

Plastics Technology: Acrylic Cheese Board

Introduction

The cheese-and-cracker server, because it is made with acrylic, requires many processes. It is usually popular with students and their families. The server is designed to hold two racks of crackers (one for round and one for square), a small cutting board for holding cheese and a toothpick holder. Traditionally, this type of product offers a great deal of interest and a reasonably high success rate. Because of the amount of labor in **material processing** for this product, it may not be your best choice for a first acrylic project. In real world manufacturing, the amount of labor involved making this product would result in a reasonably high retail price. As always, general and project-specific safety considerations should not be overlooked.

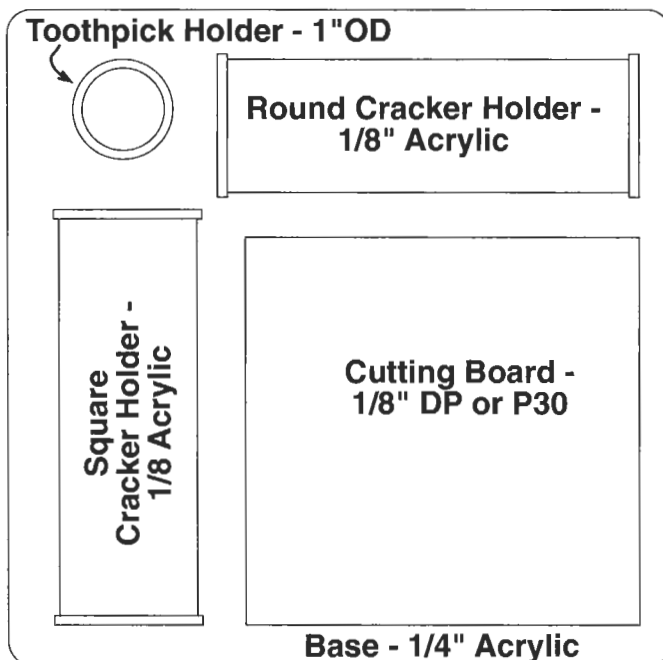


Figure 1 - Cheese tray schematic.

Job Description

You are going to produce a cheese-and-cracker server using **acrylic**. The components will be laid out using templates, cut out using a band-saw, and finished using a variety of materials and tools. A heat strip and an oven will also be needed in this fabrication. In the assembly process, you will use acrylic cement as a bonding agent to joint various pieces. Accurate measurement is essential to your success in this activity. Edge finishing is also a key and with proper effort in the finishing, you will end up with a near flawless item. The final product is a functional product that can be used personally or given as an impressive gift.

Materials and Supplies

acrylic, 1/8" clear, masked 2 1/2" X 12"

acrylic, 1/4" clear, masked 10" X 10"

acrylic, 1/4" clear, masked 1 1/2 X 10"

DP30 or P30, 6" X 6", 1/8"

acrylic tube 1" OD X 1 1/2" H

acrylic cement

mill files

220 grit sandpaper

0000 grade steel wool

Making Templates

In this particular activity, it is essential that **templates** be made.

The base will measure 10" X 10", with the corners being rounded in a **symmetrical** shape. A dime or a nickel may be used for a radius template. Larger radii will not allow enough room for the cracker holders. Your instructor may **precut** the base and then allow you to use a small **template** for the corners. If **templates** are acrylic, sand both sides for identification.

Template sizes:

- Base = 10" x 10" (1/4" clear acrylic)
- Cutting board = 6"x 6" (1/8" DP or P30)
- Cracker Holders = both square and round: 2 1/2" x 6" (1/8" clear acrylic)
- End plates for cracker holders, 2 1/2" x 1 1/2" (1/4" clear acrylic)
- Toothpick holder - *No Template* - Cut from stock, 1" OD x 1 1/2" clear acrylic tube

Material Processing

All edges of the **acrylic** will have to be processed in the order listed. Make sure you *leave paper* on the **acrylic** up to actual assembly time.

Producing the Base Plate

- Use a **mill file** to remove marks left by the saw
- Sand out file marks (220 gr), finishing with steel wool (0000) grade
- Buff using buffing compound

The quality of the finished product has a great deal to do with the material processing. Work closely with your instructor when processing the edges. The base plate (10" X 10" X 1/4") may

be precut or you may need to cut it yourself. If you are going to cut the base and you use a bandsaw, you will need to straighten the edges with a belt sander. Remember that you are not to remove the **paper mask**.

The corners should be rounded on a disc sander or a belt sander to the radius of a dime or nickel. Your instructor may provide a **template** for you to **scribe**. After processing all edges, place your name on the paper mask and then store the base for later use.

Producing the Cutting Board

The cutting board is made of DP30 or P30 which has no mask. You will have to **scribe** with an awl for **layout** purposes. You will cut out the cutting board, round the corners on a disc sander, and then process all edges. The DP30 or P30 does not scratch easily in the vice. Upon completion, store the cutting board until final assembly.

Producing the Cracker Holders

Both cracker holders, round and square, are made from the same **template**. The square cracker is folded on a heat strip and the round

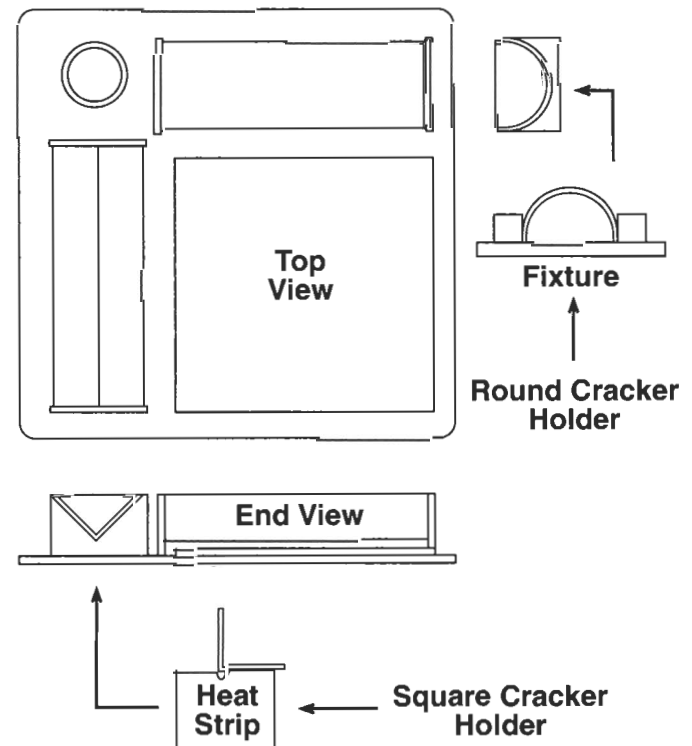


Figure 2 - Cracker holders detail.

cracker holder is first heated in an oven, then placed in a fixture. (See figure 2.)

1. **Lay out** two cracker holders.
2. Cut with a bandsaw.
3. Straighten edges with a belt sander.
4. Do NOT round the corners.
5. Process all edges.
6. Place the square cracker holder, paper off, on the **heat strip**. (Consult figure 2 to show alignment and fold to 90 degrees.)
7. For the rounded cracker holder, a fixture will have to be constructed as shown in figure 2. Remove the paper, heat to 500 degrees in an oven, and when the acrylic is **mal-leable**, place it in the fixture to form the **radius**.
8. Store both holders for final assembly.

End Plates for the Cracker Holder

1. Using the template, **scribe** four end plates and cut with a bandsaw.
2. Round two corners on each with a **mill file**.
3. Material process all edges. (Leave the paper on.)
4. Store the holders for final assembly.

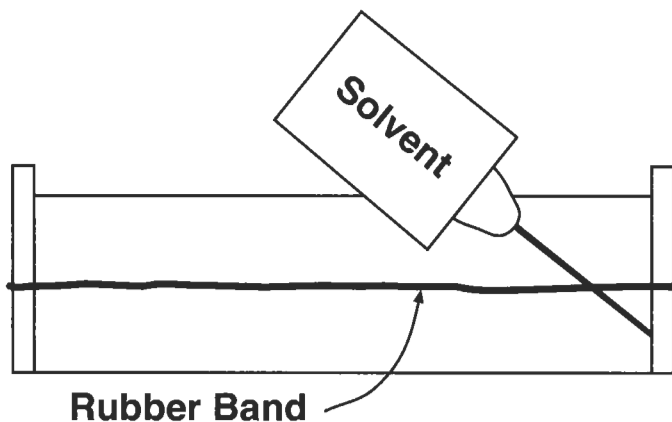


Figure 3 - Cracker holders assembly detail.

Producing the Toothpick Holder

The toothpick holder will be handled in a somewhat different manner.

1. You may cut it with a bandsaw and then grind it square on a disc sander or
2. Your instructor may **precut** holders and issue them to you as a single **component**.
3. Processing for the toothpick holder:
 - a. Do not place in a vice; hold in your hand.
 - b. File only.
 - c. Buff.
 - d. Store for final assembly.

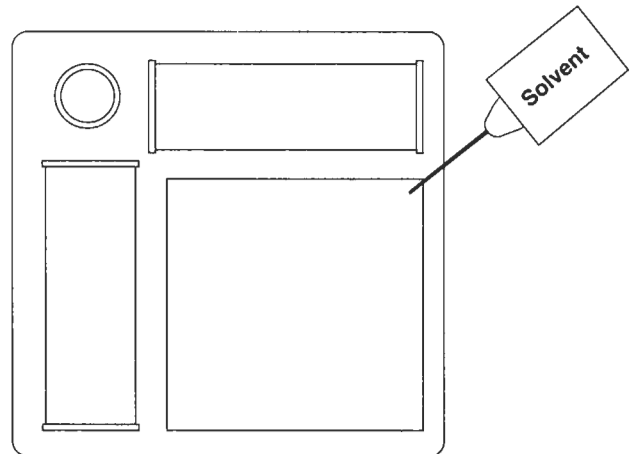


Figure 4 - Cutting board assembly detail.

Final Assembly

1. Cracker holders: Turn both the square and round holders upside down. Take paper off the end pieces and place the ends against the holders. Place a rubber band around all three **components**. Apply bonding agent only against edges that are in contact. (See figure 3.)
2. Place **components** on base according to the layout on figure 4.
3. Apply **solvent** where **components** touch. On cutting board apply only a small amount of **solvent** on corner (about the area of a dime).

Safety

The following safety considerations are specific to this activity:

1. When heating acrylic, be sure the work area is well-vented.

Safety (Continued)

2. Be careful of sharp corners and edges when processing.
3. Do not use a file that does not have a handle.
4. When drilling, do not force the bit, and be sure the material is clamped.
5. Do not bend or stress acrylic; it will fracture and send out projectiles.
6. When cutting acrylic on the bandsaw, never put your fingers in front the of blade.
7. When applying solvent, be cautious of the needle and do not breathe the vapors.

Your instructor will cover two additional areas of safety instruction with you.

1. General safety will cover such areas as laboratory behavior and how you should conduct yourself in the laboratory environment. An example of a general safety rule is: Horseplay will not be permitted at any time. You will be expected to know and will be tested on general laboratory safety rules by your instructor.
2. Specific safety rules for the hand tools, hand power tools, and power machinery will be covered by your instructor. You will be tested on your knowledge of these rules and procedures. In addition, your instructor will be giving you specific safety rules related to use and disposal of any chemicals you may need to use in the manufacture of this product. Your teacher will give instruction in safety on all tools, equipment, and processes. Students are not to begin work or use a machine until given permission by the instructor.

Vocabulary

acrylic
layout
material processing
malleable
components
solvent
templates
bonding agent
heat strip
symmetrical
precut
mill file
paper mask
scribble

On Your Own

1. Look through the mail-order section of magazines to see if you can find a similar acrylic product.
2. Tour the housewares section of a leading department store looking for similar acrylic products.
3. Examine display cabinets in department stores for the quality of work on the edges.
4. Make a list of at least five different products which you have seen made from plastic and other non-plastic materials. Now contrast and compare the plastic versions with their non-plastic counterparts. (Which one is more functional, cost-effective, etc.?)



Division of Applied Technology
Technology Education
Miami-Dade County Public Schools
Miami, Florida



TEACHER GUIDE

MATERIALS and PROCESSES: ACRYLIC CHEESE BOARD

Objectives: Upon completion of this assignment, students will be able to:

1. Identify the properties of a thermoform plastic.
2. Demonstrate material processing of acrylic.
3. Demonstrate forming techniques of acrylic.
4. Demonstrate final assembly using the bonding technique.

Helpful Hints:

1. Use templates as much as possible and sand them for easy identification.
2. Review several times the importance of good material processing.
3. Do not allow students to work on more than one component at a time.
4. Remind students to keep the paper mask on the templates until final assembly.
5. Review several times the procedure for forming the round cracker holder.
6. Do not put the toothpick holder in a vice; it will break.
7. When bonding, fill the bottle only half full. When you apply it squeeze some of the air out of the bottle so that when you turn it upside down, the solvent will not spill.
8. Bond the cracker holders upside down with a rubber band to hold them together.
9. Clean the acrylic with a solution of five parts water and one part vinegar.

LANGUAGE ARTS APPLICATION
MATERIALS and PROCESSES: ACRYLIC CHEESE BOARD

Student Name

In all types of jobs, you will find that you need the ability to communicate your ideas effectively. Writing skills are necessary in all occupations. Here are a few examples of writing skills that are related to this activity.

1. Describe how this product will be used. _____

2. Devise a flowchart from the following processes, tools, or equipment, placing the elements in the order they are used: *Disc Sander, File, Layout, Bandsaw, Sandpaper, Buffer, Steel Wool.*

MATH APPLICATION

MATERIALS and PROCESSES: ACRYLIC CHEESE BOARD

Student Name _____

In all types of jobs and occupations you need the ability to apply mathematics effectively. Here are a few examples of how math skills are used in relation to this activity.

Breakdown on material cost for cheese board:

A $1/8'' \times 4' \times 8'$ acrylic sheet costs \$40.

A $1/4'' \times 4' \times 8'$ acrylic sheet costs \$70.

1. Cost per square foot for $1/8''$ is _____.
2. Cost per square foot for $1/4''$ is _____.
3. Cost per inch for $1/8''$ is _____.
(Hint: 1 square foot is $12'' \times 12''$.)
4. Cost per inch for $1/4''$ is _____.
5. Cost of $1/4''$ base ($10'' \times 10''$) = _____.
6. Cost of $1/8''$ cutting base ($6'' \times 6''$) = _____.
7. Cost of $1/8''$ cracker holders ($2 \frac{1}{2} \times 12$) = _____.
8. Cost of $1/4''$ end plates ($1 \frac{1}{2} \times 10''$) = _____.
9. Cost of tube (1" OD is \$.10; tube is $1 \frac{1}{2}''$ long) = _____.
10. Total cost of cheese board = \$ _____.

QUIZ

MATERIALS and PROCESSES: ACRYLIC CHEESE BOARD

Student Name

True or False (T or F)

- _____ 1. Templates are used to duplicate different components.
- _____ 2. Use a bandsaw to round the corners.
- _____ 3. Always take the paper mask off acrylic sheet before working with it.
- _____ 4. The cutting board comes with a paper mask.
- _____ 5. File the acrylic before you sand.
- _____ 6. When you buff the acrylic, be sure to use a buffing compound.
- _____ 7. The round cracker holder is formed in the oven, then placed in a fixture.
- _____ 8. The square cracker holder is formed on the heat strip.
- _____ 9. The components are placed together first; then the solvent is applied.
- _____ 10. Producing edge work that is flawless can be identified with good craftsmanship.