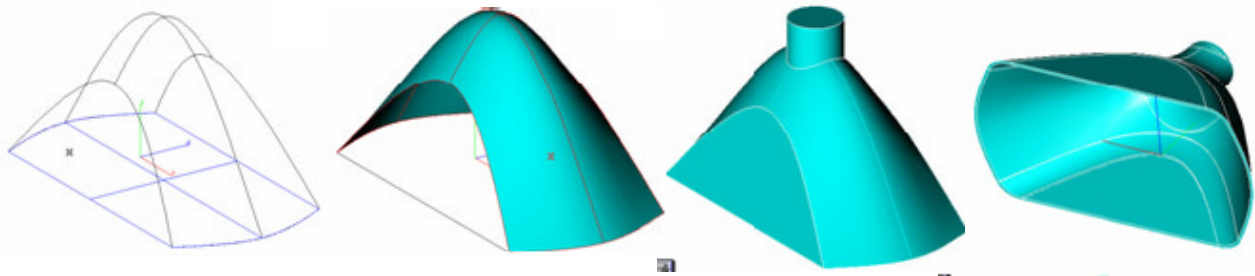# The Modeling Process Tutorial

Using Cobalt™, Xenon™, Argon™

The Modeling Process and Understanding Design Intent

General Workflow

In general, the design process begins with laying out the form and drawing shapes using the wire frame tools. Then, using a combination of surface and solid tools, build the design from the wire frames.

General Uses of Surface and Solid Tools

Surface tools are useful for creating complex, organic shapes and also for creating very specific detail shapes or to trim and modify solid shapes.

Solid tools are used for quick creation of general shapes and also for adding details such as rounded edges, holes/cutouts, protrusions, hollowed areas and more.

With the combination of surface and solid tools almost any shape is possible to create.

Modeling is a Problem Solving Process

There is no magic Make My Part Now button. 3D Modeling is a step-by-step problem solving process. First figure out a strategy to approach the model, such as breaking the shape down into simpler shapes and then building it up into the finished model. Each step along the way will present new challenges and choices about how best to accomplish a particular detail or feature of the model.

The first step to modeling even a simple part is to decide what is the best way to start or what is the best "profile" shape.

Consider what profile shape will generate more of the model than any other.
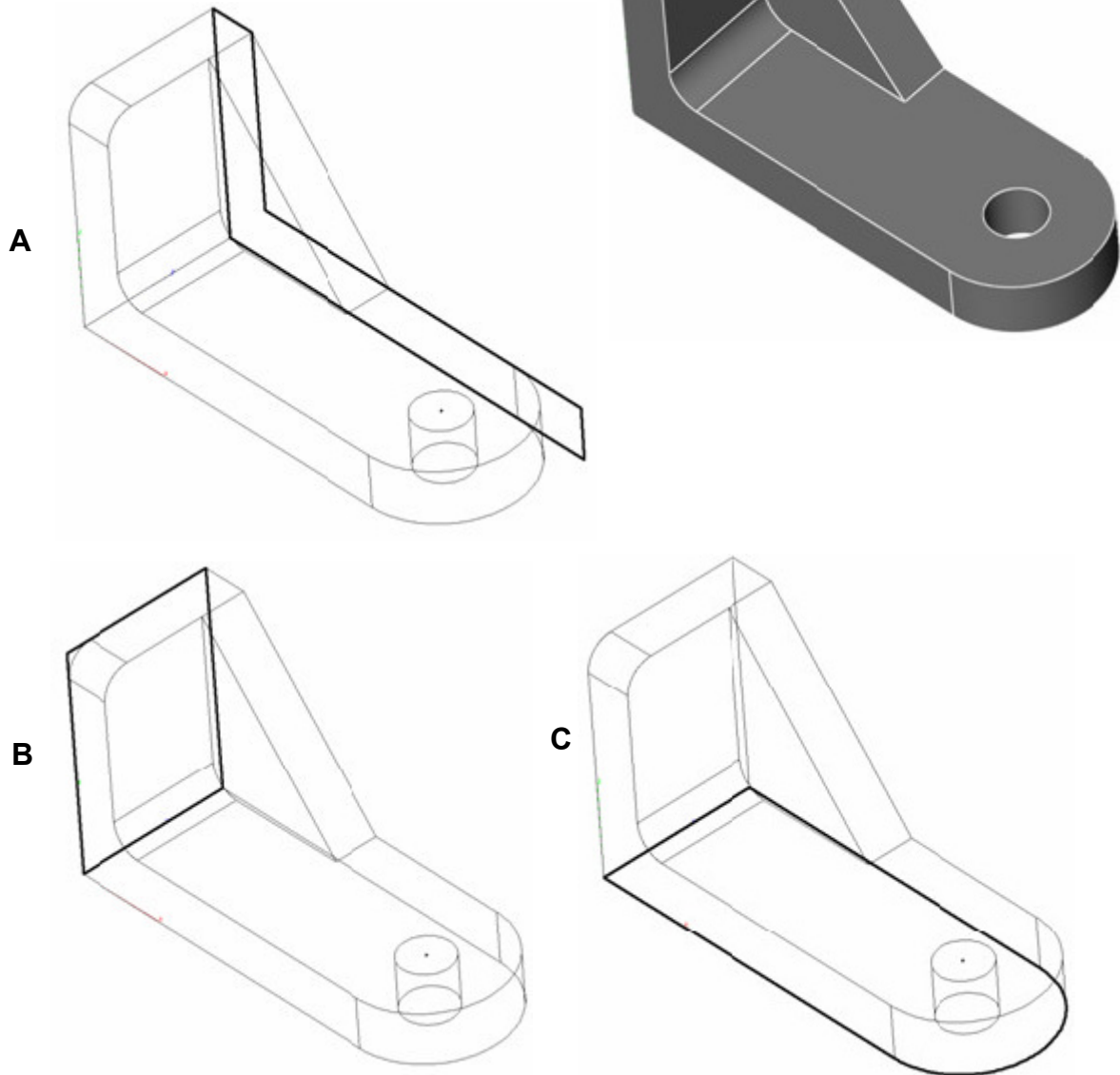
A – This is a good profile that will generate a lot of the shape quickly, but it will take a bit of extra work to create the rounded end.

B – This profile will generate a block that will require a lot of cutting and trimming to get to the final shape…this is not a very good choice.

C – This profile will create a base object with the rounded end built in, and then it just needs two simple pieces added. This is probably the best choice.
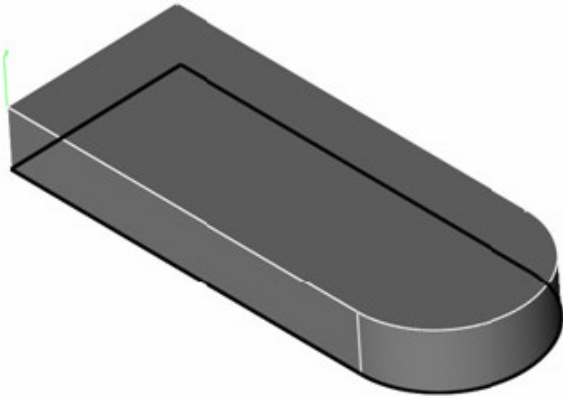
1. Draw the base shape from the top view first.

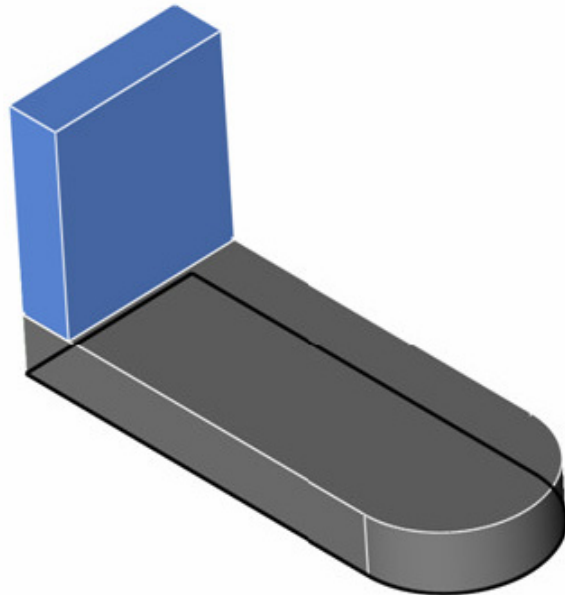   Use the **Connected Line** tool and build the round part with the

    Circle tool.

2. Then extrude that shape. Use the **Vector** option. Enter 0.60 into the Distance field in the Status Line and specify the vector by clicking the first point in the origin and the second point along the y axis.
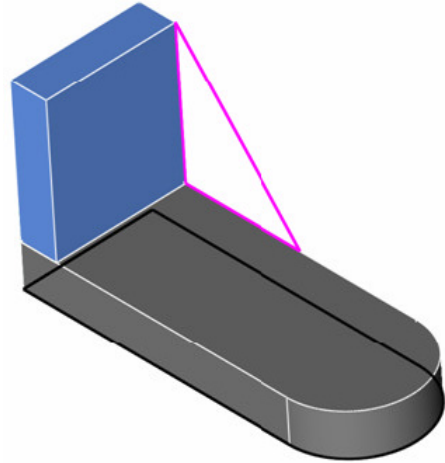
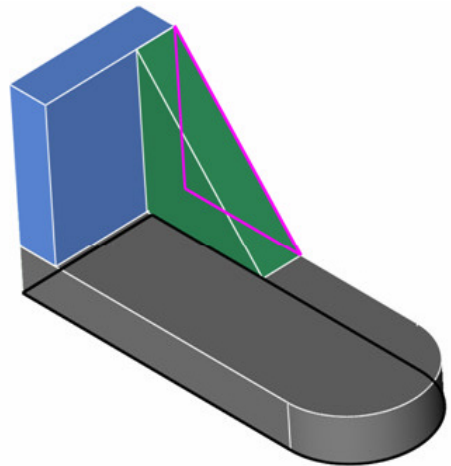3. Next, create the back part by using the **Block Primitive** .

4. Then draw the triangle shape with the

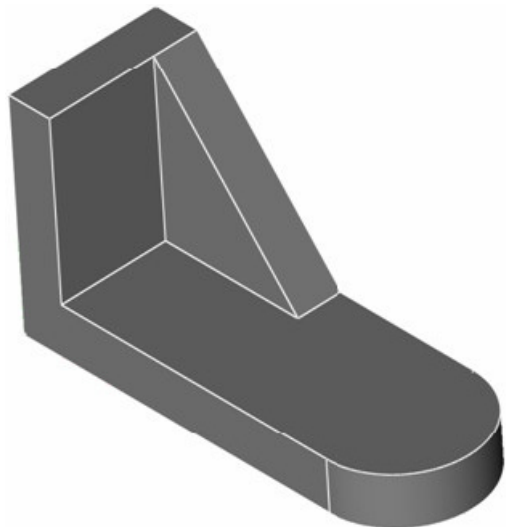   **Connected Line** tool…

5. …and then extrude the triangle.

6. Next, add all the pieces together with the

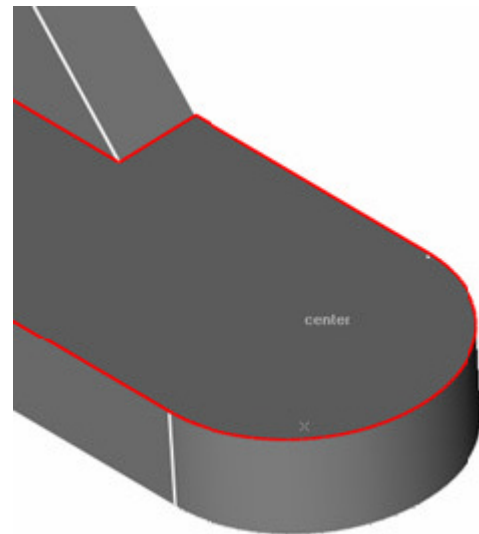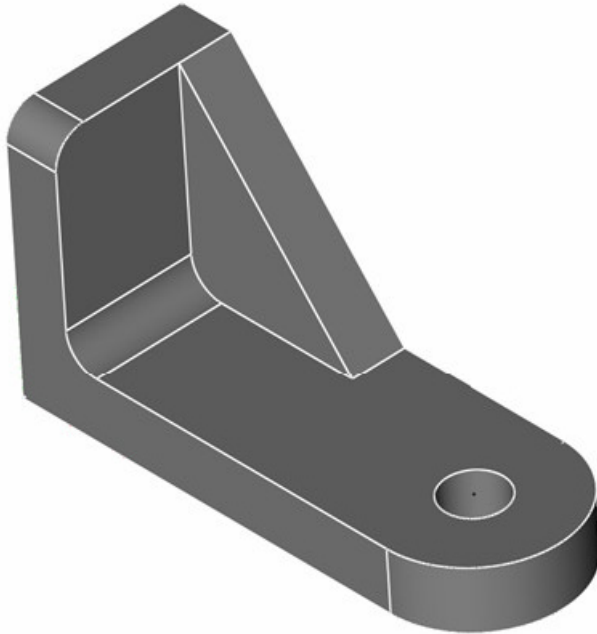   **Union Solid** tool.

7. Finally, add the hole with the **Simple Hole**

     tool using the **Through**, **Through** and **X-Axis** options and round off the

    corners with the **Blend** tool.

Making a Simple Water Bottle

There is usually more than one way to make any shape. Different approaches can have advantages and disadvantages, especially when considering how certain features might need to be changed at a later time.

This can be one of the most important considerations when deciding how to approach a modeling task. Different approaches can make certain features easy or difficult to modify later. Try to think ahead and anticipate the types of things that might change and then choose a suitable method of modeling that makes those changes easier to accomplish.

Below are several possible ways to model this water bottle shape. Also shown is the modeling method used, what it affects, and how things can be modified.
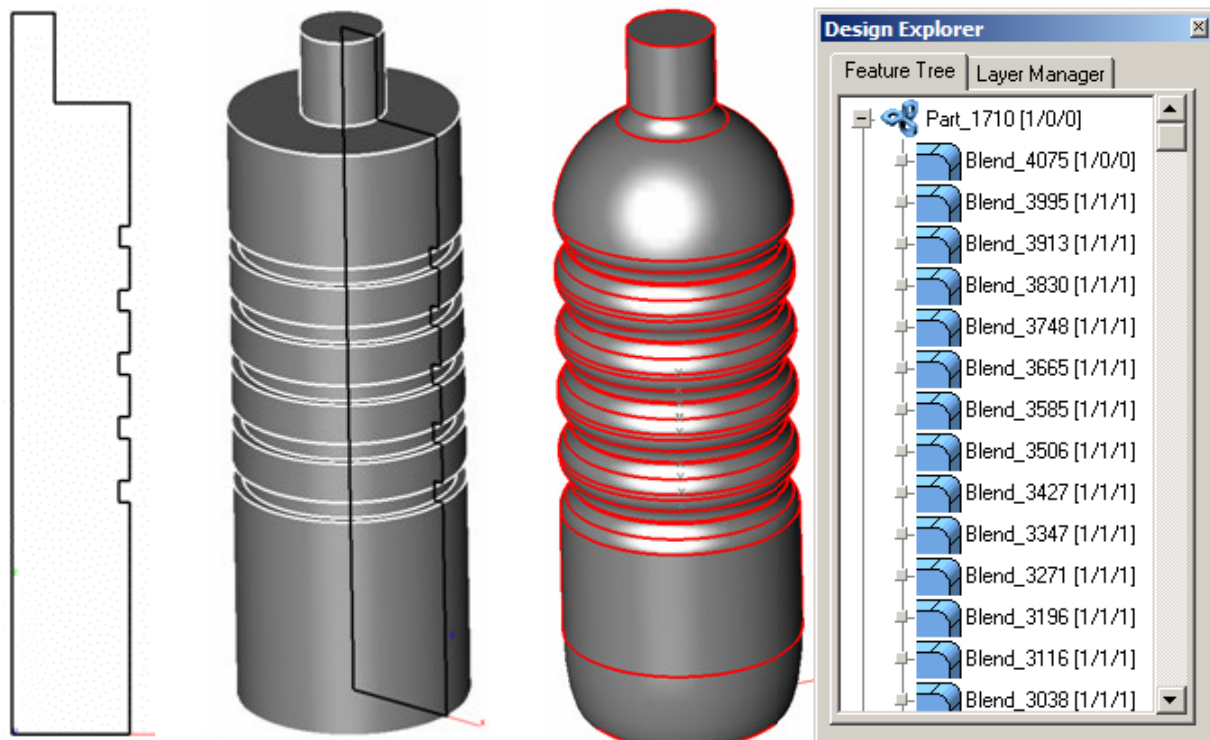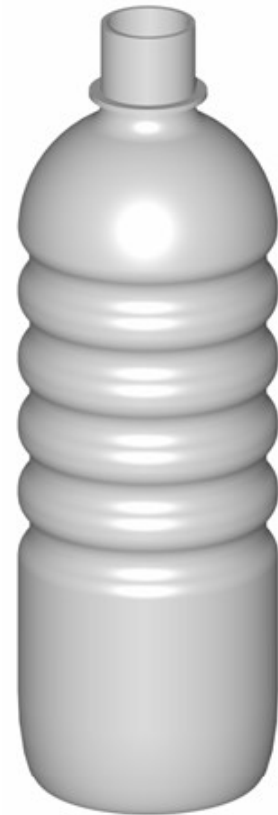
Possible Method 1

1. In this method we start with a simplified profile, and then lath it.

2. Then all of the rounded features are created with **Blend**.

3. The last step is to hollow out the bottle with the **Shell Solid** tool.

By creating the bottle from a simple profile and then adding lots of blends, this allows each blend to be edited separately and changed.

It is also easy to change the position and size of the grip features or the overall bottle dimensions by carefully dragging and changing the profile. Just be careful not to create a gap in the profile.

Lastly, change the thickness of the bottle by changing the value in the Offset field in the Status Line.
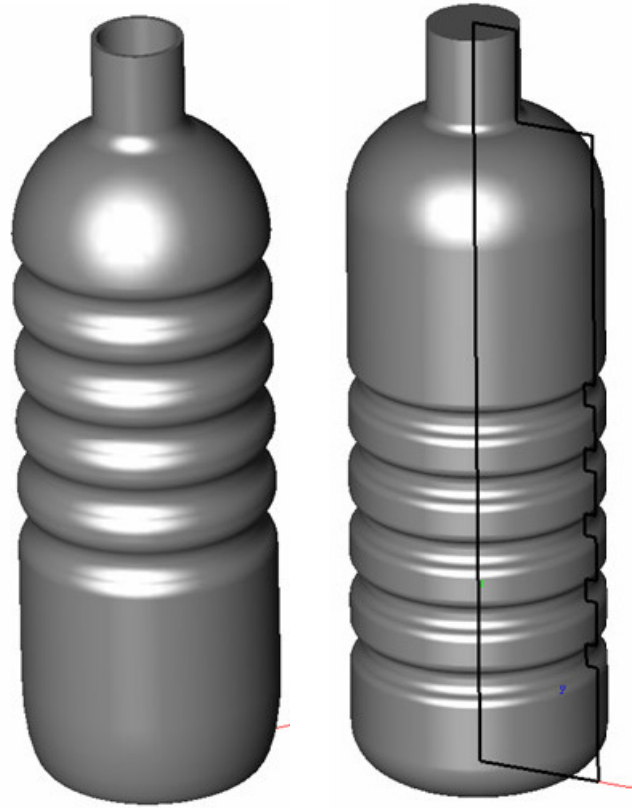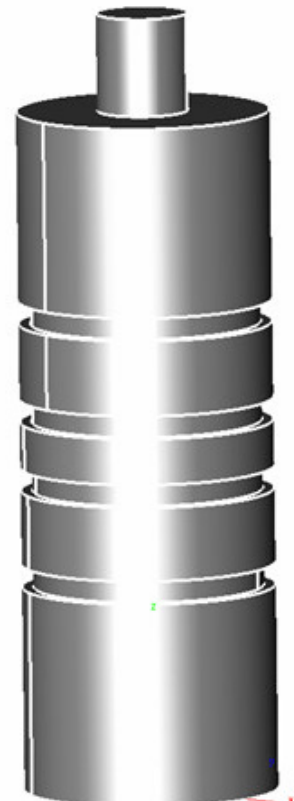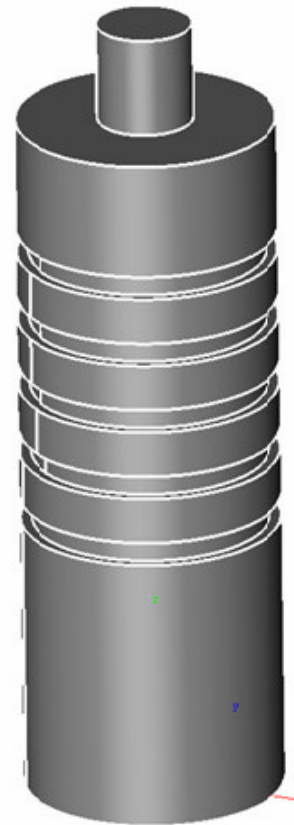
Possible Method 2

1. Build up the bottle out of several individual cylinder primitives, like a layer cake.
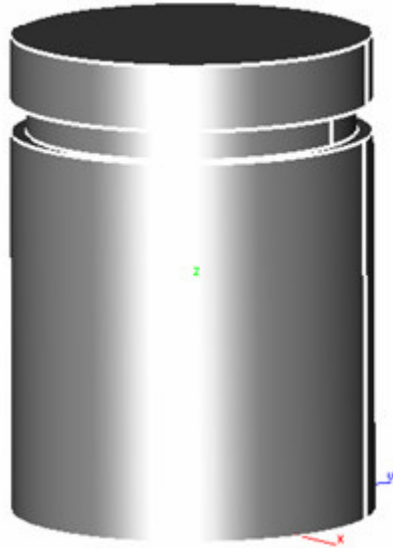
One distinct advantage of this method is that the configuration, size, and number of the grip sections can be easily changed.

Changing the number of sections is something that is difficult or impossible to do using a revolved profile.

2. Use the **Union Solid** tool to make all the cylinders a single unit.

3. Blend the edges.

4. Use the **Shell Solid** tool to hollow the botlle.

Possible Method 3

A third method would be to draw the

detailed profile to be lathed .

This can sometimes be a quick and easy way to make the shape, but it also limits what can be changed.

One benefit, however, is that this method is often a good work-around for times when the geometry is complex and shelling out the shape does not work.

With this method just build in the shell feature into the profile shape, then you don't actually have to shell at all.