Pebble Creek Glass Art Club
New Member Guide

In this Guide you will learn the following basics for creating a fused glass project:

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I. Glass Basics

Selecting Fusible Glass

The coefficient of expansion (COE) is a measure of the rate at which glass will expand or contract when exposed to temperature change. At a higher temperature, glass will expand (flow). At a lower temperature, glass will contract. For example, 96 COE glass expands or contracts 96 ten thousandths of an inch as it heats up or cools down.

There are two COEs of glass available for fusing:

- 96 COE is less expensive, easy to cut, and colors stay true after firing. Oceanside, Wissmach, and Youghiogheny are common providers.
- 90 COE glass is provided by Bullseye. The glass is hand-rolled, more expensive, and more difficult to cut. There is a wider variety of glass types and range of colors.

It is important to note two things:

- Glasses with different COEs can never be mixed in a project.
- Most Glass Arts Club members use 96 COE glass most often from Oceanside.

Types of Glass

Type	Characteristics
Transparent	Glass that is see through; it may be a solid color or pattern
Opaque	Opalescent colors that are denser and not see through;
Translucent	Opalescent colors that will allow light to pass through
Streaky	Mixes different colors of glass to form a swirl pattern
Iridescent	Has a thin metal salt coating to provide a shimmery appearance.
Dichroic	Has a metallic coating of several colors; generally used as an accent; cut Dichroic on the back side of the glass (not the etched side). May change color when firing so test first for final color. Will retain texture when firing. May result in a matte or semi-gloss surface. If a shiny surface is desired, cap with clear glass when firing.
Luminescent	Creates a rainbow effect. To preserve luminescence must be fused luminescent side down or luminescent side up and covered by white side of kiln shelf paper.
Collage	Glass formed to include frit or stringer. Not available in 96 COE.
Striker	Changes color when fired. Common in Bullseye and Wissmach.
Reaction	Two glass colors touching create a reaction; contains copper or sulfur.
Textured	Has a defined texture and a rough surface. Check firing guidelines as firing at too high a temperature could cause loss of texture.

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Forms of Glass

Form	Characteristics
Sheet Glass	Common thickness for glass is 3mm. While other thicknesses are available, 2 sheets of 3mm glass fused together to 6mm produces the best result.
Dots	Small pieces of glass fused at high temperature to form a half sphere (rounded top, flat bottom). Sizes vary based on the piece size to be fired.
Stringer	Glass rods that are generally 1mm in diameter (like spaghetti). Generally used for surface decoration.
Noodle	Long flat threads of glass, approximately 3/16" wide (like linguine) and 1mm thick. Can be stacked to 3mm as separators between colors and as surface decoration.
Frit	Pieces of crushed glass. Size ranges from powder, fine, medium, coarse, and extra-large.
Confetti	Extremely thin shards or flakes of fusible glass used as an embellishment or accent.
Rods	5 – 8mm – about the circumference of a pencil.
Murini Rods	Rods with a patterned center. Used for decoration.
Firesticks	Dichroic coated long glass either black or clear backed. May be straight or wavy.
Precuts	Glass precut into many shapes and sizes and including letters and numbers.

Tools and Equipment

Tool	Description
Hand scoring tool	For hand scoring, dip the tip in oil before scoring. Push away from your body for curved lines and pull toward your body for straight lines.
Glass scoring grid system	The Club is equipped with three cutting systems. ● Straight line – Score ¼" or wider ● Circle – Lens cutter located in main storage cabinet for cutting ½" to 4" circles; large circle cutter available upon request (class offered). ● Geometric shapes – Diamond cutter (classes offered).
Running pliers	Used to break glass at score lines.
Breaking/grozing pliers	Used to trim or cut glass to a desired shape. Also useful to remove small or uneven edges.
Wheeled tile nippers	Used to hand trim the edges of glass to a desired shape. Used to cut noodles, stringers, and Murini rods.
Grinders	Use a diamond crusted bit to shave and smooth the edges of your glass. The water reservoir must be adequately filled. Types are spindle, flat lap, or belt.
Ring saw Band saw	Specialized tools used for cutting intricate shapes or curves in glass. Must have water to work properly. May be used with fused pieces to correct problems.

Diamond hand sander	Also referred to as “cold working”. Used to smooth edges; especially helpful for smoothing when straight edges are tight to each other. Available in grades from fine to coarse. Always use wet.
Grinder guide	A guide tool that is mounted on the grinder to enable straight edges. Guides are located in the top drawer to the right of the first grinder.

Supplies

Items to purchase for creating your projects:

- Glues:
  - Elmer’s glue – clear or blue
  - Unscented hairspray in spray bottle – decant into a fine tip bottle for ease of use
  - Glastac – made by Bullseye. Blue is thick; pink is thin.
- Cork board – recommended size 17”x23”
- Cutting mat – recommended size 13”x19”
- Dust mask
- Black and silver markers (Sharpies)
- Rule – recommended size 18”; metal is preferred

Optional items:

- Razor blade (to remove stickers from glass)
- Chapstick (retains Sharpie lines when using grinders or saws)
- Tweezers, paint brush and small scoop (can make from a plastic straw) for working with frit.

Safety

- Safety glasses are strongly recommended when cutting glass and using grinders and saws. Glasses are available in the room.
- Closed toe shoes are strongly recommended. Sandals are NOT considered safe attire in the glass arts room.
- Gloves – Members may want to bring gloves for use when handling glass
- Dust mask – Recommended when cleaning kiln and working with powdered frit to eliminate breathing in powdery substances.
- Step stools – Use step stools for retrieving items that are beyond your reach. Do not stand on chairs for any reason.

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Glass Disposal

- Glass refuse for disposal – Dispose only in the dedicated “Glass Only” trash can. It is the small blue wastebasket and is clearly marked. The contents will be boxed and sealed for safe disposal. Do not retrieve and use glass pieces from this wastebasket as they may be 90, 96, or art glass. Mixing different types of glass will ruin your project.
- Glass refuse for possible use – If your small pieces of glass would be usable by another member and you are certain of its COE - 90 or 96 - you may place in the marked plastic bins next to the tall cabinets next to the windows. Make sure you put glass pieces in the properly marked container. Anyone may use glass from these plastic cases.

Caring for Glass

- Fused glass is safe for serving food and is dishwasher safe.
- Fused glass is not safe for using in microwave or oven.
- Do not place a dish that is hot from the stovetop or oven on glass.

II. Building Your Glass Project

Designing your Glass Project

- Determine if your final piece will be flat or will be molded into a plate, tray, or other object. Slumping will slump your piece into a mold. Draping will drape your piece over a mold.
    - For slumping, the mold should fit the dimensions of your project. Do not allow glass to go over the edges of the mold by more than 1/8th inch. Your project may be smaller than the mold and nest inside it when slumping.
    - For draping, determine how the piece will be constructed to work with the mold you have selected.
- Plan your design. Grid paper or a gridded mat are helpful to ensure your proportions and layout are placed within the dimensions of your project.
- Purchase your glass. 96 COE glass is generally sold in sheet sizes -
    - 12” x 12” (1/4 sheet)
    - 12” X 24” (1/2 sheet)
    - 24” x 24” (1 sheet)

  Check Bullseye for size options if purchasing 90 COE glass.
- Cut glass based on your design and mold size.
- Use a grinder to round the outside corners of your project (this helps to avoid needling, which is the formation of thin, sharp points of glass that may be caused during firing).
- Clean both sides of your glass pieces thoroughly using the club provided cleaner.
- Glue glass pieces to base glass. Use only the minimal amount of glue necessary to secure your pieces. (Note - Elmers Glue can show through transparent glass so use care when applying; use on the edges only).
- Perform your initial firing to fuse the glass pieces together.
- Additional firings may be needed to add design elements to your project.
- Use a final firing to slump or drape your project.

Glass Cutting and Grinding

General glass scoring tips:

- When using the large scorers, double check the measurement with a ruler to ensure accuracy. Pulling the cutter toward you against the straightedge will generally produce the straightest cut.
- For best results, score the smoothest side of the glass.
- If scoring freehand, stand up to ensure sufficient pressure.
- Listen for a scratching sound when scoring.

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Methods for Fusing

Method	Use Kiln Paper	Description
Bubble Squeeze	yes	Used to fuse 2 or more equal size layers of glass to form one single piece. Fires at high heat with long hold times. The final piece is generally flat (no texture). This eliminates the most bubbles between layers when fusing.
Full Fuse	yes	For firing glass that has different thicknesses. Fires at a high temperature. After firing the piece will retain slight differences in texture.
Contour Fuse	yes	Retains greater texture than a full fuse. All the components are solidly fused together with smooth rounded edges that visibly maintain the original shape.
Tack Fuse	yes	Uses a lower temperature to firmly bond glass to a base but maintain the full texture and depth of the piece(s) to be tacked.
Dots	yes	Small pieces of glass that pull up into a round ball when fired. Dots may have irregular final shapes when the pieces being fired are large or irregular to start with.
Slumping	no	Heating glass to soften and drop into a ceramic mold.
Draping	If required	Heating glass to soften and drop over a ceramic or stainless steel mold. Use small cut pieces of kiln paper under the edges of the drape mold to prevent the draping glass from touching the shelf.
Bottles	no	Special molds often used with wine bottles to create specialty designs.

Samples of the different fuse types are in the back of the room to the left of the shelves storing items waiting to go into the kiln.

Shaping Your Glass

After your piece has been fused you may choose to mold it into a certain shape using a slump or drape program. You may find the mold you want to use by looking through the lower cabinets on the side of the room opposite the windows. You may also refer to the mold inventory in one of the binders on the counter to the right as you walk into the glass room.

- Select the mold you will be using. Your piece may be smaller than the mold. If your piece is more than 1/8th inch larger than the mold you must select a larger mold.
- Make sure the mold's air holes are open. Use a push pin or open paper clip (in the pencil cup) to clean the air holes.
- Place the mold directly on the kiln shelf. The Fiber Board and kiln paper are not necessary when slumping.
- When emptying the kiln return the mold to the correct cabinet and shelf as indicated on the bottom of the mold. Use shelf liner between molds.
- If the mold is chipped, do not return it to the cabinet. Place it on the counter by the windows with a note letting the officers know it is damaged.

III. Kiln Usage Guide

Loading and Programming the Kiln

There is a separate kiln program for each fusing method. They are found in laminated sheets on the doors of the main supply cabinet.

Fusing Programs

- Ensure the fiber board is placed in Large Kiln #1. Handle carefully as it is fragile. Make sure the board does not touch the thermal couple that protrudes from the side into the kiln.
  Note: this requirement will end soon as the club is purchasing a new permanent kiln base.
- For all fusing programs, place kiln shelf paper print side down on the kiln shelf.
- Place the pieces to be fused on the kiln paper leaving a minimum of ½" between pieces.

Shaping Programs

- Shaping programs do not require kiln shelf paper.
- Place molds directly on the kiln shelf.
- Allow minimal distance of ¼" between molds.

All Programs

- Close the kiln and insert the peep hole plugs into the front of the medium and large kilns.
- Select the program you will be using. The programs are located on laminated sheets on the doors of the large supply cabinet.
- Enter the program number into the kiln and follow the sequence of steps to ensure they match the program you are using.
  BE CAREFUL DURING THIS STEP. SOMEONE MAY HAVE MODIFIED THE PROGRAM THE LAST TIME IT WAS RUN. MAKE SURE THE STEPS ARE EXACTLY WHAT YOU WANT.
- Use Review to check that all steps have been entered correctly.
- Enter Start to begin the program. Listen for a clicking sound that will indicate the kiln has started the program.

Unloading the Kiln

- It is safe to open the kiln when the temperature registers 115 degrees or lower.
- Remove the peep hole plugs from the front of the kiln (medium and large kilns only). This will facilitate the drop in temperature if necessary.
- To avoid burning yourself, open the lid for several minutes to release excess heat and acclimate glass pieces to room temperature.
- Do not set warm pieces on a cold counter as fractures could occur.
- When the glass pieces are fully cooled, rinse in tepid water to remove residue and fully clean.
- If you are removing pieces belonging to others, attach the firing slip to the piece and place on the cart at the back left of the room.

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Kiln Care

- When kiln shelf paper is used, it is recommended that you use a dusk mask when cleaning the kiln.
- Use a brush to carefully sweep the powdered kiln paper into a dustpan. The dust can only be placed in the white garbage can next to the large kilns.
- Use the small shop vacuum cleaner to remove dust that has fallen down the sides of the medium and large kilns. When vacuuming, do not touch the thermal couple.
- Use the small blower to remove powder from the ceiling and down the sides of the kiln.

Kiln Sign Up and Use

- Each member can reserve a kiln 2 times per month in the winter (October thru April) and 4 times per month in the summer (May thru December).
- If no one has signed up for a kiln in the next 24 hours you may sign up for the kiln; this is considered a one-day advance sign up. It will not be counted against your monthly limit.
- The kilns must be full to run. If you have signed up for a kiln and do not have enough items to fill it check the projects waiting to fire on the shelves to the left of the medium kiln. If there are enough pieces to fill the kiln you may run it, however if you can not fill the kiln you may not run it even though you had it scheduled.
- If you take pieces from the waiting to fire shelves you must let the person know via text that their piece is in the kiln for firing.
- Kiln unloading and cleaning is between 9:00 am and 9:30am.
- Kiln loading for the current days cycle must be started no later than 10:00 am.

Kiln Sharing

If you do not have enough items to fill a kiln and you want to share a kiln leave your ready to fire pieces on the shelf to the left of the medium kiln. You must fill out a firing slip for each piece that you are placing on the shelf. The firing slip will have your name, phone number, the specific fusing method (bubble squeeze, slump, etc.) and any special instructions for your piece.

FIRING SLIP