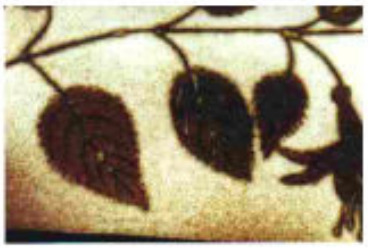
Glaze Spraying
for the
Craft Potter



Roger Graham
Pottery at Old Toolijooa School

This booklet was put together in January 2000, after repeated requests from visiting potters for a summary of glaze spraying ideas. At the time the real cost of printing and binding was about $5 per copy. We sold enough copies at $20 to cover attendance a Ceramics Festival in that year. Since then we've given copies to other far-away potters as freebies, but it seems to make sense to just tidy up all the files into one big document, to share by email.

The booklet is still copyright, but we have no problem if other potters make printouts for their own use. For those who actually go ahead and try some of the ideas, we'd be glad to hear of your results. And if you have other creative glaze-spraying tricks of your own, we'd love to know. Easiest by email:

rogergraham31@bigpond.com

You could find a bit more on our website too:

www.potteryatoldtoolijooaschool.com

Roger & Pauline Graham
Pottery at Old Toolijooa School.

Addresses and phone numbers given in the original version have been removed, long since out of date, but the main content remains unchanged.

Introduction.

Visitors to our pottery workshop have often said something like “Wow. That’s a nice effect. How did you do that?”. And the answer has often been a quick side-track to talk about spray guns. Truth to tell, there doesn’t seem to be a lot in the usual pottery textbooks about glaze spraying. The topic is dismissed in half a page or less, often with rather negative overtones. It’s too difficult. It needs a compressor and maybe even a spray booth (shock, horror). If there’s a picture, it’s almost always an unsuitable suction-feed industrial spraygun. It’s rare to get more than the briefest advice, usually unenthusiastic, often downright misleading. All of which is rather sad, because spray application has a lot going for it if you do it right. And all of which is a reason for this small book.

Sprayguns…Good and Not-So-Good.

There are sprayguns and sprayguns. What kind to buy? One common kind has a container “pot” beneath it to hold the paint. Known in the trade as a “suction feed” gun, they’re intended for paint spraying, where you expect to use maybe half a litre of paint between refills. This is the kind so often shown in the illustration in a textbook. Better than no gun at all, but for spraying glaze on pottery **definitely not the kind to buy**.

Here is a better choice, a “gravity feed” gun. These are usually smaller in size, intended for holding only a small quantity of paint (about 500 mL maximum), easy to wash out, ideal for our purpose. Sometimes the feed cup is mounted vertically above the gun (not so good). Sometimes the feed cup is offset to the side, as in the illustration. Either way, fluid drains into the gun by gravity, not pulled up by suction. For our purposes**, the gravity-feed gun is the only way to go.**

What’s so good about a gravity feed gun? There are two big advantages:

- You can **measure** the amount of glaze to be applied. That’s important. Believe me. If the pot you are working on requires 45 mL of glaze, you simply measure out that amount, tip it into the gravity-feed cup, and spray until it’s all gone. We’ll talk about application rates later.
- You can wash out the gun and change colours without wasting glaze or messing about cleaning the big pot. And that’s important too. More about this also, later.

There is a kind of crude nasty spraygun that fits on the outlet hose from an ordinary household vacuum cleaner. If you already have one, by all means try it, but don’t even consider buying one.

What about the traditional **Air Brush?** We used one for years, but not without problems. Gritty granules of glaze used to get stuck in the delicate works, with resulting splatters and profanity. Maybe it was intended for more finely milled mixtures. Didn’t hold enough for most jobs, either. Anything we ever did with the air brush is now done more easily with a touchup spraygun, so the air brush has been pensioned off.

The Gravity Feed Spraygun: How Expensive? Where do you get one? And what brand?

The gun I've used for over 10 years was made under the name **Speeflo**. There's a second one which seems to be identical, with the brand name **Star**. Both of these were priced at approx $125 Australian at the time. More recently (early 2012) I bought an almost identical gun on eBay for about a quarter of that price, including postage.

.The "fluid nozzle" from which the paint or glaze emerges is available in several different sizes, typically 1.5mm, 1.7mm, 2.0mm and 2.5mm. The size I've used with complete satisfaction is the 2 millimetre one. After months of use, the little steel nozzle becomes worn away by the gritty glaze particles streaming through it, but replacement nozzles are always in stock. Just be sure you know what size you want.

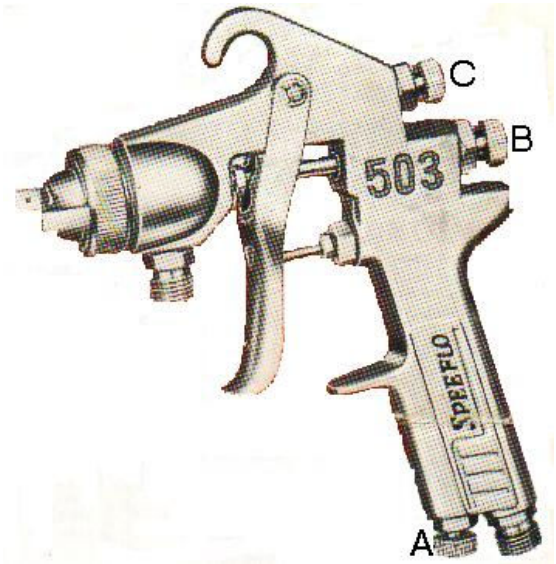
Now the Compressor.

Bought new, a compressor can be expensive, but only if you insist on a big one. Visit a good hardware shop and look at prices and models. You'll notice they come in various sizes, mostly rated in cubic feet per minute. They have an electric motor driving a compressor pump which looks rather like a lawnmower engine, mostly mounted on a steel storage tank for the compressed air. There's always a pressure gauge, mostly marked in the old "pounds per square inch" units, and in metric "Kilopascal" units. Usually there's some kind of pressure regulator with a knob you can turn to set the output pressure somewhere between fairly low (say 20 psi) and much higher (probably 100 psi or more). For pottery spraying, 40 psi is often about right.(In metric units, that's a range from about 140 kPa to 700 kPa, with a working value about 280 kPa). There might or might not be a length of pressure hose, and maybe a spraygun as part of the deal (probably one of the unsuitable suction-feed kind).

You don't need a large capacity industrial machine of 8 or 12 cubic feet per minute. Something much smaller and lighter is quite OK, say 2 or 3 cfm

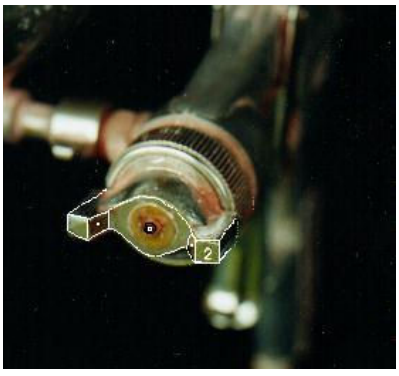
.Controlling the Spray Pattern: What You Need to Know.

Assume you now have a gun, and compressed air to operate it. If you're new to all this, you'll need some basic instruction. You'll notice that there is a trigger to pull to make the gun go (of course) and three knurled knobs that screw in and out. No matter what kind of high-pressure gun you have, it's likely to have these same three controls for the same purpose. (But notice that the gun pictured here is the kind that has the suction-feed cup underneath. The gravity-feed gun works exactly the same way).



- **Knob A** controls a needle-valve in the pipe which brings in the compressed air. If you screw this knob in all the way (clockwise) the needle valve is completely shut, so if you pull the trigger nothing happens. No air comes out. As you wind this knob out (anticlockwise) it opens the needle valve to let more and more air through. Most usually, you open this just enough air to get a spray of fine droplets of glaze without a great blast of excess air to create a mist of unwanted "overspray".

- **Knob B** covers the end of a long needle-valve which controls the amount of fluid that escapes when you pull the trigger. If you unscrew knob B all the way (anticlockwise) you will find a spring underneath it, and the end of the "fluid control needle" will be revealed. You can pull the long needle out altogether, and you'll notice it has a pointy end which goes all the way through the gun, right up to the little hole where the spray comes out. You may often pull this needle right out when giving the gun a good wash, so you can squirt water down the little holes where it comes from. With the needle back in place, and the spring behind it, knob B can be screwed all the way in again. Now when you try to pull the trigger, you'll notice that it only moves a little way. The needle valve opens just a tiny bit, if at all, and not much fluid comes out. And of course, if you screw knob B out a bit, the fluid needle can travel back further when you pull the trigger, so more fluid comes out.



- **Knob C** controls yet another needle valve, this time feeding air to two tiny holes in the "horns' each side of the spray nozzle. Look closely at the spray nozzle end of the gun, and you'll see it has <u>three</u> little holes. In the middle one, you may see the point of the fluid needle just sticking out a bit. This is where the fluid comes out. The two other little holes, in the horns of the nozzle, are for air only. No fluid comes out here. The idea is that the horns produce two fine jets of air squirting onto the mist of emerging droplets, to spread the pattern out into a fan shape instead of a narrow circular spray. So, the further you open knob C, the more air comes out of the horns and the more fan-shaped the spray pattern becomes.

- There will be times when you want a wide fan-shaped spray (to cover a platter, for example). And there will be other times when you want a narrow fine pattern (e.g. to add a fine overspray of a second colour, glaze-on-glaze, around the rim of a pot).

To be sure you've understood all that, put some water in the gun and try adjusting the knobs. This is not a set-and-forget exercise. You'll find there are times when you want more fluid, or less (knob B). Or a wide fan spray, or a narrow one (knob C). Or more air or less to suit the thickness of the glaze, or the size of the droplets you desire (knob A). You'll be twiddling these knobs repeatedly as you change from pot to pot, or from glaze to glaze.

Oh yes… you can rotate the end of the nozzle, the part carrying the horns, so the fan-shaped spray comes out left-and-right (this is when the horns are at top and bottom), or to get a fan shape vertically up-and-down (when the horns are at the left and right).

Checking the Spray Pattern .

Every time you adjust the gun by turning one or other of the little knobs, you'll want to check whether the spray pattern is what you wish for. Notice in the spray-booth photographs later, a rectangular piece of fibro board leaning against the left-hand wall inside the booth. That's where you aim the gun, to give a quick squirt and see what pattern it leaves on the board.

Fine Spray Droplets or Splatter?

Mostly what you'll want is a gentle spray of finely divided droplets, carried by just enough air to give a smooth even coat. You'll adjust the air control to get just that. If the air control knob is open too far, you get a blast of excess air which makes the droplets smaller, but also carries many of them away beyond the pot as unwelcome overspray.

At the other extreme, too little air results in a coarsely-divided spatter of slow-moving larger droplets. For some effects, this may be exactly what you want. Remember those primary-school art classes where you dipped a toothbrush in paint, then dragged your finger across the bristles to deliver a spatter of coloured drops? You can adjust the spraygun to get the same effect. But check it against the fibro test board before you splash big ugly drops on your pot.

Dismantling and Cleaning the Gun.

You'll often want to change from one glaze to another, so you'll need to wash out the gun when you do. The best thing for this is a plastic trigger-spray bottle, the kind that can be adjusted to make a narrow water-pistol kind of jet, or a wide-spreading fine mist of spray. Finished with glaze X and ready to use glaze Y? If there's any X left in the cup, tip it back into the glaze container. Point the gun into the container and pull the trigger long enough to squirt the last few drops of glaze back where they belong. Now give the glaze cup a quick squirt with the spray bottle, and spray the tiny amount of washing water back into the glaze container too. That gets rid of nearly all of glaze X, without wasting any. More water, more washing, but spray it down into the sink this time. Open the air control (Knob A) a bit when you do this, to give it a good vigorous flush.

Usually that's enough to get the gun completely clean. But sometimes there's a residue of sediment partly filling the little pipe where the gravity feed cup screws onto the side of the gun. Unscrew the little wing-nut that holds the cup in place, and have a look. A quick squirt with the spray bottle will clean out this pipe too.

Does the Glaze Ever Block Up The Gun?

No. Hardly ever. We routinely use a 100-mesh sieve, though 80-mesh is fine enough to take out all the nasties. But there will come a time when it seems that something is blocking the fluid nozzle. Glaze doesn't come out as fast as it should. Repeated pulling of the trigger clears the blockage for a while, but it's still not right. Now's the time for more dismantling.

There should be a spanner supplied with the spraygun, just for this. Begin by unscrewing the big knurled ring that holds the horned spray nozzle. The horned part comes right off, ring and all. Usually there's nothing stuck in there, but a quick squirt of water will clean it up. The trouble will be further down, inside the pointy nozzle where the end of the fluid control needle sticks out. You'll find the special spanner has a central hole with a square bit cut out, to just fit over the squared end of the nozzle you're trying to remove. Yes, it does unscrew, anticlockwise. It can be extremely tight, but it can (and must) be unscrewed. Inside, where the pointy end of the needle goes, expect to find a little bit of something blocking it. A shred of foam plastic? A gritty bit of bisqued ware? A little build-up of rust, after prolonged use? Easy to wash out or scrape out. When you come to screw the little nozzle back in, be sure to rinse away any scratchy grains of glaze so the tapered seat at one end of the nozzle fits securely where it belongs down in the gun. Easy really. Takes all of two minutes.

The Distance from the Spraygun to the Pot.

How far should you hold the spray nozzle away from the job? Applying glaze to a pot is not the same as applying paint to a motor vehicle, so the advice given in spray-painting textbooks isn't necessarily appropriate for a potter. You'll have to experiment for yourself, but here are some ideas.

- To spray a flat tile or a platter, a distance of 150 to 200 millimetres would be OK, with the spray pattern adjusted to a suitable width, say 75mm or a bit more. Bigger pot, bigger distance, wider spray pattern, more air, more fluid. I've seen advice like "hold the gun eighteen inches from the pot" but I don't believe it.

- For a smaller pot, say a microwave casserole only 150 mm wide, you would use less air, less glaze, shorter distance.

- To add just a highlight of a different glaze around the rim of a pot, close-up, the gun would be throttled back to a minimum amount of glaze in a narrow spray pattern, and held maybe 50 mm from the rim, perhaps even less, as the pot rotates quickly. You could get the same effect with an airbrush, but the touchup gun is quicker and easier.

Think about it. In the usual spray-paint job, the idea is to apply a **uniform** coat of fluid evenly across a flat surface, so the advice is to hold the gun some distance from the job and keep the nozzle pointing straight at it while you move the gun from one side to the other.. The object being painted is stationary, while the gun is kept moving. You start the gun moving before you pull the trigger, to avoid a thick buildup at the start of the spray track. **But** for spraying a pot, it's more likely that the gun will be held almost still while the pot rotates in front of the nozzle. You get the pot moving first, then pull

the trigger. And while sometimes you're trying to achieve a uniformly thick coat of glaze, this isn't always true. Maybe what you want is a thick dense coat of glaze making a narrow band around a rim, but feathering out rapidly on either side. For this you'd hold the gun much closer to the pot. So this isn't a case where one distance suits all operations.

Storing Glazes for the Spray Gun.

For glazes that are to be dipped or poured, plastic buckets seem to be the way to go. But for glazes to spray, two-litre plastic milk bottles are just the thing. You can shake the bottle vigorously to mix it all up, and pour out as much as you need. And it's easy to transfer any leftover glaze back into the same container, straight from the gun, with just a little rinse out from a trigger-spray bottle. Even if the glaze is one you store in bigger quantities in a bucket, it makes sense to keep a litre or two set aside in a milk bottle. Saves all that stirring and dipping and washing out.

Notice here a trap for the unwary. After prolonged standing, some glazes set fairly hard in the bottom of the container, and you can shake lots of times until you think all the lumps are gone. But if you tip out the whole bottle full into a big jug, you may find there's a fist-sized lump still unshaken in the middle of the fluid. If in doubt, better check this.

How Thick or How Thin should the Glaze be?

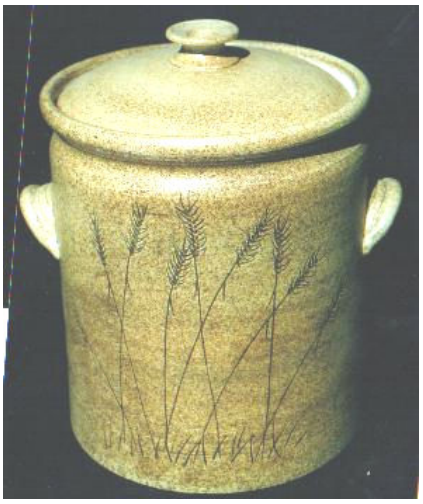
If most of your pots have been glazed by dipping, you will have sorted out your own method of judging how thick the glaze should be, and how long to leave the pot in the bucket. But if you're spraying the glaze on, how do you know when you've applied enough? If the glaze is brown, do you stop when the pot looks brown all over? Well, not really. It's easy to stop too soon, and get a glaze coat that is too thin and starved..

To get the result you want, every time, without too many failures, it pays to measure a few things along the way. And the first thing to measure is the density or "specific gravity" of the glaze when you mix it. What you're really measuring is how heavy the glaze is compared with pure water. The metric system was designed so that 1 millilitre of water by volume would be 1 gram by weight. You could measure your glaze by dipping out say 100 millilitres and then weighing it on your scales. For most glaze mixtures, you'd get an answer of about 135 grams. Which means that each millilitre weighs 1.35 grams. We'd say that the "specific gravity" of the glaze is 1.35.

Mostly, for measuring the specific gravity of the glaze, it's more convenient to use a floating stick called a hydrometer. You can buy one for checking battery acid, from a motor spares shop, but it doesn't cover the range of values potters need (from about 1.2 to 1.6) See the back page of this book for instructions on making a hydrometer from a McDonalds drinking straw.

Every bucket of glaze in our workshop has the name of the glaze (of course) and the specific gravity clearly marked on the swing ticket, mostly 1.35 or 1.4 Glazes get thicker with time, by evaporation, or by pots soaking up more water every time you dip, so from time to time we stir up the bucket, float the hydrometer in the glaze, and add water if necessary. What matters is not so much what the specific gravity is, but that it **stays the same** every time we use it.

Now the second thing you need to measure, is how much glaze is appropriate for a given area of pot. This is easiest to explain with an example. One much-used glaze is a dark rich temmoku which we mix to SG=1.4 , at which it is just right for dipping mugs and bowls and such. After spraying this glaze umpteen times onto various pots (chiefly big platters and casseroles, not convenient to dip) we've decided that 10 mL of this glaze is just right for an area of 100 square centimetres. Now comes time to glaze another platter. How much glaze to spray on it? Measure the diameter in centimetres, do a quick calculation allowing for the area of the rim inside and outside (there are several lookup tables for finding the areas of various pots, in the back of the book, if you think you'll find this difficult). Suppose you estimate the total area to be glazed at 1800 square centimetres, more or less (it's not a precision exercise). You need 180 millilitres of glaze. Shake up the glaze bottle, pour out 180 mL into the spray gun, and spray it uniformly all over. Give the gun a quick squirt of water from the trigger spray, and spray the remainder of the rinse water onto the platter too. All done, and guaranteed to be right. Every time.



Another example, just to be sure you don't think it's hard. This time it's a bread bin, and the glaze is a magnesia speckle which usually takes 6 mL to 100 square centimetres. The inside of the bin has been glazed with something else. Only the outside gets the speckly glaze. For purposes of our very approx calculation, the pot is more or less a cylinder with a circular lid. Measure its height, and its diameter, in centimetres. Calculate the area, or find it in the lookup table in the back of the book. Suppose the area to be glazed comes to 900 square centimetres. Then the amount of glaze we need is 54 mL. (that's 6 mL on every 100 square centimetres, 6 x 9 = 54)

What About Handles and Knobs ?

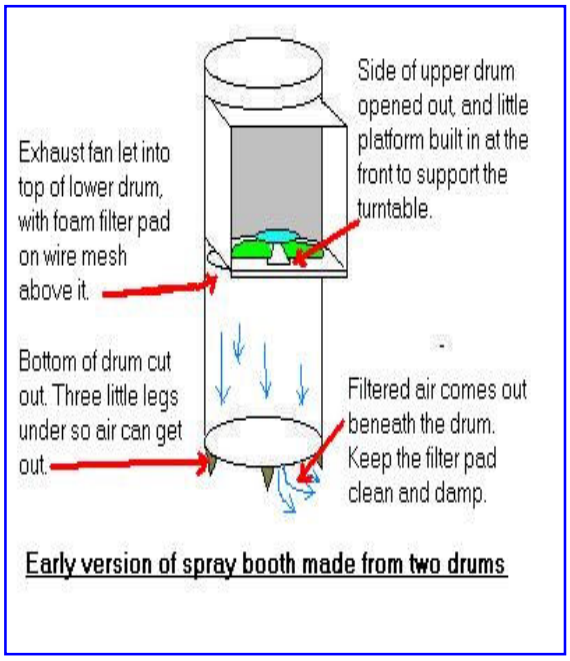
The bread bin in the previous example has two lug-type handles, and a knob which sticks up a bit on the lid. It's not easy to spray into concealed places like undersides of lugs or knobs. No problem. Use a floppy brush with long soft bristles. Dip up a bit of the required glaze, and flood it smoothly into the difficult places. Feather it out at the edges so it blends in smoothly when you spray the rest. For those little crevices where a lug meets the body, just be sure to flood in some glaze the same way as it would go if you dipped the pot instead of spraying it. This is important. If you don't do this little brush-dabbing preparation, expect to find disappointing starved areas where the spray couldn't get in so well. All of this takes only a minute, and of course it's done **before** spraying the main body of the pot.

Is it Really Worth All This Trouble?

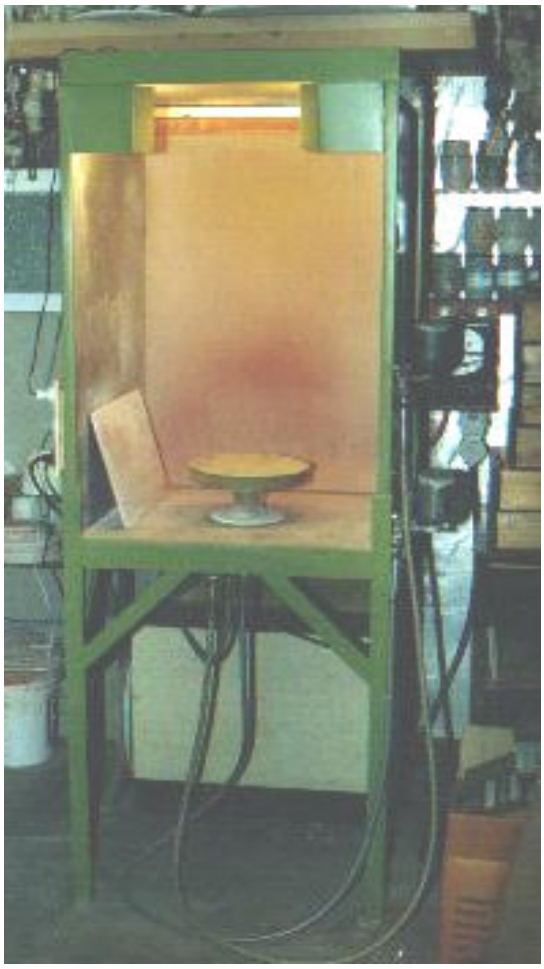
Yes indeed. As the pots get bigger, the stakes get higher. If you want to glaze a big platter by dipping, then you'll need maybe 10 litres of glaze at least. To glaze it by pouring, maybe a litre or two. But to glaze it by spraying, maybe 200 mL at the most. On this count alone, you can afford to experiment with a dozen glazes mixed in 2-litre batches, for about the same cost as a single 20-litre batch in a bucket. And if you make notes as you go, you'll be able to repeat your successes with confidence, so long as you have a record of how much glaze was applied to a given area

Where to Do It? Do you need a Spray Booth?

Well, no, you can get by without a spray booth if you set up something outside on the lawn for just an occasional pot. The overspray (little droplets that miss the pot, and drift away in the air) will land on your lawn, probably OK. You yourself will be wearing a dust mask of course. But if you want to spray indoors, then some kind of spray booth is a must. We managed for years with a simple one made from two 50-litre drums and a domestic exhaust fan, the kind they use in kitchens. With the wisdom of hindsight, if doing this again we'd use the larger 200-litre drum size. This kind of booth recirculates the air back into the room, so any fine solid particles that get through the filter end up in the air. Not a good idea, even though you wear a mask. Keep the filter clean and damp.



Early version of spray booth made from two drums



There are commercial spray booths shaped like a big rectangular box, open on one side, with some kind of vigorous exhaust fan pulling air into the box, through a filter at the back, and discharging it out of the building through wall or roof. Some have a constantly flowing curtain of water down the back of the booth to catch the overspray. Some depend on a series of baffle plates so the air flow keeps changing direction, and the solid particles get stuck on the walls. Perhaps too expensive to buy, but not at all difficult to make. There is a detailed description of an outstandingly successful home-made version, in the back of the book.

Pedestals and Turntables.

Inside your spray booth, you'll need some kind of turntable to support the pot while you spray it, as you can see in the previous photograph. A banding wheel works OK. You can salvage the turntable from an old record player, to make a good one. The idea is to slowly rotate the pot as you spray, to get access to all sides of it. Don't entertain ideas of a motor-driven turntable. You need to be able to stop and start, turn slowly or not at all, all of this by hand alone.

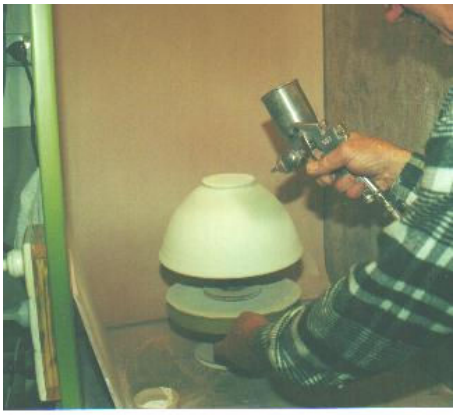
Let's agree to glaze this mixing bowl with glaze A inside, glaze B outside, and maybe glaze C on the rim. We'll start with the inside. (It's probably just as easy to pour glaze A into the bowl, rotating as you pour it out again, but we've agreed to spray it.) It needs about 50 mL of glaze. (There's a lookup table for bowl areas in the back of the book. This bowl is 26 cm in diameter, so its inside area is about 750 square centimetres. And the glaze we're using needs about 6 mL to 100 square centimetres, so we need 7.5 x 6 = 45 mL approx Let's use 50 mL It takes longer to explain that than it does to work it out.) So we shake up the glaze bottle, measure out 50 mL, and spray it all evenly inside while the bowl rotates on the turntable.

Often the bottom of the pot will be smaller than the size of your turntable, so you'll need some kind of pedestal to stand the pot up higher. This is so that you can spray adequately right down to the bottom edge of your pot, without the top of the turntable getting drowned in glaze too. You'll find use for a variety of pedestal shapes, beginning with something as simple as a jam jar. Tall and short, wide and narrow.

For some pots it's easier to spray them upside down (a big mixing bowl, for example), and for this you'll need a pedestal tall enough to lift the inverted pot away from the turntable.

Spraying Underneath a Bowl.

For a cylinder-shaped pot like a canister, it's easy enough to get a uniform coat of glaze all the way down the wall, so the bottom of the wall gets as much glaze as the top. But if the pot tapers outwards from a narrow base to a wider shoulder, things get more complex. One rotation of the turntable while you spray the wide shoulder gives a thinner coating of glaze than one rotation at the same speed while you spray the narrow base. This becomes a matter of judgment, so you spray a bit longer where the pot is a bit fatter. In practice, it's not hard. But a common defect at first is to spray too **little** glaze right down at the bottom, next to the foot of the pot, so you get a starved area down low. This is especially so if the pot curves away underneath, as mixing bowls do, so the gun can't spray directly onto the pot from below. In this case spraying the whole pot upside down becomes a better idea. Easy enough if the bowl is supported on a tall pedestal, such as the one shown in a previous photograph.



Notice the distance between spraygun and pot. The emerging fan of spray is about 75 mm wide when it reaches the pot, which is rotating at about 1 rev per second.

Spraying Around the Rim.

The mixing bowl in the previous photos has white glaze A inside, and a copper green B outside. Attractive enough, but a bit bland without a darker glaze C around the rim. The idea here is to apply narrow band of C fairly thickly on the rim itself, with just a little overspray thinning out rapidly on either side. You can do this while the bowl is still upside down, as in the first photo. This avoids getting the darker glaze down inside the white bowl, if that's how you'd like it. Notice how the gun is held close to the rim, pointing up at an angle from below. There's still overspray, but it doesn't drift down into the white bowl.

Or, as in the second photo, you can turn the bowl right-way-up and spray it from above. As before, the gun is quite close to the rim, maybe 50 mm away, and the controls have been adjusted to give just a narrow spray, not much fluid, not much air. Spraying from above results in more of the dark overspray landing down inside the bowl, so you'll need to be careful.

Don't be deceived by the apparently wide band of brown glaze around the outside of the bowl. The glaze is applied thickly only on the narrow edge of the bowl, and the overspray is much thinner down the outside. When fired, the very thin coat just blends into the green glaze beneath. Plenty of room for variation here.

Little Bats to Cover the Bases.

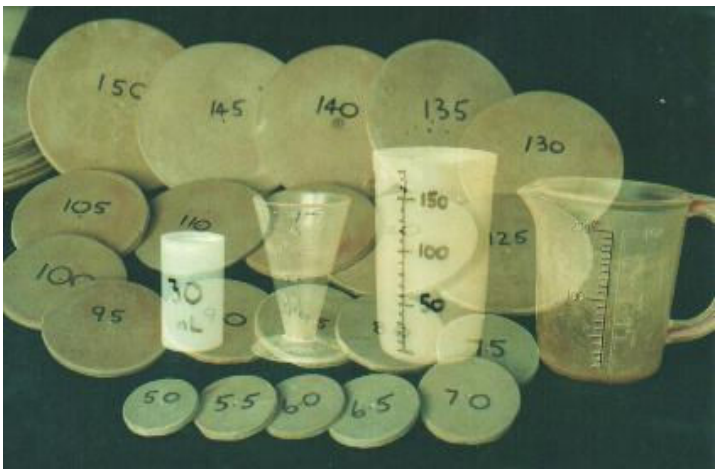
For a stoneware pot of course you don't want to glaze underneath. It pays to wax the base, even when spraying, the same way that you would do if dipping. But now when you spray, little beads of liquid glaze will build up on the waxed part, especially if the pot is being sprayed upside down. If you don't stop and blot off these glaze drops, sooner or later they will dribble down the side of the pot.

One older textbook suggests cutting little circles of linoleum (would that now be vinyl flooring?) to just cover the base of the pot, as an alternative to waxing. For ourselves, the solution has been to wax the base **and** use a suitable sized disc cut from porous "fibro" building board, the kind of grey-white fibrous cement sheet used in the building trade. We have a stack of these with diameters in 5 millimetre intervals from 55 to 200 mm, so it's easy to select a disk which very nearly matches the base of a pot, inverted or not, to keep the overspray from making a mess on the waxed base. Being porous, the fibro soaks up the water from the overspray so you don't have to keep mopping up dribbles. You'll notice one of these little bats covering the base of the mixing bowl in the previous two photos. And the set of fibro discs appears as background in the next photo showing little plastic measuring jugs.

Probably thick cardboard would do the job OK, if weighed down with something heavy like a 50 cent coin, so it doesn't blow off in the spray.

Volume Measurements.

You'll find the need for measuring out small volumes of glaze, time after time. Quantities like 10 mL (e.g. for darker blue overspray on rims of pale blue dinnerware, all pieces of the set to have the same colour). Or 30 mL (clear earthenware glaze on ceramic tiles, maybe 100 in the set, each one to get the same amount). Or larger amounts, say 80 or 150 mL for a bigger pot.. Little plastic kitchen-utensil jugs often have mL amounts marked on the sides. You can make up very practical smaller sizes from cut-down plastic items such as small bottles, with mL scale marked in black pen on the side. A 35 mm film container holds 30 mL, very convenient for measuring out say 15 mL (half a container… line up six at a time and do it in bulk). Beg for a batch of film containers from the photo processing shop next time you take a film in for printing. Since measuring the amount of glaze can be so simple, and since you do it so often, it makes sense to get this right.



Traps for the Unwary.

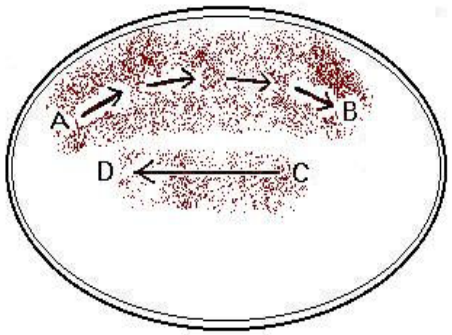
1. Too much glaze applied too quickly.

You are spraying glaze onto the vertical side of a pot as it rotates gently on the turntable. Suddenly the place where you're spraying develops a wet shiny look and little dribbles begin to run down the side. Not what you intended at all! If this happens early in the procedure, while there's still a lot of glaze left in the gun, you can stop for a while until the wet spot dries out. Maybe help it along with a hair dryer. Then gently scrape the offending dribbles back level with the rest of the glaze. Resume spraying a bit more cautiously, and you may still achieve perfection. But if the dribbles occur just at the end of the job, you'll have to deal with them as best you can by scraping and/or rubbing back. That happens with dipped glazes too, so you've been there, done that. Be more careful next time.

2. Too much glaze in the middle of a platter.

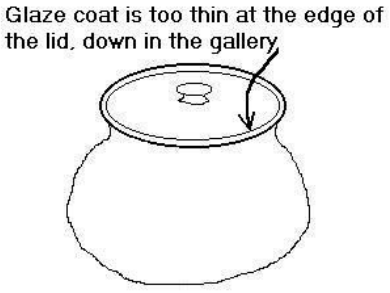
You have a big platter carefully centred on your turntable, and as it rotates you hold the gun a suitable distance from the plate as it goes around… and around… and around… and around. If all the while you gradually move the gun from the outside of the plate towards the centre, probably the middle of the plate will acquire a thicker pool of glaze than the rest. Five seconds of spray on the rotating outer part of the plate gives a medium coat. The same time spent nearer the centre gives a much thicker coat. This is where you'll have to use some judgment.

One suggestion: Keep the turntable still. Apply a slow sweeping band of spray from A to B. Then make a quicker, lighter return stroke straight across the middle from C to D. Now rotate the platter a bit, about a quarter of a turn. Do it all again, and again, and again. It still depends on your judgment, to try and get a uniform coat, but it's easier this way to avoid that puddle-in-the-middle defect.



3. **Not enough glaze in corners and crevices.**

You have made a casserole, with a lid that sits down a bit inside the gallery. The inside has been glazed with one colour X. The outside is to be glazed with another colour Y. Then probably you'll use a third glaze Z to give a bit of variety on the rim and the knob. But when you spray glaze Y over the pot, with the lid in place, the outer few millimetres of the lid won't get much glaze (they're down in the gallery a bit). And the same will happen when you spray the thin band of Z. The solution: Take the lid out of the pot, and support it on a little pedestal on its own. Then spray a little extra glaze on the area that needs it. Takes about 1 minute extra, but works every time.



Spraying Over a Stencil.

The usual stencils of paper or thin card are not a big success for sprayed glaze or slip. The stream of air from the gun dislodges the stencil, unless it's clipped or weighted in some way to keep it in place. A good solution is to make up the stencil from sheet lead. Being so heavy, the lead doesn't blow away.

You can cut the sheet with stout scissors to make quite intricate patterns. Or you can build up a complex stencil from smaller simpler pieces, later assembled with solder and stout copper wire. The picture shows an example, with simple fuchsia leaf shapes and a "flower" made up of several smaller pieces. The stencil looks white because it still carries the coat of white glaze gathered when last being used.

Making a stencil is not a high-tech activity. Assemble the pieces by soldering. A simple light-weight soldering iron is enough (say 40 watts). Plain bare copper wire approx 1mm diameter is just right, and resin-cored solder, the kind used for electronics. Use a dab of soldering flux. You can make do without the flux, if you scrape every joint clean and bright, but flux sure helps. It's easiest to "tin" both parts of the joint separately, with just a dab of solder, then position the pieces and melt the joint together quickly with the tip of the iron. Just wash the stencil clean in water when you finish.

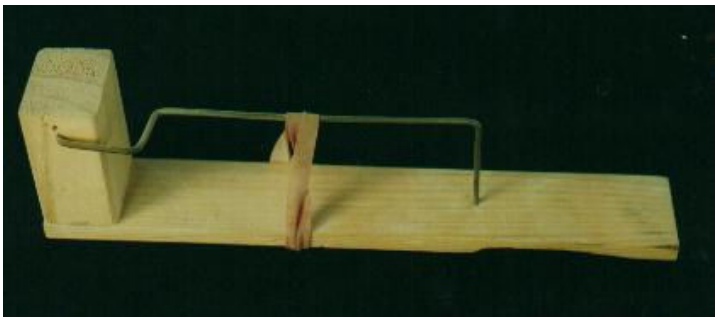
Spraying over the stencil is easiest on a flat horizontal surface such as a platter, but you can bend the lead to fit the curved shapes of other pots. More suggestions for clipping the stencil onto a vertical surface, later.

Stencils are fun in glaze-on-glaze applications. The pot gets an all-over coat of glaze A, by dip or by spray. Then the lead stencil is arranged on the surface, and glaze B is sprayed over it. As always, there are traps for the unwary:

- You'll get a crisper cleaner pattern if the lead stencil pieces fit closely down against the surface, to reduce the amount of glaze that creeps underneath.
- The spraygun needs to be adjusted to give as little overspray as possible. This means not a lot of fluid, and not too much air, and a fairly narrow spray fan. Hold the gun not too close to the pot. Too much air makes a wild blast of little drops which sneak in under the stencil.
- Crisp clean outlines happen best if the pot is not rotated while you spray. Don't spray a bit from the North, then a bit from the East, then a bit from the South and so on. If you can, spray most of the job from one direction.. The idea is to reduce the amount of glaze that creeps in under the edges of the stencil.

- Heavy applications of glaze cause a buildup of fluid drops on the stencil. If they seem likely to dribble off, stop for a while and dry things out with a hair dryer. But if droplets do escape, you can scrape them back with care and patience later. A buildup of dried glaze on the stencil from previous applications helps to blot up the fluid, so dribble-offs aren't such a problem.

Holding Stencils on a Vertical Surface.



A stencil on a flat platter just stays put by itself while you spray. No problem there. But what if you want to apply it to a vertical surface? You really need some kind of spring-loaded clip to hold the stencil against the pot. But whatever you use, it mustn't obstruct the spray enough to cause a shadow.

The photo shows one solution, using a swinging wire link with one end bent to approach the stencil from a distance. The swinging link is made from a "bike spoke" (the steel wire spoke from a bicycle wheel, that is). Strong rubber bands provide the spring action. By bending the end of the spoke as shown, you can avoid getting a shadow line behind the wire.

You can hold simple lead stencils against the vertical side of the pot, one spring clip for each piece.. Of course, when you spray you'll need to stop every little while and dry off the little fluid drops that gather on the stencil, so they don't run down onto the pot. A hair dryer is just the thing for this.

For a successful stencilled pattern on a vertical surface, you'll need to choose glazes that aren't too runny and fluid when hot. One pleasing combination is given in the appendix pages at the back of the book, under the name "**Chocolate and Cream Tin"**.

Touching Up After Spraying.

When you lift off the lead stencil, inspect the surface you've created. Probably there'll be little bits of the top glaze that have crept under the stencil here and there. Maybe the narrow stalks of leaves etc seem to have been partly buried in the snowdrift. Easily fixed with a small narrow sgraffito loop, or some other pointed tool. Just scrape away to expose the underlying glaze again.

You can add extra detail by scratching into the underneath glaze, if it suits your design. For example, the little pointy hairs added around the margins of fuchsia leaves in the picture. They weren't on the stencil, just added freehand later.

With a little cunning, you can get two for the price of one. Spray around the stencil, then lift it off and spray another **light** coat of glaze over the pattern area. Now when you fettle up the little defects, you can add leaf veins by scratching through into the base coat of glaze underneath. This fuchsia-leaf picture shows the idea.. Works OK for bird feathers, fish scales and such.

Foam Plastic Masking.

There will be times when you want to add an extra narrow spray of colour around the rim of a pot, without getting unwanted overspray down inside it. One that comes to mind is a baby's plate glazed in a very pale blue, to be given a gentle addition of darker blue around the rim. Unwelcome splatters of the darker glaze would be unsightly inside the plate. A disk of foam plastic cut to size will fit neatly inside the plate while you spray, then can be lifted out and washed clean for the next one. The thin blue foam packing in boxes of Orton cones is just right for this kind of masking.

Glazes that Settle Out Quickly.

One of our favourite glazes includes 37% of crude nepheline syenite, milled from a local outcrop up on the plateau nearby. It contains little scratchy grains of some dark ferromagnesian mineral, which give an attractive speckly finish (that's it on the bread bin, somewhere earlier in the book). Without the little scratchy grains it just isn't the same, but they settle out very quickly. So much so that the glaze isn't a big success for dipping, and you can't rub off dribbles without leaving a bland ho-hum biscuit coloured blemish. Sprayed on, it's a big success **BUT** the little fast-settling grains clog up the gun if given a chance.

If the pot requires 50 mL of this glaze, it just doesn't work to shake up the bottle and measure out 50 mL directly into the gun. Within a few seconds, the bottom of the glaze cup is clogged with a layer of black grains. The solution is to measure out the 50 mL, stir well, then transfer just a little (say 10 mL) to the gun and spray at once. Then another stir, another transfer of 10 mL, and do it all again. And if the gun shows signs of clogging, give it a quick squirt of water and spray that onto the pot too, to carry the little grains through. If you have a quick-settling glaze, the same idea should work for you.

Do You Ever Need to Dip *and* Spray on the same pot?

Yes, it happens. Here's an example. These little stoneware wombats are made to fill up odd corners in the kiln. Their finish is a simple wash of red iron oxide and frit. A quick dip in the very dilute mixture results in a suitable deposit of glaze down in the grooves between the little animal's "fur". But the bits of fur that stick up retain very little of the brown mix, so the wombat has mangy unattractive pale specks where the fur sticks up.. Now give a quick puff of spray. The added glaze lands on the upstanding bits, rather than down in the grooves. Between the two processes (dip, then spray) the coat forms without pale spots.

Re-coating an Already Fired Pot.

Sooner or later you'll want to add a bit more glaze to a pot which emerges from the glaze firing less beautiful than you planned. Maybe it needs a bit more colour on the rim. Maybe the glaze looks a bit starved. But the now non-porous pot won't accept another coat of glaze. You'll need a hair dryer, and a gentle touch with the spraygun. Use a fine mist spray, and add **just a touch** of spray to the pot. Now dry it and warm it with the hair dryer, then add another tiny spray and do it all again. As the spray coat builds up, you'll find you can add a bit more glaze each time But stop each time before the glaze starts to run, or you'll have to wash it all off and start again.

Some Glaze Recipes to Try.

Here are two glaze-on-glaze combinations which have worked reliably for us, gas kiln, oxidation, cone 9-10. Both involve a dark coloured glaze as the first all-over coat on the pot, by dip or by spray. Then follows a sprayed-on coat of a lighter coloured glaze, over a stencil if that's what you want.

1. "Chocolate and Cream Tin"

Potash feldspar	40	This is the "chocolate"
Silica #200	20	glaze. At a specific gravity
Ball clay	10	of 1.35, it needs about
Calcite	10	6 to 8 mL per 100 sq.cm
Red iron oxide	6	
Potash feldspar	49	This is the "cream tin"
Kaolin HR1	20	glaze. Spray it over the
Calcite	4	chocolate, with or
Dolomite	19	without a stencil.
Tin oxide	8	
Bentonite	2	

This "chocolate and cream tin" combination is not very fluid, and so keeps its place on a vertical surface at cone 10 without streaming down .

2. "Temmoku and Titanium"

Potash feldspar	55	This is a good oxidation
Silica	23	temmoku, cone 9 or 10.
Calcite	21	At a specific gravity of
Ball clay	8	1.4 it's OK for dipping.
Talc	8	If sprayed, it needs about.
Red iron oxide	13	10 mL to 100 square cm.
Potash feldspar	40	You'll recognize this as
Silica	30	"Leach Cone-8" glaze
Calcite	20	with added titanium oxide.
Kaolin	10	At specific gravity = 1.35
Titanium oxide	8	try 6 mL to 100 square
		centimetres over temmoku.

This combination is a bit more fluid at cone 10, so it streams down the pot a little on vertical surfaces. This can be quite attractive e.g. to emphasise throwing rings on the pot, but it's not a good combination over a stencil. On a horizontal surface such as a platter this isn't a problem.

Lookup Table to Find the Area Inside a Mixing Bowl.

For a bowl of the usual proportions, the area is approx (1.12 x Diameter x Diameter)

Diameter cm	Area sq.cm	Diameter cm	Area sq.cm	Diameter cm	Area sq.cm	Diameter cm	Area sq.cm
10	112	16	286	22	542	28	878
11	135	17	323	23	592	29	941
12	161	18	362	24	645	30	1008
13	189	19	404	25	700	31	1076
14	219	20	448	26	757	32	1146
15	252	21	493	27	816	33	1219

Lookup Table to Find the Area of a Circular Platter or Dish.

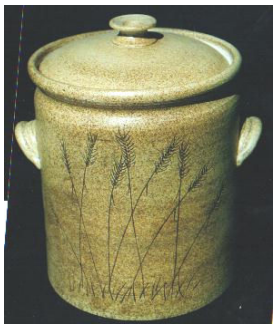
Measure the diameter of the dish in centimetres. The table gives the approx area in square centimetres. If the edges rise some distance above the flat base, try and estimate the approx diameter it would be if flattened down. It's like estimating the size of a circle of pastry to fit into a pie dish. Doesn't have to be exact.

The table gives diameters for even numbers only (10,12,14… etc). To get answers for the odd numbers (11, 13, 15… etc) just make an estimate. Half-way between the nearest areas is close enough.

The table gives the **inside** area only. If you also need to allow for the outside area, i.e. the part of the plate to be glazed **outside** the wall, here's a suggestion. Measure the diameter of the unglazed part (the underneath). Look up the area of this bit, and subtract it from the answer you got for the inside of the dish. The difference should be approx the area of the outside wall. Obviously, the total area to be glazed = (Inside area + Outside area). High intellect stuff, this.

Diameter	Area	Diameter	Area	Diameter	Area
10	78	30	706	50	1962
12	113	32	803	52	2122
14	153	34	907	54	2289
16	200	36	1017	56	2461
18	254	38	1133	58	2640
20	314	40	1256	60	2826
22	379	42	1384	62	3017
24	452	44	1519	64	3215
26	530	46	1661	66	3419
28	615	48	1808	68	3629

Lookup Table to Find the Surface Area of a Cylindrical Pot & Lid.



Measure the height and diameter in centimetres. If the pot isn't exactly a cylinder with straight sides, just estimate the approx diameter of a cylinder that would have about the same area. The table gives the area in square centimetres.

Diameter of Pot in Centimetres

Height	10	12	14	16	18	20	22	24	26	28	30
8	329	414	505	602	706	816	932	1055	1183	1318	1460
9	361	452	549	653	763	879	1001	1130	1265	1406	1554
10	392	489	593	703	819	942	1070	1205	1347	1494	1648
11	423	527	637	753	876	1004	1139	1281	1428	1582	1742
12	455	565	681	803	932	1067	1208	1356	1510	1670	1837
13	486	602	725	854	989	1130	1277	1431	1591	1758	1931
14	518	640	769	904	1045	1193	1347	1507	1673	1846	2025
15	549	678	813	954	1102	1256	1416	1582	1755	1934	2119
16	580	715	857	1004	1158	1318	1485	1657	1836	2022	2213
17	612	753	901	1055	1215	1381	1554	1733	1918	2110	2307
18	643	791	945	1105	1271	1444	1623	1808	2000	2198	2402
19	675	828	989	1155	1328	1507	1692	1884	2081	2285	2496
20	706	866	1033	1205	1384	1570	1761	1959	2163	2373	2590
21	737	904	1077	1256	1441	1632	1830	2034	2245	2461	2684
22	769	942	1120	1306	1497	1695	1899	2110	2326	2549	2778
23	800	979	1164	1356	1554	1758	1968	2185	2408	2637	2873
24	832	1017	1208	1406	1610	1821	2037	2260	2490	2725	2967
25	863	1055	1252	1456	1667	1884	2106	2336	2571	2813	3061
26	894	1092	1296	1507	1723	1946	2176	2411	2653	2901	3155
27	926	1130	1340	1557	1780	2009	2245	2486	2734	2989	3249
28	957	1168	1384	1607	1836	2072	2314	2562	2816	3077	3344
29	989	1205	1428	1657	1893	2135	2383	2637	2898	3165	3438
30	1020	1243	1472	1708	1949	2198	2452	2712	2979	3253	3532

Glaze Spray Booth.

Brief notes here describe the construction of a very successful spray booth, Feb 2000. Basically it's just a big rectangular box with top, bottom, sides and back, but no front. The box is mounted up on four legs at a convenient height, as shown in the photograph. (840 mm above the floor was just right). Beneath the box is large exhaust fan, adapted from an evaporative air conditioner salvaged from the local tip. The idea is that the fan draws air rapidly into the box through the open front, while you spray your pot on a turntable some distance further in. Any overspray is drawn towards the back of the box, to be caught by a big sheet of filter material supported there about 200 mm from the back wall. Behind the filter there is a rectangular opening approx 500mm x 150mm cut in the floor of the box. A sheet-metal chimney piece leads down to a similar hole cut in the cabinet of the salvaged air conditioner, which in turn is placed close against a vent cut low down on the workshop wall.

The idea is to close off any other openings in the air conditioner cabinet, so air is drawn vigorously down from the spray booth, then discharged out through the vent in the wall.

Do please notice that the air drawn through the booth is discharged to the outside of the building, not just recirculated into the workshop. After many hours of use, a thin dusting of very fine particles was visible around the vent in the outside wall, evidence that breathing this air would not be a good idea.

Suggested Dimensions.

The booth needs to be wide enough for the biggest probable pot. We settled on 600mm internal dimension, left-to-right. Most pots will be much smaller, but the booth still needs to be deep enough to position the turntable well into the box, so the air stream sweeps all the overspray inwards. We settled on 600mm for the depth from front of box to the filter, plus a further 60mm to accommodate the filter, plus about 200 mm space behind the filter, i.e. between the filter and the back wall. That makes the floor panel about 600mm wide by 900 mm deep, give or take a bit to fit the material available.

How high? We made ours 940mm high, internally, to fit the commercial filter material we chose.

The Filter Material.

The original design was modified from a commercial spray booth in use at the local TAFE college. The filter used there was a fan-folded cardboard material, 900 mm high, with an array of large holes offset one behind the other in the multiple layers of folded card. The idea was that, in a

commercial paint-spraying environment, the cardboard filter would become clogged by paint overspray and could then be discarded and replaced by a new section

The fanfolded filter was not cheap, being available only in lengths of 9100 mm, and priced at approx $150 per box, plus delivery. Since the whole spray booth requires only a 600 mm length, purchase of a whole box was something of an overkill but we bought it anyway. We've used just the one small piece, and it seems likely to last for ever without replacement.

Since our previous smaller spray booth had successfully used foam plastic sheet for the filter, it seemed a good idea to add a sheet of foam in front of the expensive cardboard to catch the first wet spray droplets and so prolong the life of the cardboard. With the wisdom of hindsight, we could have used foam plastic alone, just backed up with wire mesh. The foam plastic (12 mm thick) intercepts almost everything. After ten years of use, the cardboard filter is still clean and white and unmarked, and just a small trace of glaze dust has gathered beneath it. Dry overspray is brushed off the foam from time to time (with the fan running… no dust escapes) then the sheet is removed and washed clean. Removing the foam sheet is simple. Its top edge is secured between two thin slats of wood, held together by a pair of small bolts with wingnuts. The whole foam curtain just hangs on two short screws inserted above the cardboard filter.

Does it all work? Yes indeed.. It has been a total unqualified success. We wonder how we managed so long with a smaller less efficient one.

What to Make it Out Of,

We used galvanized sheet steel, made rigid by folded-over edges, and held together by pop riveting. This seemed to be a good idea at the time, being a simple copy of the commercial booth in use at the TAFE. Doing it this way requires access to a sheet metal bender with a capability of approx a 950 mm fold. (If that's the way you'd go, just ask and I can make a print of the detailed plan and cutting list). But an easier way which needs only average woodworking skills would be to make the box from waterproof particle board, the kind used in the building trade for bathroom floors etc. It's sold in NSW under trade names such as "Wet Area Structaflor" in sheets 3600 x 1200 mm, and not very expensive either.

The Blower.

There is a kind of poor-man's air conditioner in the form of a big metal cabinet containing a huge silent efficient centrifugal fan, which blows air through a curtain of plastic webbing kept moist by a tray of water within. There's a make with the name **Bonaire** which must have been very common. Every few weeks at our local garbage tip/recycling area another of these things appears, discarded for some minor reason not involving the big efficient fan. For a few dollars, you've purchased a superb exhaust blower. Even if you had to buy a second-hand one in going order from a junk store, you'd not pay much. Maybe try eBay, under the name "evaporative cooler", or maybe "swamp cooler"

The first photograph here shows one of these units “as is”., and the second shows the big centrifugal blower to be found inside it.

When running as an air conditioner, air is drawn in through the louvred slots in sides and back, to be blown out via a grille at the front. For our purposes, there’s no need to dismantle the blower. The idea is to close off all the inlet openings in the cabinet, and cut a new rectangular slot in the top. Then the whole unit can be positioned underneath your spray booth box, with a suitable rectangular chimney piece to connect the underside of the spray booth to the top side of the blower cabinet. Air is drawn vigorously in and down through the spray booth, to emerge from the front of the blower cabinet. Ours is positioned close against a suitable wall, where a big louvred grille has been positioned for air to exit.

Bells and Whistles.

You need to see what you’re doing inside that dark box. Why not add a pair of light bulbs, in the top corners above your head, to shine down inside? Extra complexity: Two second-hand lamp holders and a bit of salvaged flex.

How about a spare power outlet for the hair dryer that you need from time to time? We set up a little box with three salvaged general-purpose-outlet “power points” on the side of the spray booth, the whole thing connected via a suitable flex to the nearest outlet in the workshop. The three GPO’s each with its own switch, serve the main blower, the overhead lamps, and the hair dryer. No more trailing cords.

Where to hang the spray gun when it’s not in use? Actually, two spray guns in our case, since we keep one for titanium white glaze alone. It was no big deal to add two suitable pegs on the right side of the booth, to hang them up.

Compressed air supply? Our compressor is in another building, with a pipe underground to an air outlet in the pot workshop. Why not run an extra bit of hose to a quick-connect outlet underneath the spray booth? In fact, why not **two** air outlets, one for each gun, so they could stay plugged in without changing hoses all the time. Again, no big deal to add this small extra. The end result has been big rewards for what was really not a lot of effort.

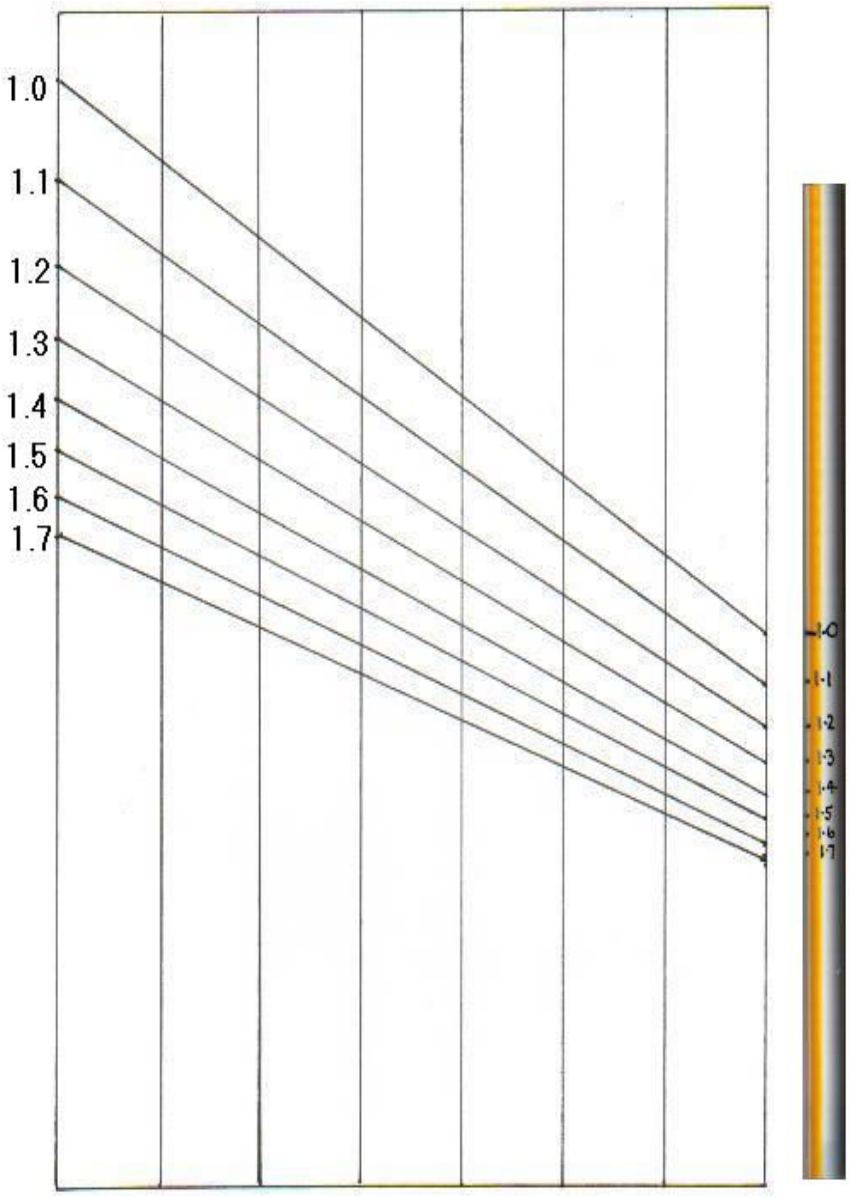
Floating Straw Hydrometer

to measure the Specific Gravity of a Pottery Glaze.

What You Need:
A McDonald's drinking straw
A dab of silicone sealant
A 4-gram scrap of lead (or a nail or a bolt … but about 4 grams)
A waterproof felt-tip pen to write marks on the straw.

The idea is to fix the little weight inside one end of the straw, sealed in with silicone sealant. Then you can float the straw upright in the glaze, and the numbers on the straw will show the "specific gravity" of the fluid. Floating in pure water, the straw should sink to the mark **1.0**, meaning that 1 millilitre of the liquid by volume would be 1 gram by weight. If the straw sinks to the mark **1.4** in your glaze, that means 1 millilitre of glaze weighs 1.4 grams…. and so on.

If you don't have scales suitable for measuring in grams, you can just guess. A 5 cent coin weighs about 3.5 grams, if that helps. A scrap of sheet lead just over 1 millimetre thick, and about 15mm x 20 mm in size, is about right. Just roll it up into a little cylinder and fix it into the end of the straw with silicone. Whatever little object you use, it must go completely into the straw (no bits sticking out) and the end of the straw should be closed completely by the sealant. Leave the top of the straw open if you wish, but don't get liquid inside the straw later when in use.



Float the newly made hydrometer straw in water. It should sink a bit over half way, and float upright. Make a mark at the water level. Now dry the straw and line it up with this chart, so the bottom end of the straw is on the bottom line, and the mark you've made on the straw is against the chart line marked **1.0**

The sloping cross-lines on the chart show where to mark the other numbers, **1.1, 1.2 , 1.3, 1.4, 1.5, 1.6, 1.7**

A value of 1.3 to 1.5 is typical for most pottery glazes. The exact value probably matters less than being able to get it the same next time, every time.