

Stained Glass for Beginners

Stained Glass as a Hobby

Making stained glass is a fantastic hobby that provides hours of enjoyment and makes a craft that can be cherished and will last for generations.

There are several major methods for making stained glass, but I will focus only on one. These methods all use cut pieces of coloured glass that are put together into the final pattern. Methods include mosaics of stained glass, lead *came* windows, and copper foil art pieces.

The most traditional method is one that uses lead came (U or H shaped channels of lead) to hold pieces of glass together. Most church windows use this method and it has an advantage of being quite durable against weather and stable over generations. Unfortunately, the lead came method is not particularly adaptable for intricate designs with small pieces of glass. When using lead came, intricate designs are usually painted on the glass. There are also many techniques specific to using lead came that need to be learned. A newer way of doing stained glass is far easier.

In the 19th century, Louis Comfort Tiffany invented a method using copper foil that is wrapped around the glass. The copper is then adhered together with lead solder. This allowed for the manufacturing of 3-dimensional objects (rather than a simple

flat window) and allowed for much more detail using smaller pieces of glass. A classic example of the tiffany method in use is a stained glass lamp.

We will focus only on the Tiffany method as it is most easily applied to small projects and requires fewer steps to produce a final piece.

Getting Set Up

To do stained glass as a hobby, you will need to have a working area and some basic equipment. The working area itself needs to take into account that you will make a mess

with some very sharp pieces of glass (often too small to see). Don't try to make stained glass in a carpeted area – if you do, you will probably never be able to walk on the carpet without shoes again! A temporary area is fine if you want to go

through the trouble of putting things away every time you finish, but a more permanent workshop is usually more practical. Make sure that the area is also away from children and pets, as they don't mix well with broken pieces of glass.

You will need a solid surface to work on at a suitable height. Standing height is usually more convenient, but a desk at seated height is OK if that is what is available. Good lighting is *essential*, especially if you set up shop in your basement. A very bright desk lamp is handy. The surface itself is best made with wood – a scrap piece of plywood is great. The wood will allow you to push pins into it if you need to hold your piece in place, and it is reasonably resistant to wear



and tear. Better yet, it won't dull your glass cutter, and it can be flipped over after a while to give you a brand new surface to abuse all over again. You will likely need to have a water supply handy, since you will need to wash both the pieces you are working on and your hands. A handy hint is to attach a couple of scrap pieces of wood to your work surface to give you a right angle – this will be useful if you want to make sure your square projects don't turn out a little skewed. Good ventilation is also useful, particularly if you do a lot of stained glass.

Equipment

Sure - you can spend a lot of money on stained glass equipment and get yourself completely outfitted and ready to make tons of projects, but will you really use all that expensive stuff? Not likely. You will probably use just the essential pieces of equipment and find that the fancy extra stuff will gather dust (and glass chips) sitting unused on a shelf somewhere. So what is the minimum equipment that you need to get started? What would be nice to have, but not essential? What is a waste of money?

Minimum Equipment Needed to Start

- A dust pan and brush (you'll soon realize why this is at the TOP of the list...)
- A pattern
- Some **glass** (get *more* than you need)
- A **glass cutter** (get a good quality cutter + some cutter oil)
- A Sharpie marker (can also be used as a *fid*)
- A craft knife (Xacto knife) and some scissors
- Pliers (you may have these already)

- **Running pliers** (specially designed to help break glass along a cut line)
- **Copper foil** (7/32" with black backing is a good start)
- A **soldering iron** (80-100 watts)
- Soldering **flux** (and a small paint brush to apply it)
- **Solder** (60-40)
- Copper wire (to make a hanger – Home Hardware sells these)
- Straight edge (a good metal ruler is nice)
- Glass polish (car wax works well here – buy “finishing compound” if you want to look cool)
- Fishing line (yes... 12 lb test and up can be used to hang your masterpiece) and suction cups (dollar store type is usually fine)
- Bandages (lots... you *will* get poked when working with cut glass)
- Patience (lots...)

The items in **red** are ones that you will need to buy at a stained glass store or online. The other stuff you likely have already laying around or can easily buy locally. I buy virtually all of my supplies from a store in Burlington Ontario called Mystic Stained Glass (www.mysticstainedglass.ca/) at 185 Plains Rd. East. The owner, Maggie, is fantastic, knowledgeable, and very friendly. I highly recommend her store as a place to visit frequently. If you want to buy online, Delphi Glass (<http://www.delphiglass.com>) is a good online source (it is from the US) and if you are looking for a Canadian company, the Glass Place (<http://www.glassplace.com/>) allows you to order over the phone from their online

stock/price list. Their website has a lot of tongue-in-cheek humour in it, and their prices are reasonable. Below are more details on the specific items in red that you should get.

Glass. There are many types of glass available, and what you choose depends on what pattern you are making. There are 4 basic types: *cathedral* (transparent), *water glass* (transparent with a texture/pattern impressed into the glass), *semi-opaque*, and *opaque*. Most stained glass windows use transparent glass, and most stained glass lamps use opaque glass. Choose whatever you think looks good for your final project (if you are hanging it on a wall, don't use much transparent glass since it doesn't look great when no light is shining through it). Be warned, some glass is hard to work with – the more opaque or the more patterned the glass, the harder it is to cut cleanly. Luckily, the hardest to cut glass is usually more expensive to buy, so this is not a huge problem for the budget conscious crafter. There are many brands of glass out there (e.g. Spectrum, Uroboros, Bullseye, Wissmach, Kokomo, English Muffle, Youghioghenny, etc.) but you really need to *look* at and *feel* the glass before selecting it for your project. As soon as you get it home from the store, you'll likely forget what brand it was (I do). You can also work with other glass items (bevels, globs, mirror, etc.) but these are pretty straight forward to use.



Glass cutter. This essential item is important to get right for you. You can buy the *el-cheapo* variety from the hardware store (maybe \$5) and be perfectly happy with it. I find that these dull quickly and are not very easy on your hands. The more expensive types are filled with oil to keep the better quality cutting wheel lubricated. They last for years, and when the wheel wears out, you can replace them. These usually cost \$20 to \$50 and the oil is less than \$10 (many stores will pre-fill them with oil, and this will last a long time). Many people don't like the amount of oil that is released when you cut with these devices – the simple solution is to not have oil inside (or to decrease the volume with a small set screw, if it is so equipped) or to just store your cutter standing on a sponge that is soaked with oil. This is usually enough oil to do the job. I like the feel of the more ergonomic handle style, although the brass barrel (pen shaped style) works very well.

Copper foil. The foil that you use to wrap your glass is an important structural element and it also is a design feature. Good foil (some can be lower quality) sticks well to the edges of glass. The foil comes in different widths, but I would recommend starting with the standard 7/32" width. It is easy to work with. You would only need to change to a wider foil if you want wider solder lines in your final project (1/4") or narrower foil (5/32" or 3/16") for narrower lines (e.g. if you have many very small

pieces in your pattern). If your glass is a different thickness, you may need a different width of foil. Just to complicate matters, the foil also comes with different backing colours, and this only is a concern if you use glass that is transparent. Since transparent glass allows you to see the inside of the foil, you don't want it to be copper coloured if your solder is silver (more on this later). My suggestion is to buy 7/32" foil with a black backing, as this is usually most adaptable to many different projects. If you only use opaque glass, go for the copper backed (plain foil) – it is a little cheaper.

Soldering iron. Although you can buy one at Canadian Tire, don't scrimp on your soldering iron. It is a very critical part of maintaining your stained glass well-being. You can expect to spend between \$60 and \$100 on a good iron. I would suggest getting one that is 100W, although 80W is still functional (it takes longer to heat, but not *that* much longer...). Although irons usually come with a stand, I would suggest buying a better stand if you have the money available. The cheap tin ones work, but you may have to attach them to a block of wood or a brick to keep it from falling over and burning something you would rather not burn.



Flux. This is an essential chemical. You need to brush it onto all the copper foil pieces where you want the solder to stick. If you don't use flux, you might as well not start. Melted solder has a mind of its own and will not stick to anything unless it is

fluxed. I use a liquid flux (less than \$10) but many people swear by (not at) a paste flux. Ask at a stained glass store to see what they suggest. One small bottle will last a long time. To use flux, just grab a plain (dollar store) art paint brush and a small jar (baby food jars are great for this). Don't be tempted to stick your paint brush into the original bottle – you will find that this can *spoil* the whole bottle and eventually it will stop working. Just pour a few mL into the jar and discard down the sink anything you don't use.

Solder. There are many different types around, but just go for the standard called 60:40. This solder has 60% tin and 40% lead. It works well and is easy/cheap to buy. If you need something special, you could buy solder with no lead (for jewellery or something that will be handled a lot), solder with some silver in it (will shine a little brighter), or solder for making a 3D solder effect or to stick better to 3-dimensional objects (a different proportion of tin/lead – it solidifies at a different temperature). Don't buy solder meant for electronics projects, as this will often have a core of flux that won't work properly for stained glass.

Non-essential equipment and supplies

So, what kind of things would be nice to have but are not really necessary to buy right away? You'll find that stained glass stores are filled with items that you can spend money on, but many of them are not really critical. Here's a list of some items that you may find useful.

- **Grinder** (and a grinding shield or safety glasses). This machine (usually well over \$100) will make fitting your pieces together much easier and completing a complex project a lot faster. It wet grinds the edges of your glass pieces with an abrasive wheel (*wet* is important to prevent chipping). I use it all the time now (not on my first project, though), but the investment isn't worth it unless you continue making glass projects. If you cut accurately, you may not need it. Perhaps you could find someone that is a stained glass retiree that wants to sell their machine cheaply... If you don't have a grinder, you can use a sharpening stone with water on it (the old fashioned way is to use a stone from your garden – it really works!).
- **Fid**. This is a fancy name for a device that is used to “burnish” the foil to the glass. Burnish is a fancy word for making sure your foil sticks properly to the glass. The foil is like adhesive tape, so you run your fid over the surface of the foil to make sure it sticks properly and to get rid of any folds or wrinkles. No, the fid doesn't have any other useful applications that I know of...
- **Grozing pliers**. I have never owned a pair of these ‘special’ pliers that help you to chip away at your glass to make it the right shape. Cut it correctly the first time or buy a grinder. If you can't do either yet, go ahead or get the pliers to



help you *groz* the edge (yes, *groz* is a real word...).

- **Light board / table**. This is handy for laying out glass and looking at how pretty it will be in your final project. Got a window? That will do in a pinch. I really don't use it very much, but my wife loves it.
- **Patina**. If you like shiny silver solder lines on all your projects, you won't need this chemical. If you would prefer that the solder lines look copper, or black, or like old pewter, then you can buy a bottle of the specific chemical that will oxidize your solder to the right colour. I like black and pewter to artificially “age” the pieces that I make. Make sure, though, to match your copper foil backing to the colour you will change your solder into...
- **Chain**. Some larger stained glass pieces look silly hanging on fishing line. Small lengths of chain can really add something to the final look of a project. Stained glass stores sell chain (which can be expensive), but plumbing supply and hardware stores also have some chains with small enough links to not look too weird. Just attach the chain to the loops of copper wire that you added to you project before you soldered it. Wait... you *did* add a copper wire loop as a hanger, right...?
- **Capping**. This is usually made out of zinc and is used to give a nice finished edge to your project. It is not terribly

worthwhile to use for a small suncatcher, but a larger panel will definitely look better and be much stronger structurally if you add capping around the edges. It is soldered to your project to adhere it correctly, although it will sometimes not change colour with the patina chemicals (there are special zinc patina chemicals out there that you can buy if needed).

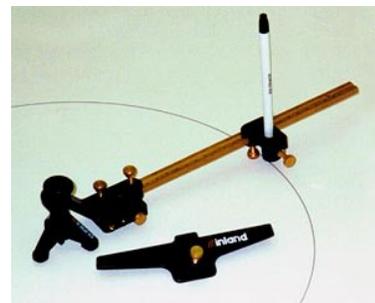


- **Glass storage.** Tend to buy lots of glass? Have leftovers from a number of projects. There are many ways to store this safely. I like to store smaller pieces in those plastic drawer units you can buy at discount stores. For larger pieces, perhaps you can re-purpose that organizer rack that you used for vinyl LPs in the 1970s?
- **Re-strip.** This is a thin strip of copper that will only bend one direction (not sideways). You add this to the edges of your projects to add structural support if needed. It can disappear under the solder so you don't see that the re-strip is there for bracing. Can be useful if you end up with a project that is a little wiggly.
- **Copper foil caddy.** This little device holds all of your rolls of foil neatly and all you do is pull on the foil you want – no coiled foil all over the floor! Be careful – they come in some uninspired (and truly hideous) colours.

Stuff you probably *don't* need

There are some items that sound great but often don't live up to their advertising. Here are my suggestions for things I wouldn't suggest.

- **Strip cutter / circle cutter.** This complicated looking contraption allows you to cut perfectly even strips of glass or nice circles of glass. In my opinion, a straight edge will give you a good straight line, and if you used the strip cutter, the glass will likely break where you don't want it to anyways. Why bother? Need a circle, cut it the old fashioned way, by hand. It will be faster.
- **Automatic foiler.** This sounds like a great idea, but usually takes longer to figure out than it is worth. It might be useful if you are doing many really large pieces, but isn't the point of a hobby to spend *time* doing something?
- **Flux remover.** This unnecessary chemical doesn't really make much sense if you are applying a water soluble flux that you then *wash off completely* with water. If you are using a really special kind of flux that is hard to remove... well, what the heck are you using that for in the first place?!



Making a Stained Glass project

Steps to making a stained glass project

1. Get or make a pattern and buy your glass / supplies. Try online to save some money.
2. Cut the glass and/or grind to the shape that you need for the pattern.
3. Dry fit all pieces to ensure they are correct, and fix them as needed.
4. Foil all pieces, burnish with a fid, then dry fit again.
5. Apply flux with a paintbrush to all the copper foil.
6. Tack solder all the joints between glass pieces (apply solder to all the lines now if you want).
7. Attach a loop of copper wire as a hanger if needed (don't forget this step!). This is usually at the top of your piece.
8. Flip over the piece, apply flux again, and apply solder to all the lines.
9. Flip over yet again, apply flux as needed, and apply solder the front, making sure that the beads are all perfect.
10. Apply flux and solder the edges of your piece.
11. Clean up any ugly solder beads by re-melting them and adding more solder - then allow to cool completely.
12. Wash well with cool water to remove all the flux.
13. Apply a patina chemical if desired – a small volume of the chemical is poured on the lead lines and allowed to chemically react.
14. Wash with water, dry with a towel, then apply a small amount of finishing compound/wax.
15. Once dry, shine with a cloth.
16. Display proudly.
17. Start again at step 1.

How to choose or make a pattern

So, where do I find good patterns? How would I make my own pattern? What makes a good pattern? Stained glass books are sometimes a good source for patterns, although they tend to aim at a beginner audience with beginner-looking projects. If you want to look at such books, go to the library or browse the craft section at Chapters. If you want to make something other than a gruesome tulip suncatcher, you'll have to be creative. The internet is also a great source of ideas, and you can find countless free patterns ready to make. Just search in Google for "stained glass patterns" and you will probably get just under 5,000,000 hits. How to sort through them? Hit the images tab in Google and click on something that catches your eye. Although a great source of ideas, you can spend hours looking for something that you may be able to draw out on paper yourself. This website has some good tips (<http://stained-glass-patterns.org/>). If you decide to draw your own patterns, there are a few rules of thumb you should consider.

- Here is the primary rule to follow - **make sure that all/most pieces are connected to more than two others.** This simple rule will make your final glass pieces much stronger. If you have a piece connected to just one or two others, it will wobble easily and may break. This usually requires some extra bracing with a thicker solder bead, or, even better, add some re-strip to brace the joint from underneath the solder.
- **Size matters.** Most pieces under ~8 to 10 inches across will not need any thought as to how to make them stronger

– especially if the *more than 2 rule* is applied. If the piece is a little larger, you may want to consider adding some zinc capping – this finishes off the piece with a nice frame and adds a lot of extra support to strengthen it. Don't want a frame? Just add *re-strip* to some of the solder lines (ones that are running in two different directions), and this will help to prevent bending. Very large pieces may require external support bars – but you probably don't want to make anything that big anyways.

- If you have an object that is the main focus of your design (say a flower or a bird), draw it so it *overlaps* something else. Sounds strange, but this can make a simple design look spectacular. If you want to further highlight the focus, put it lower down in 'frame' of your panel. This will help it to jump out at you.
- Have a nice bird pattern that you got out of a book or off the internet but don't know how to put something around it to finish it off? Make some sketches on paper and add a few simple lines to connect parts of your bird to the edge of the frame. Careful, though!! If you have cut glass before, you will know that glass breaks unpredictably if you try to make an inside curve that is too tight. If you find that one of your background pieces has one of these curves, add a lead line somewhere to make it easier to cut. You'll get the idea when you try it.

Glass cutting tips

This is an art, in and of itself. However, cutting glass cleanly and perfectly every time is never going to happen. *Breakage happens*. If it does, put the broken pieces

aside and make something else with it. Not sure what else to make, try randomly putting all the broken pieces together in a patchwork design, add a frame, and voila – you have an art piece! It works. Here are some other useful tips:

- One of the best tips that I have for cutting glass is to **use the glass cutter properly**. That means, hold it so the cutting wheel is perpendicular to the glass (get down to its level and take a look – often you will be holding it at a funny angle).
- **Always cut glass from edge to edge.** Always. Edge to edge. Got it? Glass can't reliably be cut without starting your cutter at one edge and ending at another (except in movies where you can cut a perfect circle in a piece of glass to then reach inside and steal a precious diamond... it doesn't work that way).
- **Don't press too hard** on the glass with your cutter. All you really need to do is scratch it, and this scratching doesn't take your full body weight to achieve. Listen to the sound that the cutter makes – it should sound a little like ripping a piece of paper.
- Have a complicated main focus object in your pattern that would look great if everything fit together perfectly? If it is all made from the same colour of glass, why not cut it from one piece of glass by taking small cuts at a time?
- **Cut on the smoothest side** of your glass if one side is bumpier. An easy tip to understand, but often forgotten (believe me, I know!).
- There are several ways of cutting glass to match your pattern. One way is to

place your paper pattern on the work surface, put your glass on top (unless it is completely opaque, then never mind...), and hand cut each piece by following the lines underneath. This is fine but doesn't always work out perfectly. How about tracing your pattern onto your glass with a Sharpie marker or a paint pen? That is what I do most of the time. Another option is to cut out your pattern and use a glue stick to paste the pattern piece on the glass. This is fine if you don't have a lot of grinding to do after cutting, since the water from the grinder will make the glue release from the paper and away it goes...

Foiling tips

Foiling takes some time to master, but it doesn't have to be as discouraging as many people make it out to be. Here are some ideas to help with applying that copper foil to your project (without throwing it through the window you eventually want to hang it in).

- Use your craft knife to clean up any overlaps in the foil. Sounds like a minor deal to have some overlapping foil, but it is surprisingly simple to cut away the jagged edges on the face of the piece of glass. Take it away and your solder line won't look as jagged as well.
- Take your time – if it isn't perfect, peel it off and start over. Until you get really good at judging where the centre of the foil is in relation to the centre of the piece of glass, things will go a little wonky. If you consciously start foiling every piece with the idea of getting the

foil centred on the edge of the glass, you will get a much better result. If your glass is bumpy on one side or you are using bevels, all bets are off. Trial and error is the only way to go.

- Always use your fid or your burnishing device (the Sharpie marker is good for this). An old toothbrush can also help if your glass is bumpy on one surface.
- If you incorporate glass globes into your piece (I actually buy them at the dollar store), you can easily burnish them without your hair falling out by wrapping them loosely in foil then placing them into a glass jar. Put a lid on the jar and shake like you are making salad dressing – after a minute or so, every one of the globes will be fully burnished as if by magic.



How to finish your project

Applying a patina chemical (after you wash away the flux) is a great way to change the final look of your project. If you want the solder lines to disappear (when the colour is the most important feature of the design), then change them into black or pewter. If the lines are more important than the colour, then keep them bright silver or make them copper coloured. Don't like the colour of the solder that you so carefully added patina to? Brush it with some fine steel wool to remove any old wax and patina, then re-do it in the colour that you like.

Once you have cleaned and washed away the patina, you can polish the piece using stained glass finishing compound or even standard old car wax (just about any wax will do). If your prized piece looks a little dull after a few years – just wash it again and apply more polish to make it look as good as new.

If you remembered to attach a hanger before you finished soldering (usually just a small loop of wire), you can hang it from a piece of fishing line or attach some chain that coordinates with the colour of your patina.

Safety

The number one safety concern with stained glass is usually preventing cuts from shrapnel. Although cuts *will* happen, by far the most frequent cuts are not when you are working with it – you usually get cut when you are moving it from place to place or just not paying attention.

To help prevent those annoying little flakes of glass from digging into your hand, you should CONSTANTLY be sweeping your work surface with a brush and dustpan. Every time I cut glass, I spend more time sweeping than cutting. Believe me, it works!

If you wear eye protection, you will find that the number of glass shards that try to fly into your eye will be reduced. When you work with a grinder, make sure everything is very wet and you should have fewer glass chips flying. A safety shield is a great way to reduce this risk.

The next safety concern is more chemical in nature. Glass crafting does use chemicals –

patina, flux, etc. and these things can cause problems with lots of exposure. Good ventilation is always important to reduce how many fumes you breathe in (many newer stained glass products are less toxic – check them out). You could wear surgical gloves (they won't prevent cuts, though) but you may find you can't accurately work with glass. I have used liquid glove / *glove in a bottle* products that are a siliconized hand cream. These creams provide a barrier which reduces your absorption of some of the nasty chemicals and makes things far easier to clean off your hands at the end of the day. I find that the biggest mess usually comes from the marker or paint pen that you use to mark your glass. It gets everywhere!

If you use traditional solder, you know that it contains lead. You may also know that in the workplace, lead is a designated substance that can be hazardous to your health. Since your home is not your workplace, it is up to you to decide how to protect yourself from excessive lead exposure. The barrier creams, ventilation, and not licking the lead solder are good ways of reducing exposure. Replacing the solder with a less toxic one is also something to consider (although you may find that the alternatives may also be toxic).

The most important safety tip I have for new stained glass crafters? **Wear shoes** while working on your project.

*Above all else,
just enjoy making stained glass!*