

Instructions

Beginners Stained Glass Foil Method

Basic Types Of Glass

Cathedral - clear or colored see through glass

Wispy/Translucent - clear glass with opal streaks

Opal - glass that allows light through but cannot be seen through

Materials:

- | | | |
|-------------------------|----------------------------|--------------------|
| • Breaker/Grozer Pliers | • Iron Stand | • Soldering Iron |
| • Running Pliers | • Fid (for smoothing foil) | • 50/50 Solder |
| • Glass Cutter | • Flux Pen | • Corkbacked Ruler |
| • Safety Glasses | • Copper Foil | |

Step 1 - Cutting and Breaking Glass

1. **SCORE:** A light continuous scratch on the glass surface, extending from one edge of the glass to the other edge.
 - A good score should look like a hair on the glass; a string is too heavy. Also, a good score has no breaks or gaps in it.
 - Heavy pressure is not required and in fact can cause a poor break of the glass.
2. **CUTTING (FIG. 1):** Hold the cutter as you would a pen or pencil. Don't tilt from side to side, but keep the wheel perpendicular to the piece of glass. Drag your hand as you score to control the motion. Steering is from the elbow/shoulder, your wrist should remain motionless. Stand rather than sit while cutting.
 - You can either push or pull cutter. To cut straight lines pull; for shaped pieces push so that you can see where the pattern lines are located. Score across the full width of glass.
 - Always score the glass on the shiniest or smoothest side.
 - Make only one score at a time, break, then make the next score.
 - Avoid running your score lines less than 1/2" from the side of the glass.
 - NEVER back up or re-score the same line.
 - ALWAYS number your glass pieces.
3. **BREAKING (FIG. 2):** For the "two fisted grip," place hands in tight fists, place fingers together on bottom side of glass with score line running between fingers. Place thumbs on top surface of glass, slightly apart, one on each side of the score. Press down with your thumbs and up with your fingers to snap the glass along the score line.
 - Running pliers - have a curved jaw which allows for more control when making long or more difficult breaks. Line up score with indicator line on the upper jaw, placing pliers 1/4" to 1/2" over the glass edge. Gently clamp down on the glass. Turn set screw until you feel it just touch the glass, then back off the set screw slightly and squeeze.
 - Breaker/Grozer Pliers - are used for removing pieces of glass



FIG. 1



FIG. 2

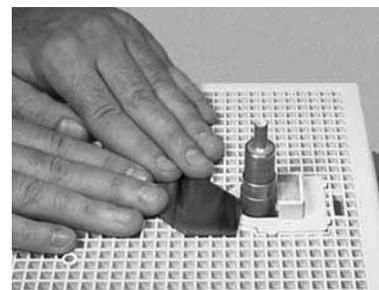


FIG. 3

too small for hands or running pliers. They have a curved lower jaw and a flat upper jaw, both with a serrated inner surface. Place the plier approximately 1/16" from perpendicular, parallel to the score line, with the flat jaw on top. Use your other hand while applying the two fisted grip (described earlier) and bend pliers down and away from the score.

- Grozing - is the removal of flares, nibs and small pieces from the glass edge. Using one hand to hang onto the glass, roll the serrated surface of the Grozer/Breaker jaw over the edge, thus removing unwanted glass. Grozing allows you to clean the glass edge for safer handling and easier foiling, as well as a better fit.
- Grinders - many types of grinders are available for quick and accurate trimming of cut pieces (FIG. 3).

4. SPECIAL CUTS

- Inside Curves or Tapered Cuts
 - Score inside curves first
 - Score outside curve, pinch tip of glass while breaking with running pliers
- Contour Cut - Use when breaking out a curved area too tight to break out with running pliers or when other methods of breaking fail.
 - score along pattern line
 - make a series of scores parallel to original pattern line, 1/8" - 1/4" apart.
 - using breaker/grozers, break out parallel scores one at a time working toward the pattern line.

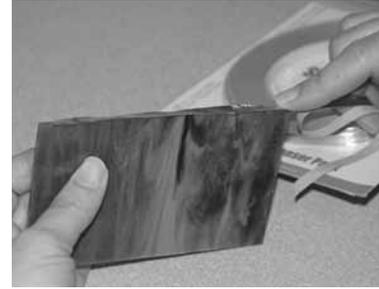


FIG. 4

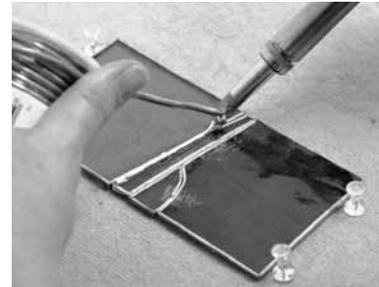


FIG. 5

Step 2 - Constructing Piece Patterns

- Layer the following 5 items: original pattern, carbon paper, cutting or layout pattern, carbon paper, piece pattern (tag board, vellum, mylar).
- Trace over original pattern using a pen or pencil. Make sure to trace all lines.
- Number all pieces, designate color and direction if desired.
- Separate copies.
- Cut out piece pattern using foil pattern shears. Outside edges can be cut with regular shears.
- Place pattern piece on glass, trace around it using a permanent marker. If using other than smooth side of glass turn pattern piece over.
- When scoring glass, cut on the inside of the drawn line, so that the line is on the waste portion of the glass.

Step 3 - Foiling

Foil comes in assorted widths, thickness and backing colors such as: silver, black or copper backed. Selection depends on glass types and any effects you may be looking for. Start with 1/4", 1.5 ml thick copper foil.

- Peel back 2"-3" of backing from the foil, hold glass with the edge toward you, apply foil to glass so that it extends evenly over both sides of the glass. Crimp (fold) over edges making sure to fold corners neat and flat (FIG. 4).
- Burnish foil using fid or similar tool. Press foil flat against glass on the outside edge first, then both sides of the glass. Don't scrub as you may rip the foil.

- Lay foiled piece over corresponding piece on working pattern.

Step 4 - Soldering Safety

No drinking, eating or smoking while handling lead or solder! Pregnant or nursing women should avoid all soldering.

1. **SOLDER TYPES:** Solder is a mix of tin and lead in different proportions. Only use solid core types.
 - 50/50 can be used for foil method and lamps.
 - 60/40 best for either foil or lead.
 - 63/37 can be used for decorative work
 - Lead Free is used when projects are handled--kaleidoscopes, jewelry boxes or objects for young children.
2. **SOLDERING A PROJECT:**
 - Re-align pieces on pattern. Use metal push pins or layout blocks to hold together.
 - Apply flux to copper foiled pieces.
 - Tack solder at seam intersections by holding iron above project and allow solder to drop onto panel (FIG. 5).
 - Completely solder seams by holding iron tip on the foil, perpendicular to the seam. Hold iron as you would a carving knife. Feed the solder into the tip as you move along the foil. Stop soldering ¼" from panel edge on all seams if you are putting a came edge on your panel.
 - Allow panel to cool, then flip, flux and solder all seams as on the front. It is not necessary to tack solder the back. When flipping project over be careful; any straight edges/seams can act as a hinge, and pull foil away from the glass.
 - Apply edge came (optional).
 - When the front and back are completely soldered, wash thoroughly using warm water and soap and a soft brush. Clean both sides, then rinse well and dry.

SOLDERING TIPS: Here are some hints:

- If solder doesn't flow smoothly—apply more flux.
- If seams bulge over the glass— there's too much solder...you may need to melt and pull off the excess.
- If solder spits or bubbles there's too much flux...wipe some off.
- Flat seams need more solder.
- Don't stay in the same spot too long or the solder will bleed through or the glass will crack.
- Wipe your iron tip frequently on a wet sponge while you are soldering.
- Re-tin your tips as needed using a sal-ammoniac block.

Step 5 - Finishing

Apply a wax coating to help keep your panel from oxidizing. Hang your panel with a chain that will support the weight of the panel.

Glossary of Terms

Cutter: A tool consisting of a handle and a beveled cutting wheel. The wheel may be constructed of either steel or tungsten carbide, and rotates freely on its axis.

Cutting Oil: Is a high-viscosity fluid used in conjunction with glass cutters. Oil keeps the wheel clean of dust and glass chips, which increases the life of the cutter.

Score Line: When the cutter is pressed against the glass and then drawn or pushed across the surface, it makes a score-line, which resembles a light scratch on the surface of the glass.

Run: Glass does not break in half like a loaf of bread. Rather, it begins to break at the edge of the glass and then runs to the other edge, completing the break. The special pliers used to control the process are called running pliers.

Groze: The process of filing or chipping away small of glass. Pliers with small serrated teeth are used for this process, and they are called grozing pliers.

Grind: A electric tool used for the precision shaping of glass is the grinder. Glass pieces are laid flat on the work surface and pressed against a rotating diamond coated bit to remove glass in

very controlled amounts. This is called grinding.

Copper Foil: This is essentially copper tape, and it comes in different widths and thicknesses. It is wrapped around the outside of a piece of glass and then pressed into place along the sides. Solder will stick to the copper foil but not to the glass during the assembly process.

Flux: Flux is either a paste or a liquid used in the soldering process to clean the metal surfaces. It is applied to either copper foil or lead came just prior to soldering.

Solder: Solder for stained glass comes in a few types: 60/40 and 50/50 being the most common. These numbers express the tin to lead ratio. 60/40 melts at a lower temp than 50/50 solder. There is little real difference in the strength and flexibility of these solders; which one you use is a matter of personal preference. Rosin core solders are not acceptable for stained glass work. Lead-free solder is another option.

Tinning: Usually performed on copper foil to prevent oxidation when you apply a thin layer of solder to a metal surface.

Burnishing: The process of smoothing foil against the sides of the glass.

Lead Came: A thin strip of metal with a channel grooved into it to receive pieces of glass. Came is cut to the size of the glass pieces and each is soldered into place at the point where it intersects another piece of came.

Zinc: A pre-formed metal strip much the same as lead came but far stronger. It is generally used for the initial framing of panels.

Patinas: Chemical solutions which are applied to solder seams to alter their coloration.

Safety Tips

Glass:

- Never hold glass over your head.
- Before moving large pieces of glass, check for cracks.
- Always carry large pieces of glass vertically-from top and the bottom - NEVER from the sides.
- If a piece of glass is going to fall, LET IT. Do not attempt to catch it.
- In the classroom, always be aware of people around you.
- Always wear eye protection (use face shields on the grinders).

Flux:

- Flux is a mild acid. Avoid contact with eyes and skin.
- Always have good ventilation when soldering.

Lead:

- When working with lead or solder, NEVER eat, drink or smoke until you have washed your hands!

General Safety:

- Lead and glass particles can settle on your work surfaces and floor. Always use a damp cloth and ventilate your area when cleaning.
- Women who are pregnant or nursing should not solder.