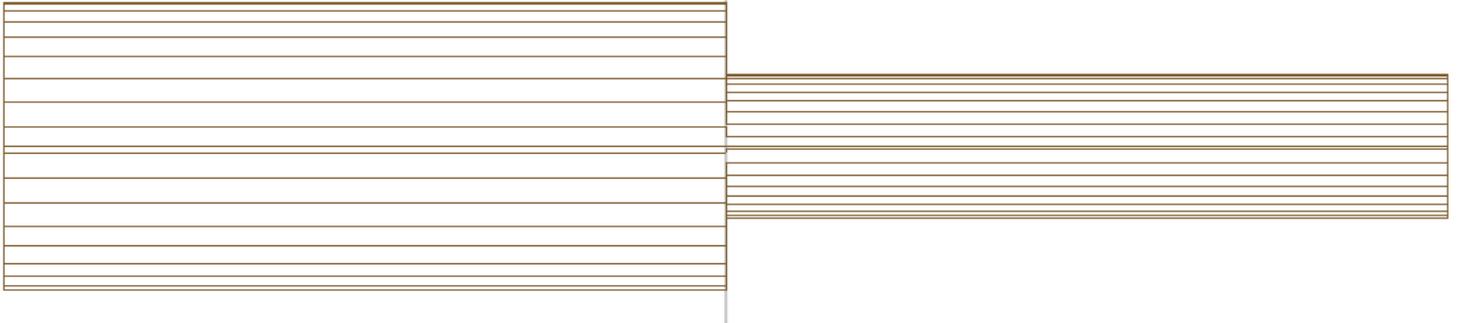
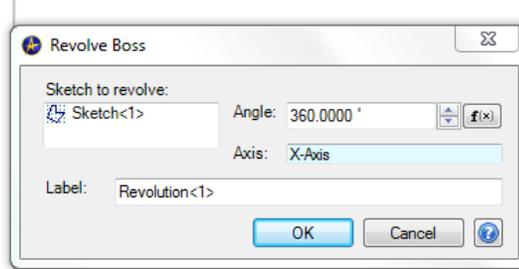
Now we are ready to turn this 2D cross section into a 3D object. I selected Revolve Boss tool and saw:

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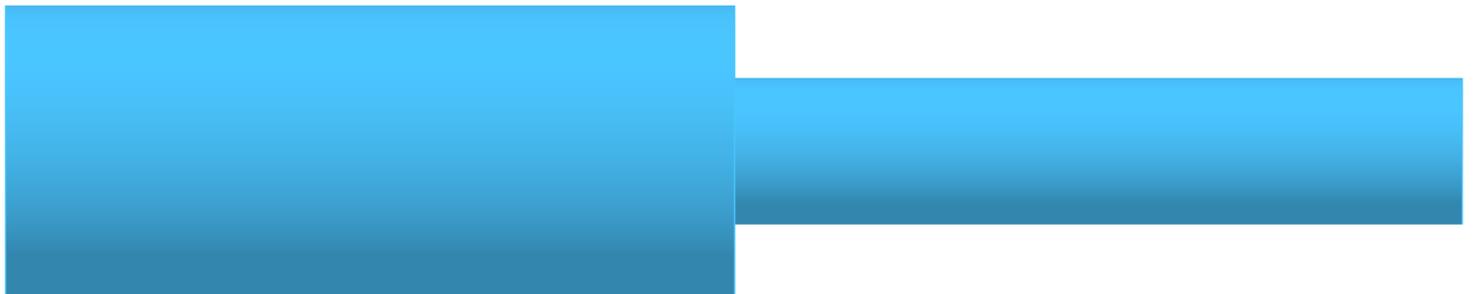


Sketch to Revolve is the one I just drew. The Axis is my X axis. If in doubt, just pick an axis and see what you get. You can always edit the extrusion and change the axis.

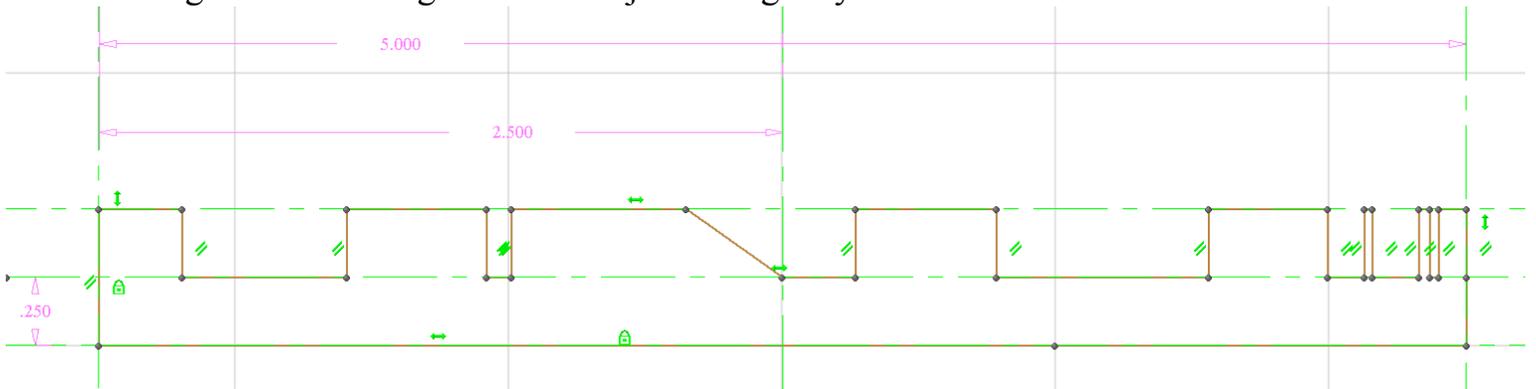
When the sketch and axis have been identified, I saw:



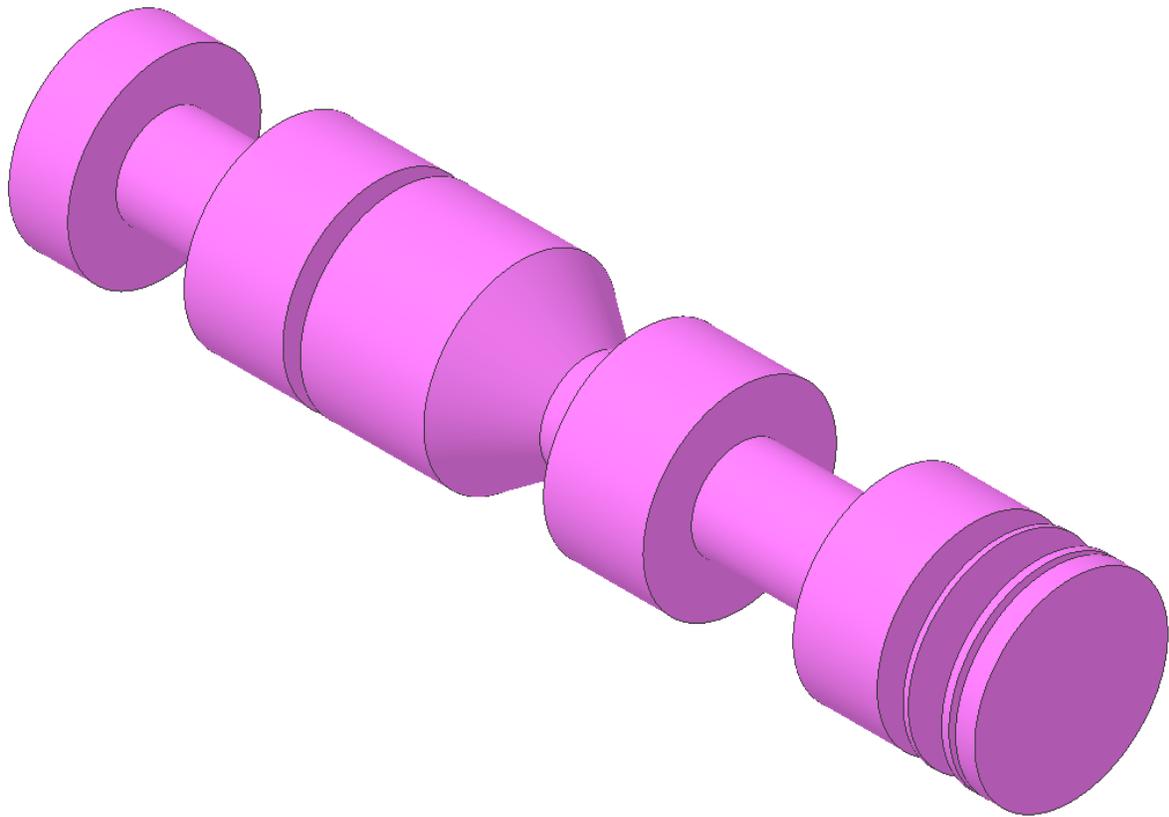
My cross section has been rotated around my X axis to form my part. I clicked OK to finish the process.



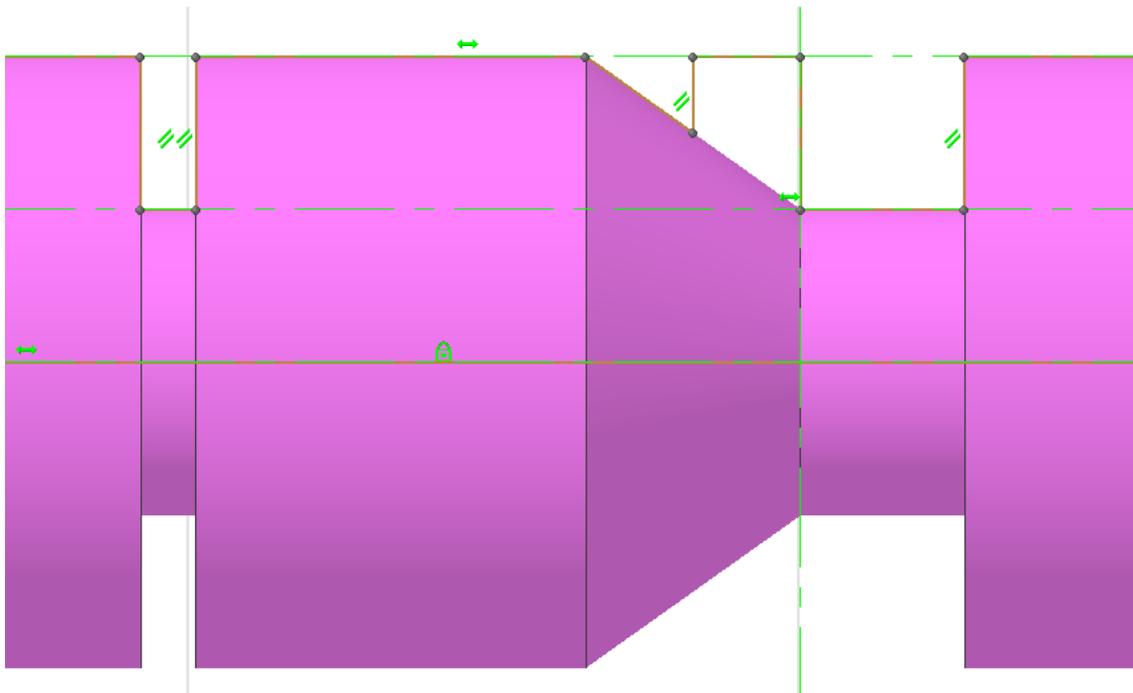
Now let's try this approach with a more complex form. I have chosen to stay to my original scaffolding of lines and just change my cuts.



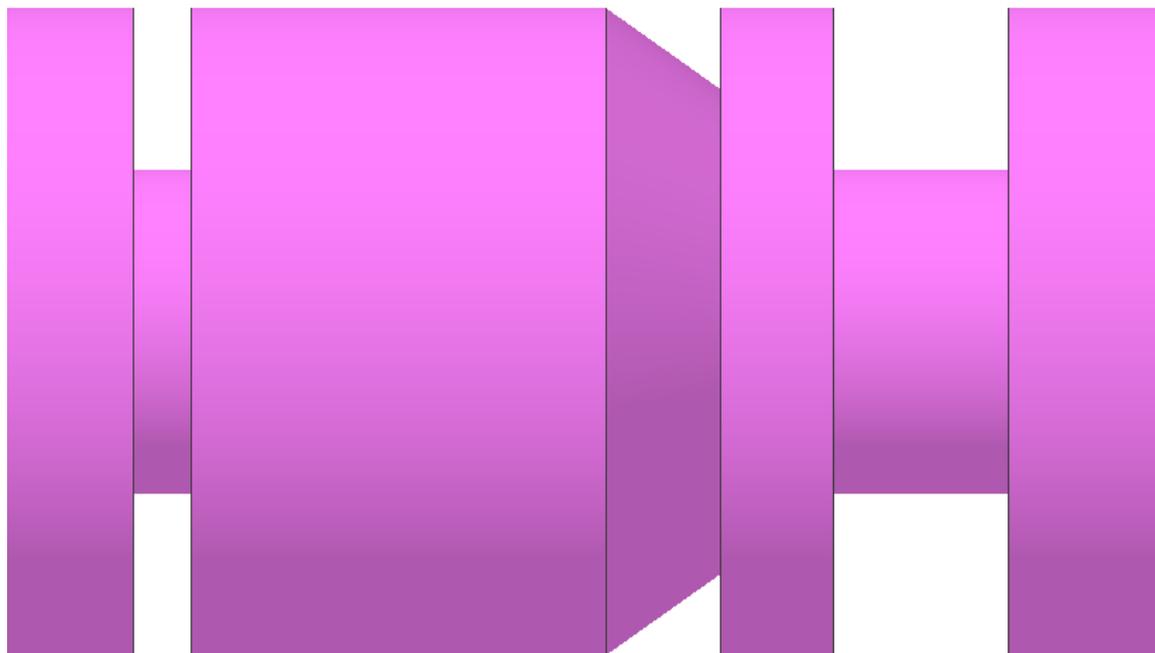
Using the Revolve Boss tool I easily generate:



What if I want to change the figure? I go back to the 2D figure and move any lines I want.



I have removed the lower half of the tapered section and replaced it with a step. Be careful to remove the old line and connect the new line without gaps. The cursor changes shape to tell you when you are on a line end point.



I welcome your comments and questions.

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