

Cutting skill is the most important factor. If you get good cuts, the rest of the job is relatively easy. If you get poor cuts, the rest of the job is spent compensating for that poor cut.

## Cutting Methods

- **Template cutting**  
This requires cutting the desired pattern shapes out of paper, cardboard, or plastic to make templates to be held onto or attached to the glass with glue or tape. The cutting score is made by running the glass cutter along the outside edges of these templates. Template cutting is the easiest cutting method to learn and is the most common method taught to beginners.
- **Stencil cutting**  
For this you also cut out templates, but instead of scoring along the template, you draw the pattern shape onto the glass using the template as a stencil. You then score on the line drawn on the glass. Stencil cutting is the preferred method for cutting with a glass saw.
- **Trace cutting**  
To trace cut, place the glass over the pattern and make the score by using the cutter to follow the line on the pattern while looking through the glass. Just like tracing a drawing with one paper over the other but with a glass cutter instead of a pencil. Most glass is trans-parent enough to permit this. Opaque and dark colored glass that cannot be easily seen through, can still be trace cut by using a light box. Because trace cutting takes longer to master than template or stencil cutting it is usually not taught to beginners. Although many artisans don't use this method, it's usually preferred by professionals because it's considerably faster than other methods. If speed is important, you might take the time to master this technique.
- **Cutting guides**  
If you want to make several copies of the same piece, it might be worth making cutting guide templates. Cut a template from a piece of plywood or plexi-glass, that is slightly smaller on all edges than the piece you want to make. Set the cutting guide on the glass and use it as a guide to cut against. The time spent making such a guide can often be saved in being able to produce very fast and perfectly accurate cuts.

## Running a Score

"Running" a score is when you crack the glass along the score so that it will then break accurately along that score. Scores for straight lines and simple curves don't need to be run but can be just broken off. Deep curves or complex curves should be run to ensure the glass doesn't break away from the score. Some of the different ways to break glass or to run a score are:

- **Two hand break.** The most common way to break glass. With the score facing up, hold the glass with each hand on either side of the score and sharply turn your hands outward to break the glass apart. As well as straight line scores, it will work on simple and gentle curves.
- **Table edge break.** For large sheets of glass, it's often better to snap the score on the edge of your cutting table. After scoring it, slide the glass to the edge of the table so that the score line is parallel to the table edge and about 1/4" outside the edge. Lift the glass about 12 inches and press it down sharply against the table. It will break cleanly away.
- **Fulcrum break.** For running straight lines and simple curves, you can break by placing something like a pencil or old-fashioned glass cutter under the score as a fulcrum. Sharply press down the glass on both sides of this fulcrum to make it break.
- **Pressing.** After scoring, turn the glass over and with your thumb, firmly press down on the score. As it cracks along the score, keep moving your thumb along to chase the score it's full length.
- **Breaking pliers.** You can use regular pliers, or those specially made for breaking glass. For breaking off pieces that are too small to be done by hand, hold the piece with the pliers and snap it off the same way you would to break by hand.
- **Breaking & running devices.** Numerous devices are available to help you run a score. They work on the same principle as either the fulcrum or pressing methods.

## Cutting Glass

- **Tapping.** Old-fashioned conventional glass cutters were all specifically designed to use the round non-cutting end for tapping glass. For cutting many shapes, tapping is one of the best ways to be certain the run stays on the score and doesn't stray. After making your score, turn the glass over and tap along the back of the score to chase the break along your score. This is called "running" a score. Start at one edge of the glass and tap with a continuous rhythm (like a woodpecker), following the score across the glass, until the piece breaks away along your score. Tapping will often cause the glass to chip along the break. If you tap very slightly to one side of the score line, the chipping will be only on that side of the score. The other side will break as cleanly as you would expect for a non-tapped break.

### Cutting Stance

When cutting glass, you should bend forward far enough that you look down at the glass in front of the cutter. Sighting one eye down the front of the cutter, in the same way a shooter would sight a gun, will give you a clear view of where the cutter is going. Use your body position to determine the pressure on the cutter. By leaning forward, you will increase this pressure - by leaning back you will reduce it. Do not try to use arm strength to do this. Instead shift your body weight backward or forward.

The cutter should be held firmly with the lower arm stationary and with the elbow held firmly against the body. The wrist and forearm should NOT move when scoring.

Move your shoulder, shift your weight, step back, or just shuffle your feet if you like - but don't move your arm any more than you absolutely must. The most important factor in getting a score that results in a clean break, is to be sure the score is made with a smooth flowing stroke that maintains a consistent unchanging pressure. This is best done by leaning over the cutter and keeping the arm as stable as you can.

It's the same idea as hammering nails. A beginner will swing the hammer with the wrist. A professional carpenter learns that it works much better if you lock the wrist and elbow in place, and swing with the entire arm. It's the same with scoring glass.

Listen to the sound the cutter makes. Try to have it produce a smooth and constant tone that does not start and stop, or change pitch. If you learn to cut by sound, you will always know when you have a perfect score.

### Light Box

This could be an elaborate unit built into your cutting table, or something as simple as a sheet of glass propped up on bricks with a light under it. Anything that provides light will work. If you use incandescent lights, be sure to provide good ventilation to prevent heat buildup. Using fluorescent fixtures will eliminate that concern.

Perhaps the easiest to build light box is a simple 2' x 4' wood frame box with a 48" fluorescent fixture inside. Paint the inside white to reflect light, and place a sheet of 1/4" thick window glass on top. Plexiglass will work but might bend from usage. Safety or tempered glass would be the best choice, but isn't really needed. Simple window glass is strong enough - unless you plan to drop a hammer on it. Looking directly into the lights can be irritating, so you should do something to diffuse the glare. You can rely on the plastic diffuser cover that usually comes with the fixture, you can sandblast or acid-etch the glass, or you can place a sheet of opaque white glass underneath it.

A trick that will help you see through opaque or dark glass is to turn off all the lights in the room except the light box. That produces a clearer definition of the pattern lines.

### Glass Saws

There are 2 basic different kinds of glass saw - ring saws and band saws. The ring saw uses a metal ring coated with diamond dust. The band saws are like conventional band saws but have a diamond coating on the blade. Both types require the ring or band be kept constantly wetted with water - just like a grinding head.

Glass saws are becoming increasingly popular because they can produce other-wise impossible cuts. Some larger models can be used for "stack cutting" multiple copies of a piece. Saws are especially handy for thickly textured or difficult to cut glass. They can NOT be used to cut metal. Trying to

do that just removes the diamond dust. There is a huge difference in quality and cost. Test drive before buying a saw.

### Hand Held Cutters

Other than a few of the die-hard old-timers, most glass artisans use some form of the “Toyo” type oil filled cutters. Since the original pencil type, Toyo has introduced a pistol grip style that most artists prefer. There are also several other brands of oil-filled cutter now available. Each is different, and each has some advantages. The best guide for selecting a cutter is the same as for almost all other tools. Try out different ones to find the style that you feel most comfortable with - then buy the best one you can afford

### Stationary Cutters

Several kinds of circle cutters are mounted on a fixed platform. There are also some kinds of conventional cutters that are stationary mounted. The most common are the “Score One” and the “Cutter’s Mate”. Both of these have a conventional oil-filled cutter head that is mounted so that it will always remain perfectly vertical. This allows the user to not worry about the cutter position, and concentrate just on maintaining a consistent pressure. This is a huge advantage for someone that has difficulty holding a cutter in their hand. These devices have allowed many people to continue cutting glass when they otherwise would have been forced to stop.

Stationary cutters are also especially helpful for production work when used with thick wood or plastic templates. The fixed position cutter head can efficiently be slid along the template guide to produce consistently accurate cuts by even an unskilled user.

### Pneumatic Cutters

Some large production companies use table-mounted cutters that use a machine driven conventional cutting head, with air pressure to provide the precise pressure on the cutting head. This ensures that each score is machine perfect. The more elaborate versions of pneumatic cutters use a computer program to “steer” the cutting head so that each cut is also perfect.

### Waterjet Cutters

For years waterjets have been used to cut metal to make precision machine parts. These machines use a high pressure jet of water containing an abrasive material. Recently, many glass producers have started using them for cutting glass. With a computer driven program, a waterjet will produce a perfectly smooth cut and cut each piece to extreme accuracy. This makes them ideally suited for high volume production work.

### Cutting Oil

The 3 most commonly used oils for filling “Toyo” type cutters, are kerosene, diesel oil, and “cutting oil.” When Toyo first introduced oil-filled cutters, they specifically recommended kerosene. Most artisans consider it to be the best oil for cutters. It’s inexpensive and flows smoothly. Second best is diesel oil. However, both of these have a pungent odor that some users dislike. Many suppliers now sell a product called “Cutting Oil”. This is not something specially designed for glass cutters, but a lubricant

that has for years been used in food processing machinery because it is free of taste and odor. It might smell better (if smell is really important to you), but it’s more expensive and doesn’t work nearly as well as either kerosene or diesel. You should never use anything heavier. It’ll just plug up your cutter’s wick.

### Oil Advantage

For many years, professional glaziers have dipped their cutters in oil to produce better cuts. Even today, some glass artisans prefer to not fill their cutters with oil, but instead keep the tips oiled by dipping them.

Applying oil to your cutting wheel has two advantages. First, it allows the wheel to turn smoothly and ensures a more uniform cut. Second, it helps encourage the cut to break where you scored it. When glass has been scored, it immediately tries to heal itself. It tries to close the opening made by the score. Filling that score with oil, makes it harder for the score to close, and increases the probability that your score will break accurately. Whether you choose to dip your cutting head in oil before each cut, or to use one that wicks oil onto the head, keeping it oiled will always improve your cuts.

## Cutting Glass

### Cleaning Your Cutter

As you cut, small bits and shards of glass can get picked up by the cutter wheel and stick inside the cutter head. The easiest way to clean these out is by back-peddalling your cutter. If you usually cut by pulling the cutter towards you, start your cut by running the cutter backwards for several inches. Don't press hard enough to make a score – just enough to roll the wheel. The idea is to roll the cutting wheel several revolutions to clear out any debris.

### Damaged Cutter?

It takes a lot to damage a cutter wheel, but it can happen. You might have dropped it, or hit it with something metallic. A good way to check is to use it to score a piece of mirror. The mirror will provide a reflection of the score you make. If you see a perfectly uniform line, your wheel is fine. If there are any interruptions in the score, the wheel is nicked and should be trashed.

As tough as cutting wheels are, they don't last forever. They will wear down. Because they wear very slowly, it's extremely difficult to tell if your cutting problems are from something you are doing or from a well-worn wheel. The only way to accurately check is by direct comparison with a new cutter. Take your old cutter down to your local glass shop and try out a new one alongside yours. If the new one cuts better, it's the wheel and not you. Keep your old worn cutter. A well worn cutter wheel usually works better for straight cuts and for cutting thick glass. As tough as these cutting wheels are, they don't last forever. They will wear down.

### Storing Your Cutter

A common complaint with oil-filled cutters is that the oil stops running onto the wheel. There are three possible causes. A partial vacuum in the chamber, a plugged wick, or a dried wick. A partial vacuum can build up in the oil chamber from the oil wicking onto the wheel. To prevent this, it's a good practice to occasionally open then reseal the cap to allow the air to re-pressurize inside the oil chamber.

Whichever oil you use, there might be small quantities of contaminant in it. These contaminants can build up in the wick's tip and clog it so that the oil no longer flows smoothly onto the cutting wheel. Remove the cutting head to see if your wick is contaminated. If it is, just trim about 1/16" off the end. Pull the wick out gently and cut it with a razor blade or utility knife

If you leave your cutter laying on its side, the wick might dry up and oil no longer runs onto the cutting wheel. Oil-filled cutters should always be stored standing up with the cutting head facing down so the wick is kept constantly oiled.

### Cutter Position

The cutter should be held with the cutter head as vertical as possible. It should not be angled forward or back, nor should it tilt from side to side. It should be held firmly enough that you can accurately guide it, but not so firmly you can't maintain pressure.

### Cutting Mirror

Mirror is cut the same as regular glass, but you must be careful when you break it. The silver back will chip easily if you don't snap it apart quickly. Intricate curves can be a problem. If you tap mirror to run the score, do it much more gently than you would for glass.

Special care must also be taken when grinding mirror. The silver backing chips easily. Use your finest grit grinding head and always grind moving against the direction your grinder head rotates. Be extra careful to use a gentle steady pressure when grinding.

To avoid scratching the back of your mirror, it's a good idea to put a clean piece of paper or towel under it while cutting.

### Straight Edge

Anything can be used as a straight edge to get a straight line score. A variety of wood or plastic squares are made specifically for cutting glass or you can use a metal square. If you do, it's a good idea to put tape of some kind on the back to avoid having the



metal scratch the glass. Masking tape, electrician's tape, or duct tape works well. You can also just use a straight piece of wood as a straight edge. Wood moulding like the kind used around door frames makes particularly good straight edges.

## Practice Exercises

If you possibly can, try a few different types of cutter to find what kind feels most comfortable.

Try pushing to score and try pulling. Either way works identically well but everyone has a personal preference as to which is more comfortable to use. Pushing allows you to always see the line you're scoring along but many people find pulling is more accurate. You learned to draw and print from top down and spent your entire life doing it that way. The better you are at drawing and printing, the more likely you'll find pulling more comfortable than pushing.

Practice pressure control. Nothing is more important than getting a smooth consistent score. Practice lots.

Understand that there are 3 separate procedures in cutting glass. The score, the run, and the break. Sometimes, but not always, the run and break is simultaneous. Learn and practice all the many different ways to cut glass. Different techniques are like different tools. You'll have personal favourite "tools", but there will always be times when some other "tool" is better suited for your needs.

As with all skills, the easiest way to learn is usually the least efficient way to do. The most efficient way to do is usually the hardest to learn. If you invest time to learn the hard ways, you'll rarely have any need to use the easy to learn ways. Cutting along templates is the easiest way to learn. Trace cutting is the most difficult to learn but is also the most efficient. Few artisans that can trace cut will ever use templates.

Practice tapping to run a score. This is an especially important skill that will allow you to break out very complex shapes. Score a 1" dia half circle ("C" shaped) on the edge of a piece of glass. Tap it out. Create a 2" dia hole in the middle of a piece of glass by scoring a 2" dia circle and tapping it out.

Practice grozing. Learning what you can do by "chewing off" an edge of glass will teach you that some tight curves are better left unscored and instead grozed to desired shape.

## Cutting Problems

If your score fails to break accurately along the score, some possible causes are:

- **Score is not uniform.** You may not have maintained a consistent pressure throughout the score. The break will then not follow your score but will instead veer off. This is especially important and especially difficult with textured glass.
- **Score is too hard.** You might have been pressing too hard. If your score produced tiny chips or shards, it's likely that you are applying too much pressure. A lot of textured glass cuts best with a fairly gentle score and will break poorly if scored too hard.
- **Score is too light.** You may not have pressed hard enough. On most glass, you'll hear the score being made. If you didn't hear it, you may not have been pressing hard enough to make a proper score. Not pressing hard enough is rare for other than beginners. Pressing too hard is much more common.
- **Cutter is not vertical.** You may have held the cutter on a slight angle. Perhaps a little forward or back, or to one side? This will produce an inconsistent score.
- **Cold glass.** If glass is too cold it will often refuse to break accurately. Sometimes you will have to warm up the glass first. An electric heating pad or blow dryer works well.
- **Dirty glass.** Dust or oil on your glass can cause the score to run erratically. If this is old glass that has been around for a while, that might be your problem.