

3-D Modeling Project

Stapler--Disassembly of the Stapler

One of the best ways to learn engineering design graphics principles and to use 3-D modeling tools is to use a real object to simulate the process. When the author first learned CAD, he used this technique using a road bike. There are a number of inexpensive products that could be used for this exercise that can easily be purchased at stores, such as a disposable camera, mechanical pencil, or various tools. For this exercise you will be using a stapler like that shown in Figure 1A. The stapler in the figure is a Swingline Desktop Stapler #81800 that can be purchased at popular retail stores, such as Wal-Mart, Kmart, and Staples. If you wish to avoid having curved surfaces, Swingline desktop Stapler #74700 can be used. You will be assigned to teams to purchase a stapler, disassemble the item, measure the parts, create the design sketches, make simple design changes, model the parts, create working drawings for manufacturing, perform simple assembly analyses, and create rendered models of the assemblies.



Figure 1A
Desktop Stapler for Design Project

Sketching the Parts

To start on this assignment the stapler must be reverse engineered by disassembling the stapler and measuring all the parts using a caliper and a micrometer. As each part is measured, design sketches are made of each part with dimensions. This would be a good opportunity to start your own designer's notebook. Your first assignment is to disassemble the stapler, taking careful notes that describe the sequence so you can assemble the stapler again after taking measurements. Take one of the simpler pieces (Figure 1B) and make a sketch with dimensions showing the width, height, and depth of the piece (Figure 1C). Label the part, and on a separate sheet of paper, begin a parts list by listing all the parts, including the material, basic dimensions, and the part name. Design and create your company drawing sheet using the dimensions for standard drawing sheets. Remember, the designer's notebook for this project should include all the sketches, notes, and parts list (Figure 2A).



Figure 1B
Parts to be Sketched

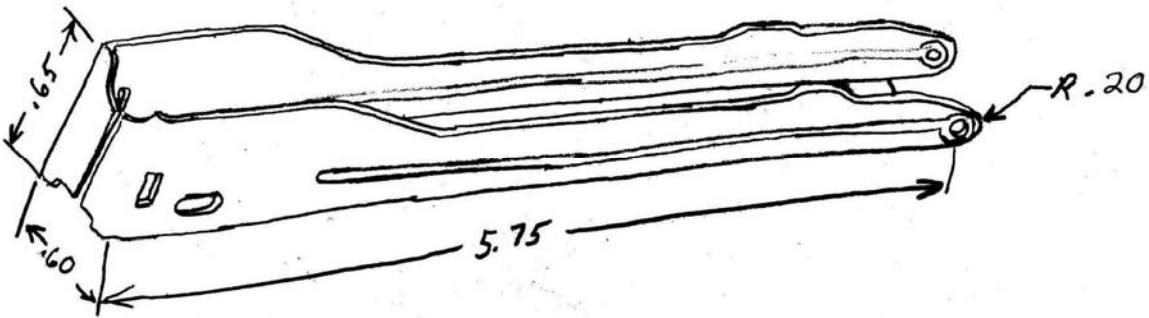


Figure 1C
Sketched Part with Dimensions

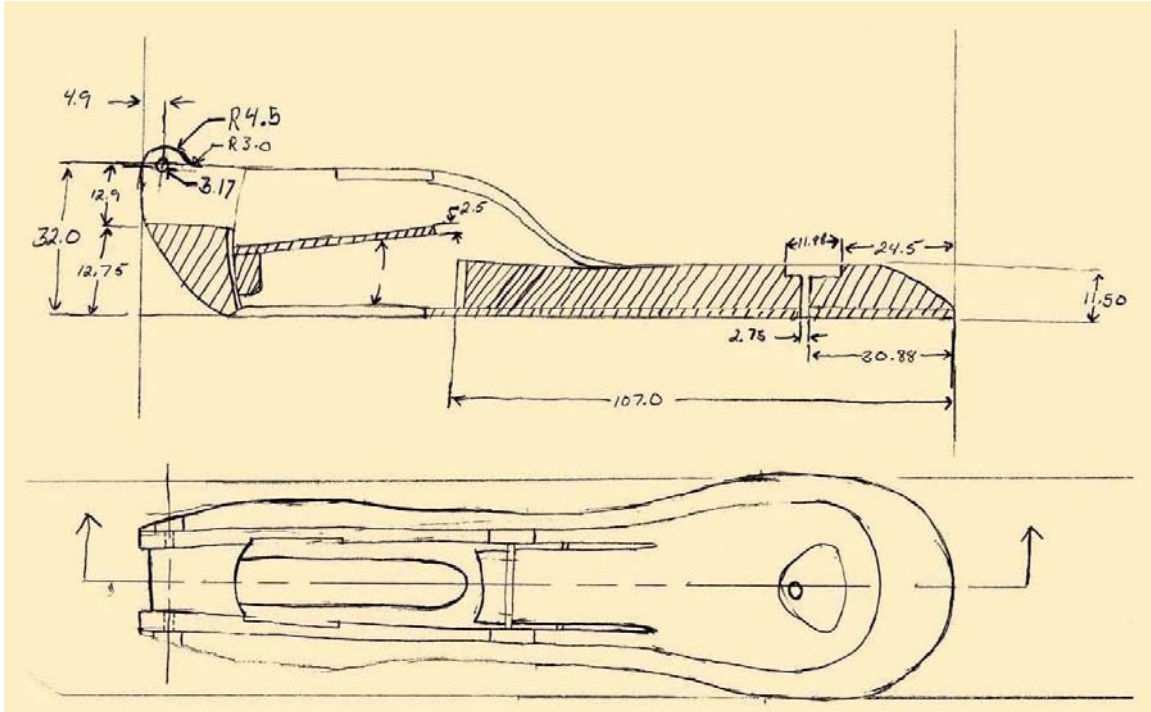


Figure 2A
Design Sketch

All sketches of each part of the stapler should be completed along with a parts list. The plastic housing that encloses the metal parts that actually do the stapling are quite complex, giving the stapler both aesthetic and functional design elements. Redesign the plastic housing so that the stapler is not only aesthetically pleasing but has improved functionality by allowing the stapler to stand on its hinged end in addition to its current flat base. Create design sketches of your new design ideas; then refine the design you select through more refined sketches.

After you have created 3-D models of the parts, create multiviews using CAD. Depending on your CAD software, you will either be able to automatically extract the views or will have to create the views yourself. If the views are automatically created, make sure that the CAD-generated views conform to ANSI standards.

Isometric Sketches

Create isometric pictorial sketches of each part of the stapler. Make an isometric pictorial sketch of the redesign of the plastic housing you created earlier.

Section Views

Create a full-section sketch or 2-D CAD drawing of the stapler housing.

Dimension Parts

You should have created multiview drawings of each part. Now dimension and tolerance all the parts using decimal inches.

Assembly Drawings

You should have created detail drawings of all the parts. You now need to create a pictorial exploded assembly drawing of the stapler with parts list. Use sections where needed to clarify the assembly. Create a photorealistic pictorial assembly rendering of the stapler.

Redesign of the Stapler Plastic Housing

The plastic housing of the stapler serves a functional purpose, giving an elegant form as well as the dimensions necessary to serve its primary function of stapling paper. In this exercise, you are to redesign the plastic stapler housing so that it retains its elegant form but also will allow the stapler to stand on its end on a table top. The rear or hinged end of the stapler housing will have to be redesigned so that it is flat and large enough to support the stapler on end when it is placed on a flat surface. Create design sketches first, then use those sketches to build your computer model of the new housing.

Geometric Tolerancing

You should have created multiview drawings of each part and dimensioned views. Choose one of the simpler parts and apply geometric tolerancing symbols.