



Introduction to Sandblasting

Sandblasting is like spray painting but instead of paint you blow an abrasive material with compressed air to etch the surface being blasted. A “resist” material is applied to the glass, the desired design is cut into the resist to produce a stencil, and the areas you want to be etched removed.

Equipment

There are many different ways to sandblast. You can do it in an enclosed cabinet, in a specially built room or outdoors. Sandblast cabinets are designed to contain and recycle the abrasive grit. They can be relatively small table top units or floor models large enough to accommodate relatively large projects. You can even get “pass through” cabinets that allow you to slide the material to be blasted through so there is relatively no limit to the size of project you can blast.



Sandblasting Cabinet

A compressor is used to apply a high pressure jet of air to blast the abrasive material.



Small Air Compressor

Abrasive Material

Different materials are available from very fine to extremely coarse. The coarser the grit, the faster it will blast and the rougher a texture created. Most decorative sandblasting on glass is done with 100 or 120 grit with finer grits used more for special effects and coarser grit mostly for aggressive deep carving.

Sand is inexpensive and readily available, but produces silica dust when blasted. This is EXTREMELY harmful if inhaled so blasting with sand should only be done under very carefully controlled conditions while wearing a respirator that ensures you do not inhale any of the dust produced.

Garnet will work if you have nothing else available but is softer than the other abrasives so will take much longer to do the job.

Aluminum oxide is a popular choice for many sandblasters. It's cheaper than silicon carbide but



Introduction to Sandblasting

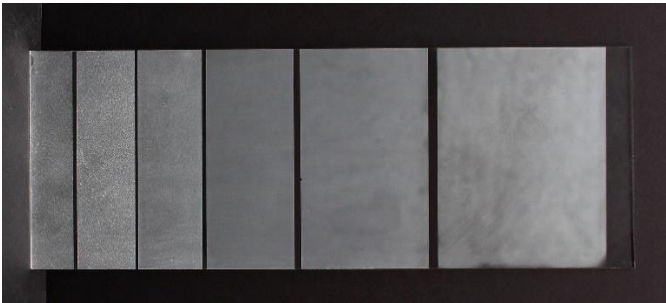
wears down much quicker so you won't be able to reuse it as many times as silicon carbide.

Silicon carbide is much more expensive than aluminum oxide but because it is much harder it can be used many more times. If you do a lot of sandblasting, the greater number of uses can make silicon carbide cheaper in the end than aluminum oxide. Aluminum oxide rounds off from use and stops working as an abrasive. Silicon carbide is too hard to wear down but instead breaks into smaller grit which will still work as an abrasive.

It also has the appealing feature of producing bright sparks where it hits the glass during blasting. This makes it easy to see exactly where the grit is hitting – a terrific aid for fine detailed work.

This photo was created using different silicon carbide grits on glass to demonstrate the different textures created.

From the left 60, 80, 120, 200, 400, 600 grit



Although the finish produced by the different grits look quite similar, their textures feel a lot different. They also reflect light a lot differently.

60 or 80 grit abrasive would normally be used only when you want to remove a lot of material in a hurry. Finer grit is used either when you intentionally want the etching effect to be very slow or you want a smoother finish. The finer the grit, the longer it takes to etch. 600 grit is so extraordinarily fine, we had to hold the blast gun no more than 1 inch away from

the glass to provide enough force to hit the glass rather than just create a cloud of silicon carbide dust.

Resist Material

Different materials are used depending on the kind of blasting to be done.

Resist Considerations

How tough – will it stand up to aggressive blastings?

How adhesive – how well will it stay stuck?

How soft – how easily will it bend over curves?

How expensive – will cheaper material work?

Paper Resist can be used if you're just doing a surface etch, you're careful doing it, and you blast at relatively low pressure. You can use any vinyl coated paper just glued on with spray adhesive or even just use masking tape.

Vinyl Resist is a popular material as a sandblasting resist and comes in a variety of thicknesses. I use 8 mil for almost everything and have had consistent success with it on even the most aggressive blasting. I've used it to surface etch and on deep carved glass and stone projects that took several hours to complete. It's great on all flat work and on straight curves like cylinders but too stiff to bend over multiple curves. For that you either need a softer more flexible material or, as most artisans do, just cut slits in it to lap over to allow for curvature.

Rubber Resist is usually selected for extremely aggressive blast projects or for where being able to bend it over multiple curves is important.

Photo Resist is a stencil created by printing onto a transparent material that allows UV light to pass through. It can be done on a laser or ink printer but only with special paper. This creates a negative of the image. Photo resist produces a stencil that allows for extensive and intricate detail. Creating photoresist stencils is pretty involved, easy to screw up, and requires a good understanding of sandblasting effects. It's not something for



Introduction to Sandblasting

beginners. If you want to experiment with photoresist, it's maybe a good idea to start by buying some of the premade photoresist stencils.

Liquid Resist is a way to brush on shapes for sandblasting. Asphaltum, shellac, or melted wax are commonly use to paint on as a liquid resist. Asphaltum and shellac will leave crisp lines but wax erodes during blasting and leaves fuzzy lines. A reliable working material as liquid resist is the liquid latex use to make molds.

Cutting Stencils

You can could out stencils either manually or with a stencil cutting machine.

For a hand prepared stencil, apply the resist material to the glass, draw out the design on the resist and cut out the parts to be etched with a knife like a xacto or box cutter.

Machine cut stencils are done from a design in a computer with a vinyl plotter/cutter. A huge advantage to using a machine cutter is the design is retained in your computer to be reused whenever you want and to be easily resized as you wish.

Sandblasting Techniques

Different techniques are used to create different effects.

Surface etching is a single uniform blasting that produces a uniform texture.



Sandblasting Surface Etch

Shading is a multi-stage blasting technique.

Where carving is done to create different depths of blast, shading is done to create different shades of blast ranging in tone from 0% to 100%. Where other blasting methods produce a black and white variation, shading creates varying tones of gray.

A skilled sandblaster can create shaded designs that look like black and white photographs.

Because shading requires delicate control, it is usually done with pressure reduced and blasted from a greater distance than for surface blasting or carving. A pressure pot is especially helpful to maintain low but consistent pressure. Some artisans prefer to use unusually finer grit for shading projects.

This technique takes consider practice to master and is NOT recommended for beginners. Might be a great idea to put in a lot of time practicing before trying a project.



Introduction to Sandblasting



Sandblasting Shading
by Harish Dewani



Sandblasting Multi-Stage

Multi-stage blasting is when a strong contrast is created by removing part of the stencil and blasting long enough to cut deeply into the glass - then removing the rest of the stencil to surface etch the rest of the design.

It can be two stages, or as many stages as you want to try. Because the objective is to create a strong contrast between the different parts, it's important to spend significantly different time blasting each stage.

Where almost any design can be done as surface etching, and most can be carved, multi-stage designs usually need to be specifically designed to be done as multi-stage etching. It's important to plan a multi-stage design carefully so you're blasting components in the desired order to create the desired effect.

Carving is when the glass has been blasted in variable curves to create contour. It takes a lot more time than other sandblasting techniques and takes a lot of time to become skilled at doing. Carving is usually done at high pressure and from close distance. For that reason it's especially important you use an especially strong resist that will stand up to the aggressive blasting needed to carve deeply into the glass.

Like multi-stage blasting, carving requires careful advance planning to create the desired effect.

Carving is designed to be seen from the smooth side. Keep this in mind when blasting the varying curves and depths to create contrast and perspective. It's like mold making where you think positive but do negative.

When you do your design, you might want to flip it before cutting the stencil.



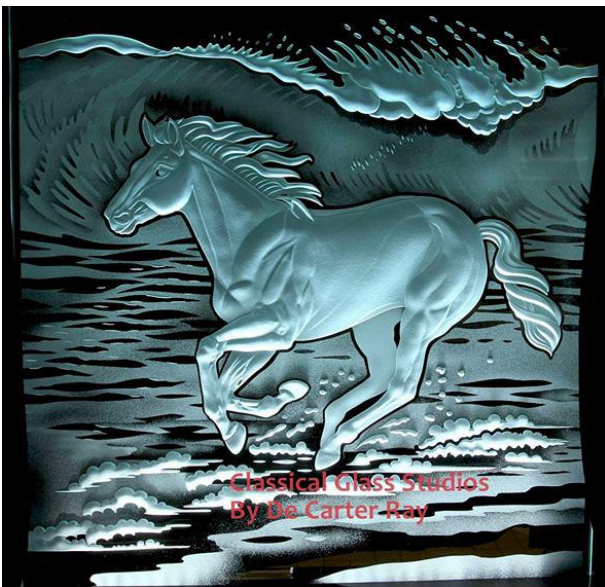
Introduction to Sandblasting

Some specific carving effects to consider:

- Variation – do you want a uniform depth or do you want it varied.
- Depth – how deep do you want to carve.
- Perspective – do you want a negative curve or a positive curve
- Contrast – how strong a difference do you want. Strong? Gentle?

Carving is usually done on thick glass. ¼” is the most common but thicker glass will allow for even more dramatic effects.

Surface etching and shading are done by blasting straight on. Carving is done by changing the angle of the gun to create different curves and contour shapes.



Sandblasting Carving
Work by De Carter Ray

Blasting Variables

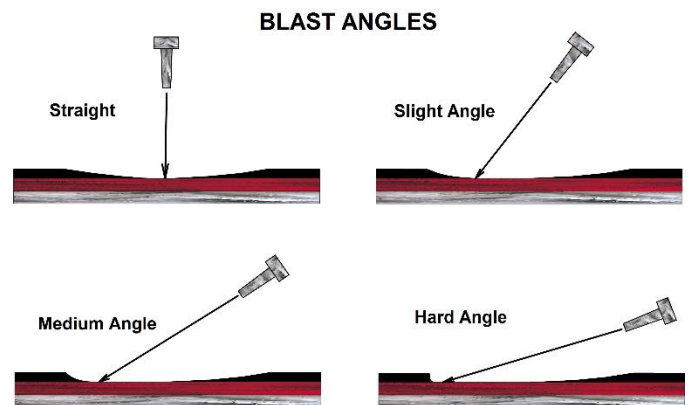
Air pressure – a higher pressure will make blasting faster. Lower pressure allows slower blasting for more control.

Nozzle size – a large nozzle sprays a wide pattern making it easier for uniform texture. A smaller nozzle blasts a fine pattern – better for fine detail control

Blast distance – blasting from farther away spreads over a wider area and is more likely to produce a more uniform pattern. Blasting closer allows for finer control.

Angle of blasting – will determine the angle the glass is etched. Varying the angle of blast will allow you to create variable contour shapes. Blasting on a tight angle is especially important for kilnformed flashed glass.

Abrasive ratio can be controlled and varied with a pressure blaster. Higher ratio blasts faster and lower ratio slower – which may be desirable for fine control.





Introduction to Sandblasting

Iridescent Glass

Sandblasting to etch a pattern on iridescent glass creates a delicate but interesting effect. You can leave the etched parts frosted from the sandblasting or you can fire the glass in a kiln to fire polish the etched parts, the contrast between the solid coloured parts and the iridescent parts is quite striking. I think this effect is most attractive on black iridescent glass but it's fun to experiment with other colours.

Sandblasting iridescent glass to apply mica powder is a slick way to control the mica pattern and be sure you have a crisp well defined image.

.When fired in a kiln, mica will fuse to glass but will not stick to the metallic iridescent surface. By sandblasting a design that just surface etches through the coating you can provide a surface the mica will reliably fuse to.



Gold mica applied on sandblasted iridescent black glass

Mirror Sandblast

Sandblasting on mirror is popular because it's especially attractive. A double image is created where the frosted image on the surface is reflected in the mirror backing.

Etching the back of mirror can produce some unique effects. When the silver backing is removed - you have clear frosted glass contrasting with mirror. If you install a light behind, the light will shine through the clear glass only. Some artisans install such mirrors in a medicine cabinet with a light inside the cabinet so the etched pattern lights up.

For a particularly interesting look, install such back etched mirror over a coloured surface so the etched parts show coloured through the unetched mirror parts. It can be a solid colour or a pattern. This can be a fun technique to experiment with.

Flashed Glass

Flashed glass is glass in which a thin layer of colour has been applied over another colour. Usually clear or white base. Cutting through the thin coloured top layer (with acid etching, engraving, or sandblasting) exposes the base colour in contrast.



Sandblasted red flashed glass goblet



Introduction to Sandblasting

Kilnformed Flashed Glass

Flashed glass comes only in a limited selection of colours and only on white or clear base. We decided to experiment with ways to make a kind of flashed glass in a kiln so we wouldn't be so restricted to what colours were available. We call it "Kilnformed Flashed Glass". Our first attempt was a single layer of glass full fused onto another single layer then a design sandblasted through the top layer.

On our first experiment, the vibration from the blasting cracked the base glass.

So we tried it with 3 layers. Worked perfectly. Because the objective is to sandblast entirely through the top layer of glass, we decided to use 2 layers of 3mm thick glass as a base and a layer of 2mm thin glass on top. That started as 8mm thick - then firing in the kiln to full fuse brought it down to 6mm thick and reduced the top layer to only 1.5mm and the base double layer to 4.5mm

For this technique you want to blast straight on until you're started to expose the 2nd layer colour. This exposure almost always starts in the middle of the space being blasted. Once that exposure has started, you stop blasting straight on and switch to blasting on an angle so you blast more off near the edges than in the middle. Continue blasting and continue increasing the angle you blast at so you carve the glass along the edge of the stencil.

Because you're blasting for a long time and because you're blasting at a tight angle against the edge of the resist, it's ESSENTIAL you have a sturdy resist that has been carefully applied. If not - that angled blasting will lift the edge of the resist. You DEFINITELY don't want that. The entire objection of applying resist is to have it stay in place and not lift.

Once the sandblasting is complete, the project is fired in a kiln to tack fuse temperature. This softens off the harsh edges from blasting and puts a fire polish on the glass parts that were frosted by sandblasting.

There is nothing difficult about this technique. It's just time consuming. VERY time consuming. It takes a long time to blast through any significant area of glass 1.5mm thick. Often even longer than it takes for carving.

It's IMPORTANT to note than when you sandblast for carving, you intentionally want to create curvature. For kilnformed flashed glass you want the opposite. You want to avoid curvature. You want to blast through the top layer of 1.5mm glass down to the glass beneath it. But NOT any further. You DEFINITELY don't want to blast through the second layer to expose the third layer.

If you just keep blasting straight at the glass, you won't blast out a square trench but instead will blast out a curved scoop – deep in the middle and



Kilnformed flashed glass



Introduction to Sandblasting

Acid Etching

Before sandblasting was introduced, glass artists use Hydrofluoric Acid to etch glass. This acid dissolves glass but not wax. A stencil is created by pouring molten wax on the glass and the design scraped away to expose the glass. When the acid is poured onto the exposed glass it begins eating into the glass. The desired depth is created by how long the acid was left on the glass. Once the artist is satisfied, a neutralizing agent is spread onto the acid and the now neutralized material washed off. The wax is then scraped off to expose the acid etched glass.

Acid etching produces a beautiful effect but is rarely done anymore. In part because sandblasting is so much quicker and so much less work. Even more because this acid is REALLY nasty stuff. First concern is it can react with other compounds to release fluorine gas. That's the scary stuff the Germans used in the 1st world war to kill allied soldiers. Fluorine is MUCH more dangerous than chlorine. Chlorine is heavier than air so a small leak will sink to the floor. Fluorine is lighter than air so will rise. If you're bending over a project and fluorine gas is released, it will be rise up to your face for you to inhale.

Nasty stuff – but that's not the REALLY nasty part.

The REALLY frightening feature of this acid is if you get any on your skin it will enter your body through the tiniest scratch – even along the cuticles of your fingernails. Once inside, it quickly travels to the nearest bone where it proceeds to eat out the calcium. Essentially dissolving the bone.

Creating Tooth for Paint

Sandblasting is an excellent way to apply tooth to glass to get paint to stick. The paint will stick CONSIDERABLY better to a surface that has been roughed up from sandblasting than it will to smooth glass.



Painted on sandblasted glass

Removing Devitrification or Kiln Wash

Sandblasting is a fast and easy way to remove devitrification, stuck on kiln wash, or stuck on ceramic fiber paper to clean the glass ready to be refired in a kiln.

When you do this, it's important you take care to blast off the entire surface. You want to sure you get it all. If you miss a few bits and fire the glass in your kiln, you'll be back afterward to sandblast all over again to remove the bits you missed.

It has been argued that glass that has been fired after being blasted with silicon carbide will come out of the kiln with a scummy surface. That's true - it will. But ONLY - when you don't adequately clean the glass after it's been sandblasted.

Aluminum oxide isn't as hard as silicon carbide so doesn't blast aggressively. If you blasted with Aluminum oxide, you can just wash off the glass and fire it in the kiln. Not so with silicon carbide. Because it's more aggressive, little micro bits of abrasive embed in the glass. You need to remove them.

Pour on a little dish soap, add a touch of water and get busy vigorously scrubbing with a stiff brush to



Introduction to Sandblasting

scrub out all the bits of grit. A wire brush is a good choice. The soap acts as a lubricant to release the bits of grit. Wash it off and it's now ready for the kiln.

Tempered Glass

Tempered glass can be surface etched or shaded but can not be deep carved. If you want to blast tempered glass, it's a good idea to use relatively fine abrasive and relatively low pressure. Blasting too deep will cause the glass to explode.

Laminated Glass

You can sandblast laminated glass you want to take special care to not blast through one layer of glass to expose the plastic between the layers of glass.

Designing for Sandblasting

If you can draw, no reason you can't freehand draw a pattern for sandblasting. If you're not especially skilled at drawing, chat with Mr. Google to find design ideas. You can print out an image and use it as a pattern, use it to produce a drawing, or download an image and use it to draw your sandblasting design.

It'll help a LOT if you take the time to learn to use one of the computer drawing programs. CorelDraw and Adobe Illustrator are two of the most popular but there are many others that work well.

Once you've prepared your design, you can either transfer it to the resist to be hand cut or use your computer to direct a vinyl cutter to cut it for you.

There are different ways to transfer the design onto resist

- **Carbon paper** – use it to trace the design onto the resist then cut out the resist.
- **Spray adhesive** – spray the glue onto the back of the printed image and glue it onto the resist. Cut through both the paper you glued on and the resist. Spray on adhesive if available at most art supply outlets.
- **Photocopy onto architectural repro film** and attach it to the resist. Check your local art supply shop for this or look for online sources.

If you use a vinyl cutter, even little inexpensive ones can be used to cut resist but a warning – the little ones are not especially reliable for pressure control and often either fail to cut all the way through the vinyl to the backing or, much worse, cut right through both the vinyl and the backing.

You might also make friends with a local sign shop. They all have vinyl cutters to make signs.

Finishing

Etched glass is infamous for picking up fingerprints is a bit difficult to clean. Many artisans like to apply some form of protective coating. You can wipe it with mineral oil or coat it with Armour All.

There's a commercial product called Clear Shield designed for this. It's a bit expensive but does a terrific job protecting etched glass from smears and smudge.