

Basic Types of Glass

Cathedral - Clear or colored glass that you can see through, transparent.

Wispy/Translucent - Clear or colored glass with opal or opaque glass streaks, generally translucent.

Opal - Glass that allows light to shine through, but cannot be seen through.

Cutting, Breaking, & Shaping Glass

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 line has no breaks or gaps in it.
- Heavy pressure is not required and in fact can cause a poor break of the glass.





CUTTING: 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 the cutter. To cut straight lines pull; for shaped pieces push so that you can see where the pattern lines are located.
- Always score the glass on the shiniest or smoothest side.
- Make only one score at a time. Break the glass, and 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.

SPECIAL CUTS:

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

BREAKING/SHAPING:

- **Two Fisted Grip Method** – With your 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 Method** – Running pliers have a curved jaw that allows for more control when making long or more difficult breaks. Line up score with indicator line on the upper jaw, placing pliers ¼” to ½” over the glass edge. Gently clamp down on the glass. Turn the set screw until you feel it just touch the glass, then back off the set screw slightly and squeeze. 
- **Breaker/Grozer Pliers Method** - are used for removing pieces of glass 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 pliers approximately 1/16” in from the glass, 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 Method**- 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 Breaker/Grozer Pliers over the edge, 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. 

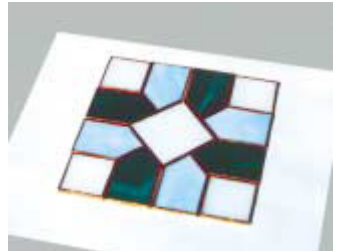
Constructing Piece Patterns (for Opaque Glass)

- **Carbon Paper Method**
 1. Layer the following 5 items (from top to bottom): original pattern, carbon paper, paper for cutting or layout pattern, carbon paper, piece pattern (tag board, vellum, mylar).
 2. 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.
 3. Place pattern piece on glass, trace around it using a permanent marker. If using other than smooth side of glass turn pattern piece over.
 4. When scoring glass, cut on the inside of the drawn line, so that the line is on the waste portion of the glass.

- Photocopy Method
 1. Make two photo copies of original pattern.
 2. Cut out piece pattern using foil pattern shears, if you do not have foil shears cut out the pattern line, not on the pattern line. Outside edges can be cut with regular shears.
 3. Place pattern piece on glass, trace around it using a permanent marker. If using other than smooth side of glass turn pattern piece over.
 4. When scoring glass, cut on the inside of the drawn line, so that the line is on the waste portion of the glass.

Foiling

- Foil comes in assorted widths, thickness and backing colors such as silver, black, or copper backed. Selection depends on glass type and any effects you may be looking for.
- Beginners should start with the easy to handle 7/32", 1.5 ml thick foil.
 1. Peel back 2"-3" of backing from the foil, hold glass with the edge toward you, and apply foil to glass so that it extends evenly over both sides of the glass. Crimp or fold over edges making sure to fold corners neat and flat.
 2. 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.
 3. Lay foiled piece over corresponding piece on working pattern.



Soldering Safely

WARNING: No drinking, eating, or smoking while handling lead or solder! Pregnant and lactating women should avoid all soldering and contact with these materials.

SOLDER TYPES:

- 50/50 – 50% Tin/50% Lead, this solder can be used for foil method and lamps.
- 60/40 – 60% Tin/40% Lead, very versatile solder, great for either foil or lead methods.
- 63/37 – 63% Tin/37% Lead, best used for decorative solder work.
- Leadfree – Use when projects will be handled--kaleidoscopes, jewelry boxes, or objects for young children.



SOLDERING A PANEL

1. Re-align pieces on pattern. Use push pins or layout blocks to hold together.
2. Apply small amount of flux to copper foiled pieces.
3. Tack solder at seam intersections by holding iron above panel and allow solder to drop onto panel.
4. 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 $\frac{1}{4}$ " from panel edge on all seams if you are putting a came edge on your panel.
5. 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 panel over be careful; any straight edges/seams can act as a hinge, and pull foil away from the glass.
6. Apply edge came.
7. When the front and back are completely soldered, wash thoroughly using warm water and soap (such as CJ's Flux Remover #5514) and a soft brush. Clean both sides then rinse well and dry.

SOLDERING TIPS

- 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 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.



Instructions: Beginning Stained Glass

Framing

CAME: A metal channel used for edging your panel, comes in various widths. Types include: zinc, brass, copper, and lead (lead needs to be stretched before using).

1. Fit the side comes to your panel first, having them extend beyond and overlap the top and bottom of the panel. Then fit the top and bottom comes within the side comes. This will leave the top of the side comes open for the rings. Solder the corners and all seams where they meet the came.
2. Place a ring over the opening at the top edge of the zinc. Flux, and solder the ring securely.
3. Clean your panel with flux remover, then dry.
4. Lead came can be used for oval or round frames but remember to stretch it first. A came bender can be used to bend zinc, copper, or brass.

WOOD: Frame your panel with zinc or lead first. A wood frame is optional. Silicone or glazier points can be used to secure the panel to the frame.

Patinas and Finishing your Panel

PATINA: A chemical used to change the color of soldered seams to black or copper.

1. Make sure that your panel is completely cleaned before applying patina.
2. With latex gloves, apply patina to soldered seams using a small brush, a cotton rag or paper towel; add patina as needed. Patina the front and back of the panel, then rinse clean.

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.

Delphi Basic Supplies List

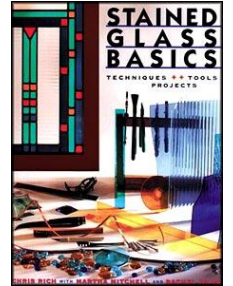
5066	Breaker/Grozer Pliers	3000	60/40 Solder
5068	Running Pliers	5169	Scythe Stone
5104	Glass Cutter	5514	Flux Remover
5163	Safety Glasses	5511	Black Patina
5013	Iron Stand	425658	Corkbacked Ruler
5521	Flux	5086	Foil Shears
5141PK	Flux Brush		
5561	Copper Foil		
5002	Soldering Iron		

Instructions: Beginning Stained Glass

For more stained glass instruction, see these Delphi Best Sellers!

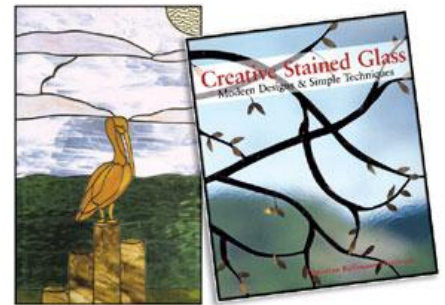
Stained Glass Basics #6405

A great step-by-step instruction book for all skill levels. Features copper foil, overlays, lead came, 3-D, panel lamps and repairs. Includes inspirational color photos and technical tips.



Creative Stained Glass #6686

A great instructional book for all skill levels. Features 27 projects, from simple to more complex. Includes inspirational color photos and technical tips. Covers special subjects, like lamps and working with mirror.



Delphi Made Easy DVD's

Stained Glass Made Easy #6149D

This excellent video guides the beginner step-by-step through a simple but elegant window project. All the copper foil basics are covered, including: cutting, foiling, soldering, patinas and framing. This updated tape provides all the how-to information and confidence you need to create your first stained glass window. Includes pattern.



Soldering Made Easy #6151D

This video is loaded with useful tips, tricks and advice for beginners and intermediate crafters. Learn techniques to smooth rough solder lines and really beautify your work!