



## Light To The Finish

Beautify the house and encourage lofty thoughts with a copper and glass candle lantern.



### Materials:

- Clear glass 19"x 20" minimum
- Lightweight lubricating oil
- Vinyl contact paper - (the stuff used to cover kitchen shelves)
- Glass cleaner
- Paste glass-etching compound
- Copper, zinc or brass "came", available in a stained glass shop - also called 'C' or 'U' channel - you'll need a minimum of 10' (Get a bit extra to practice on!)
- Finish nails
- Scraps of wood - plywood about 12" x 16" and some trim pieces (cove molding or quarter round)
- Solder
- Flux

### Cut List:

- Glass 2 - 4 ½" x 10"
- 2 - 5" x 10"

### Tools

- Wheeled glasscutter tool
- "Sharpie" pen or grease pencil for marking the glass
- Framing
- Square
- Straight-edge for cutting the glass (can use framing square)
- Utility knife or Exacto Knife
- Rubber gloves
- Leather gloves
- Eye protection
- Rotary tool (Dremel or Foredom)
- Cutoff wheels
- Tri-square
- Metal file
- Hammer
- Soldering iron
- Flux brush

**Note:** Put a masking tape 'X' on glass when storing to remind you where it is. Use low-adhesion masking tape - usually green or blue in colour - it will come off more easily.

Buy extra glass to practice on, especially if you are new to glass cutting.

Glass-working tools and etching materials are usually found in a stained glass shop.

### Steps:

The lantern parts must be measured and cut very precisely. Because of their rigid nature, glass and copper are quite unforgiving, so the more accurate you can be the better the results.



Use a square to make the sure the glass is squared



Mark the top point using a square



Mark the bottom point

### Glass Cutting:

Lay the glass over a non-skid mat on a sturdy table. Use a square to check that the glass is square on at least one side. If it isn't, you'll have to cut it to make it square. Use the square to mark the top and bottom of the cut line. Use a sturdy straight edge (like the framing square) as a guide to make the cut. Place it on the glass near the marks you made. Put the cutting wheel in the center of one of the marks. Slide the straight edge up to the side of the cutter. Repeat for the other mark. Be sure to check both marks again with the cutter to be sure the wheel is in the center of the marks.



Lubricate the glasscutter wheel with a drop of oil placed on the glass



Start at the top edge



Pull the cutter to the very bottom edge

Lubricate the wheel with a drop of oil. Grip the cutter either between your thumb and index finger or between the index finger and the one next to it or press down with your thumb on top. It requires a lot of pressure to make a good cut, so use whichever position gives you the firmest grip. Be sure to hold the straight edge firmly because it will want to slip around on the glass.



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Start at the top and pull the cutter toward you to the bottom. Be sure to go off the edge of the glass and onto the non-skid mat with the cutter. It is important to have the score go to the very edge to give you a clean and easy cut.



Slide the score line just over the edge of the table



Hold the back and lift the glass a few inches



Bring it down sharply and the glass will break away along the score

Put on a pair of gloves. Slide the glass to the edge of the table so that the cut line is just barely over the edge in the air. The largest piece should remain on the table. Hold the edge on the table at the back so the glass doesn't slip around. Lift the other end three or four inches and drop it down sharply on the table. The small piece should break away into your hand. Move quickly. Glass breaks most easily just after making the score and gets harder the longer you wait.

Repeat until you have the four pieces of glass squared and cut to size.

**Trouble shooting:** The cutter should make a very audible sound when you are cutting. If you have trouble breaking the glass along the cut line, you may not be pressing hard enough.

However, never run the cutter over the same score twice. It dulls the cutter and won't give a clean break. You get one chance to make a long even cut, so make it count.

Glass always breaks down and away from the score line, never towards it.

If the glass sizzles and pops when you've made your cut, try lubricating the wheel more. You may also try not pressing as hard. New glasscutters take some wearing in and won't cause the sizzling as they age. If the cut does sizzle make the break as quickly as possible. It will get worse the longer you wait and may not work at all.

The edge of the glasscutter can sometimes hang up on the straight edge. If your straight-edge is made from aluminum or softwood, it can cause drag or catch on the side of the cutter. Use a hardwood or steel straight edge, or at least wax the surface of the soft wood.





Apply vinyl contact paper to the surface



Rub out any bubbles



Draw a design onto the contact paper



Or trace it on with a light box

### Etching:

First clean the glass and then apply a piece of contact paper. Rub out any air bubbles. Draw the desired design on the paper freehand, or trace it on. Clear contact paper makes it easier to trace designs out of design books. You can also use a light bulb under a plastic container, or a light-box.



Patterns can be found in design books



Cut along the pattern lines with a very sharp knife



Remove paper in the areas that are to be etched

Cut out the design using a very sharp blade. Keep in mind that the glass will be etched in the areas where the paper is removed. Remove those areas.



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Brush on the etching compound



Rinse off with water



Remove the remaining contact paper

Follow the directions on the container of etching paste. Usually, it is brushed on and left for three to five minutes and then rinsed off in water. Continue brushing for the entire period of time that the etching cream is in place.

The etching compound is an acid and should be treated as such. Use rubber gloves and eye protection at all times.

Rinse the glass off in clean water. It sometimes takes some rubbing to remove all of the etching cream. Then remove the vinyl contact paper.



Metal with a channel used to frame the glass



Use a scrap piece of glass inside the channel to prevent crushing when clamping



Use a tri-square to mark the 45 degree angle

### Cutting and building the frame:

The glass fits into the copper channel, which is easily crushed. In order to cut the copper channel, use a scrap piece of glass placed in the channel to support the metal. Clamp it to the table. Use the forty-five degree angle on a tri-square to make a 45-degree mark on the copper at one end. The short side of the miter joint will always be on the open side of the channel.





Use a rotary tool with a cutoff blade to make the cut



Be sure to hold the rotary cutter perpendicular to the metal

Use the rotary cutter to cut off the copper at the mark. Be sure to keep the cutoff wheel perpendicular to the metal for a clean cut.

Remove the clamp and the scrap piece of glass. Slide the pre-cut glass pane into the channel. Mark the opposite end of the channel with a 45-degree angle, clamp it and cut it. Repeat until each of the panels is framed in copper channel.

It is sometimes difficult to cut the copper perfectly at the corners. Use a metal file to help clean them up and re-cut where necessary.



A wooden jig holds the copper frame in place while soldering



Flux the joint

### **Soldering:**

Build a soldering jig out of scrap pieces of wood. The jig should fit the size of the framed glass panel. Be sure that is squared.

Put the first glass panel with its copper frame into the jig. Plug in the soldering iron and let it reach its full temperature.

Apply flux to each corner of the frame. Brush the corners several times with flux to be sure it has penetrated the surface of the copper.



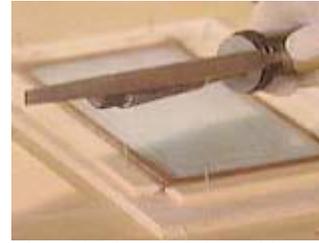
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Heat the joint and add the solder when hot



A small clean puddle of solder is all that is needed



Clean the head of the soldering iron with a file if it gets burnt gunk on the end

Hold the roll of solder in one hand, and the soldering iron in the other.

Touch the corner with the flat side of the iron and let it heat for a moment. The flux will start to bubble. Touch the solder to the soldering iron on the opposite side from the copper and let a drop run down and under the iron. Quickly pull the iron away leaving a drop on the copper.

Be careful not to apply too much solder as it will make an ugly joint. A small drop will do the trick. The copper must be well fluxed and hot to accept the solder. If the iron isn't heating the copper enough, causing the solder to puddle on the surface, then you either need a larger, more powerful iron, or the tip needs cleaning. To clean the tip, rub it with a metal file until it appears shiny and silvery.

Practice soldering on some scraps of copper and glass first if you haven't done much soldering. Try to buy the copper, solder and flux from one glass shop. There are many types of solder and flux so buy them from someone who knows that the materials will work together.



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Clamp the pieces into a right angled jig



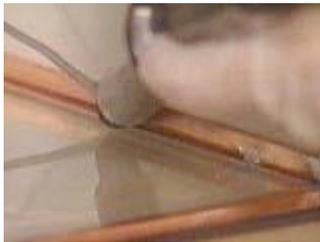
Tack the pieces together in three or four places

Build another jig that will hold the finished panels at right angles to each other. Two pieces of 1"x 8" pine or two pieces of plywood screwed together along one edge to form an "L" shape will do the job.

Lay the panels in the jig, being careful to put the correct sides facing out and the narrower panel on top of the wider one.

Flux the long joint where the two panel edges meet. Solder them together in about four or five spots. Don't heat the copper too close to the corners or the hardened solder that's holding the corners intact will melt, causing the whole thing to fall apart.

Repeat with the other two panels.



Reach inside the box from either end and tack the final joints together



Completed lantern with candle inside

Put the two soldered halves together and clamp them to each other. Be careful not to overtighten the clamps. Lay the assembly on its side. The joint to be soldered should be on the bottom. Flux it and reach in from one side with the solder and reach in from the other side with the soldering iron. Tack the panels together in four or five places.

Turn the lantern over and repeat.

If you have made a very large lantern you may have to solder a piece of copper sheet to the bottom to help give it some strength.

Now put a candle in that baby and prepare to be dumbfounded by your profundity.

