# Ceramics MONTHLY

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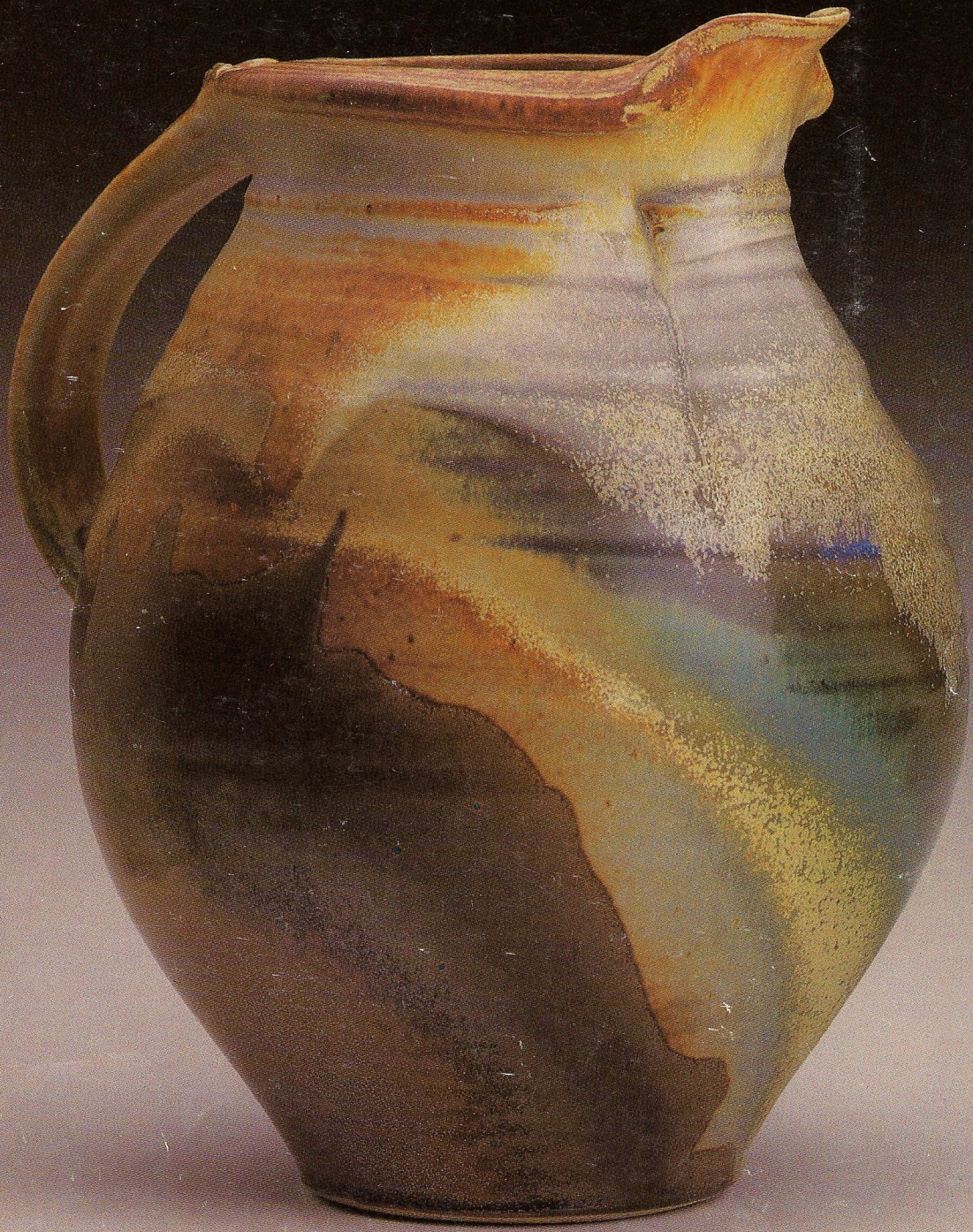
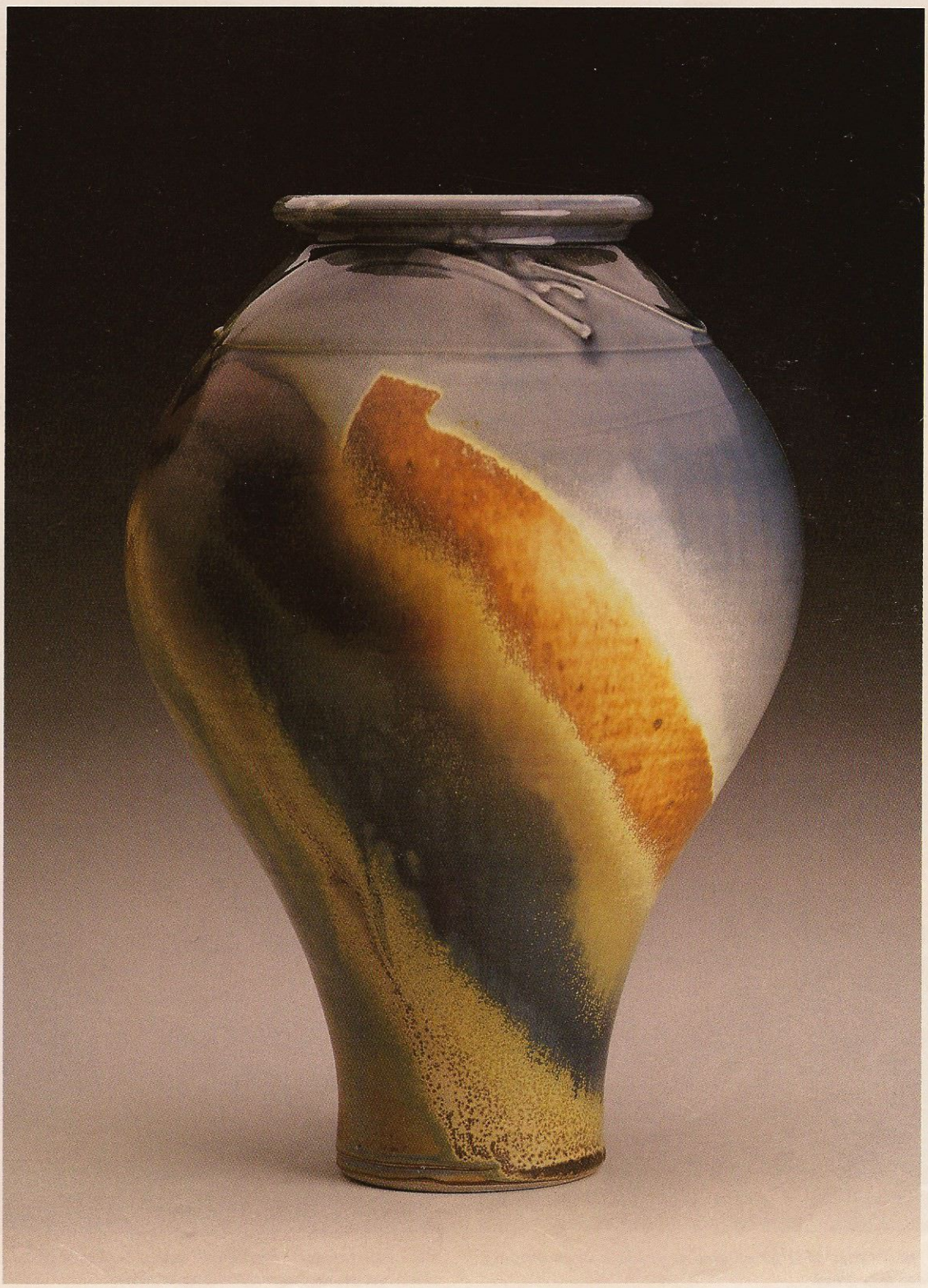


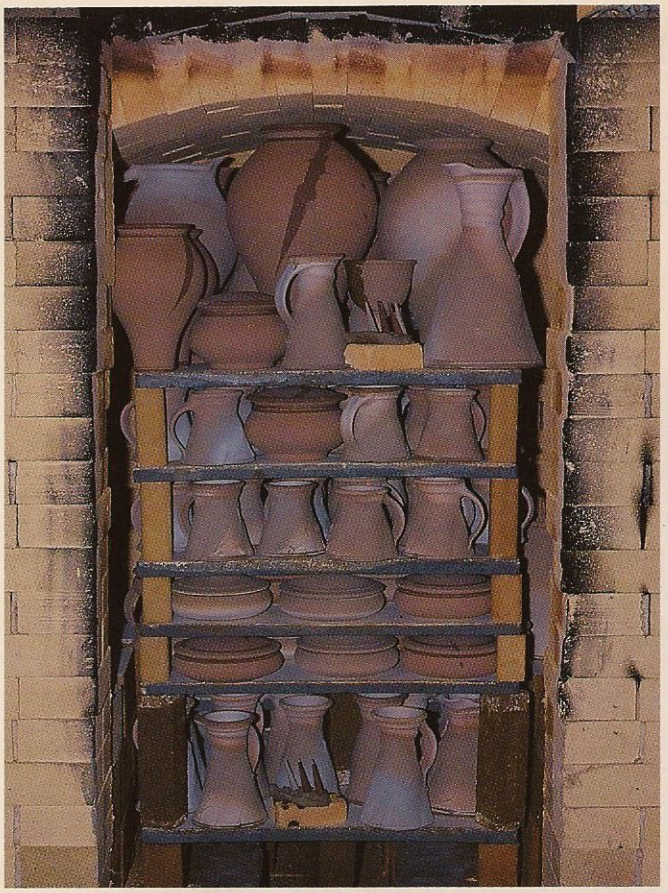
# An Approach to Single Firing

*by Steven Hill*

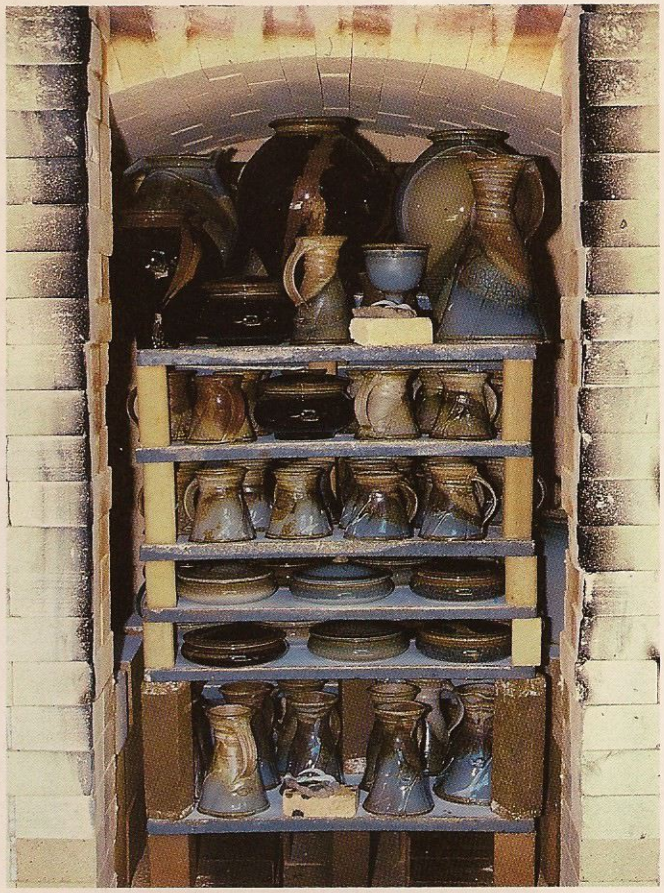
*Single-fired stoneware vase, 15 inches in height, thrown, with trailed slip, dipped and sprayed glaze.*



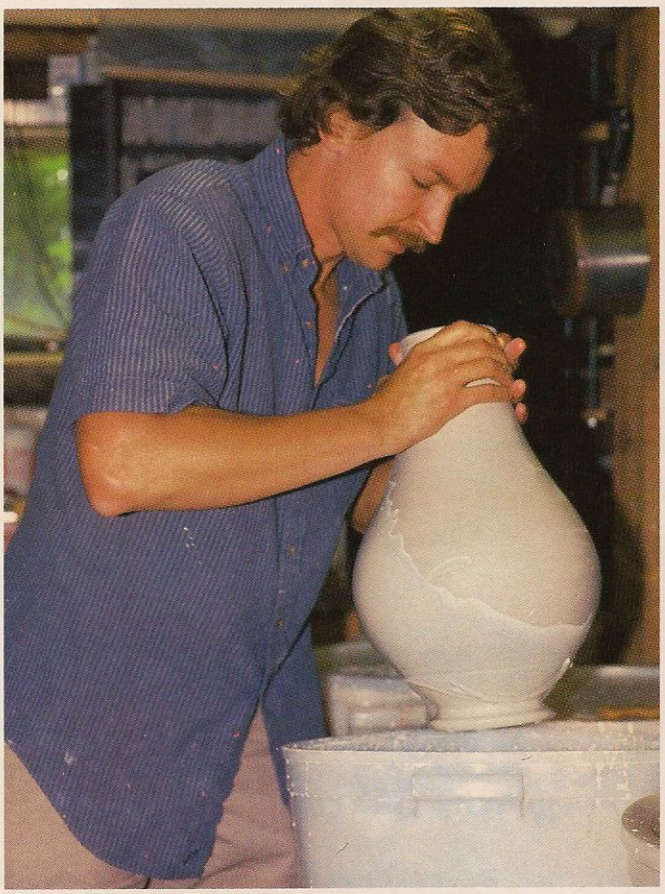
*Photos: R.C. Nible*



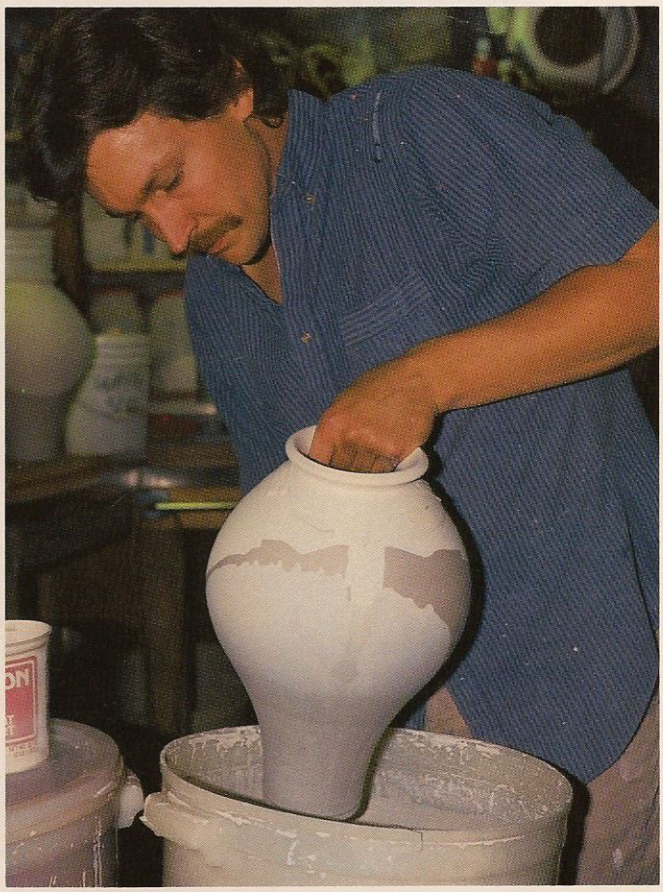
*A kiln load of glazed raw ware is fired slowly to bisque temperature, maintaining oxidation to Cone 04.*



*The Cone 10 firing then proceeds at a typical rate, with reduction beginning at Cone 04.*



*Pressure is spread over as large an area as possible when dipping bone-dry ware into glaze.*



*Raw pots can even be slapped into a bucket of glaze to encourage wave motion and corresponding marks.*

FOR the past 13 years, I have been single firing all my work. The first experience I had with single firing was in 1972 at a salt-glazing workshop taught by Peter Sohngen at the Memphis Academy of Arts. I left that workshop determined to be a salt potter and also never to fire another bisque kiln.

Frustration probably would have won out had I not felt something special for the process. I responded to the stronger connection between making and glazing a pot. Single-fire glazing becomes a natural extension of the forming and decorative processes and gives a chance to follow through without losing sight of the original intention for each pot.

Potters often talk about good pots as having "life" or "character." The bisque fire seems to do its best to snuff that out. After bisquing, pots look and feel dead; bisqued clay no longer responds to the hand or water, but it has not yet realized the transformation that glaze firing will bring. Following through directly from making to glaze firing is a major advantage of single firing.

Another advantage is that it encourages directness in glazing. My personal tendency is to fiddle with something until it is just right (or dead!), but when single firing, you must apply glaze and be done with it. Raw clay doesn't take too kindly to having glaze removed from it. It also demands that you be tuned in to the clay, much as in throwing.

When glazing, you don't have to handle pots delicately, but you must have some understanding of the physical properties of your clays and glazes. It is actually possible to put a lot of vigor into the glazing process—pots can be dipped; glazes can be poured, sprayed, brushed or layered. Nearly every decorative technique can be used with single firing, although some must be adapted to decrease the amount of water absorbed by the clay.

I prefer glazing when the pots are bone dry. A viable and often-used alternative is to glaze pots when they are leather hard, but this involves glazing each when it is ready instead of when I am ready. My studio is very small and cannot function as both a making and glazing space at the same time. Also, my glazing time is intensive, whereas when I am making pots my work space is more casual.

After single firing my work for several years, I thought I understood the answers to most of the technical problems. But with more experience, it became clear that success was more like a high wire act, with clay bodies and glazes on opposing ends of a balancing pole. For this reason the following data cannot be interpreted as the answer, but merely as a good point of departure for experimentation.

### Clays

The first step is to try your current body to see how it responds to single firing. If it turns out to be unsatisfactory, you then must decide if you want to alter it or go with a different body altogether. Most clay bodies will work fine for single firing.

It is important, however, for the clay to have a certain amount of physical strength to withstand the stress of raw glazing. For some people a typical porcelain might be okay, but for others it might take a body with above-average dry strength. A general guide for increasing the dry strength would be to increase the amount of ball clay in relation to other clays or to increase any clays in relation to nonplastic ingredients. If this causes problems with increased shrinkage and warping, add grog to compensate. When developing a clay body specifically for single firing, a good starting point would be approximately 33% ball clay plus other plastic and nonplastic ingredients as if it were a body for twice firing.

Some clays, because of their particle size and distribution, have a tendency to absorb water like a sponge, which can lead to cracking when glazing bone dry ware. Many years ago I attributed this characteristic to bodies high in any open fireclay. Looking back, however, this problem could have been exaggerated by poor throwing techniques. It's hard to say how much was due to clay alone.

At the present time I work with the following two bodies:

**SH Textured Stoneware Body**
(Cone 10, reduction)

| | |
|---|---|
| Custer Feldspar | 22 pounds |
| Kaiser Fireclay | 100 |
| KT 1-4 Ball Clay | 100 |
| Flint (200 mesh) | 14 |
| Flint Grog (35 mesh) | 25 |
| | 261 pounds |

**Sohngen White Stoneware Body**
(Cone 10, reduction)

| | |
|---|---|
| Custer Feldspar | 18 pounds |
| Kentucky Ball Clay (OM 4) | 30 |
| KT 1-4 Ball Clay | 150 |
| Flint (200 mesh) | 18 |
| Flint Grog (35 mesh) | 18 |
| | 234 pounds |

In the Sohngen recipe, SGP 1 ball clay can be substituted for the KT 1-4; as these are both fairly nonplastic ball clays, any other substitutions would require experimentation. The 35-mesh flint grog (available from Missouri Minerals Processing, Inc., High Hill, Missouri 63350) is used because of its light gray fired color and relative fineness.

### Glazes

Learning about how glazes relate to single firing has been quite an evolutionary process. Most potters have read that slip glazes work best for single firing and that is the advice I followed when I started. But slip glazes (glazes that are predominately clay) can lead to serious water absorption problems with your clay body, as they tend to stay wet longer after they're applied. The quicker a glaze dries, the smaller the chance that water in the glaze will affect the clay body.

Yet clay is a very important ingredient in all single-fired glazes. When glaze is applied to a green pot and water is absorbed, the clay expands. As the water evaporates, the clay contracts to its original size. Therefore, the glaze must contain enough clay for it to shrink as the body contracts. Insufficient clay content can lead to crawling. In extreme cases, sheets of glaze will fall off the pot before it is fired. After years of experimenting with glazes that had progressively lower and lower percentages of clay, I now feel the minimum clay quantity is between 5 and 10%, but it will vary from one glaze to another. I also include 2–6% bentonite in my glaze recipes for further insurance.

Other than clay content, there are no special considerations that apply to single-fired glazes. The following are a few of my long-time favorites:

**Altered Sohngen Stony Matt Glaze**
(Cone 10, reduction)

| | |
|---|---|
| Barium Carbonate | 4.74% |
| Dolomite | 17.90 |
| Spodumene | 7.37 |
| Talc | 11.05 |
| Kona F-4 Feldspar | 35.26 |
| Bentonite | 5.26 |
| Georgia Kaolin 6 Tile Clay | 18.42 |
| | 100.00% |

**Altered Shaner Red Glaze**
(Cone 10, reduction)

| | |
|---|---|
| Bone Ash | 3.68% |
| Talc | 3.93 |
| Whiting | 19.66 |
| Custer Feldspar | 48.16 |
| Bentonite | 1.97 |
| Georgia Kaolin 6 Tile Clay | 22.60 |
| | 100.00% |
| Add: Red Iron Oxide | 5.32% |

**Fake Ash Glaze**
(Cone 10, reduction)

| | |
|---|---|
| Whiting | 32.26% |
| Albany Slip Clay | 51.61 |
| SGP 1 Ball Clay | 16.13 |
| | 100.00% |

For blue, add 2% cobalt carbonate and 2% red iron oxide.

**Celadon Glaze 3**
(Cone 10, reduction)

| | |
|---|---|
| Whiting | 19.6% |
| Custer Feldspar | 37.5 |
| Bentonite | 3.6 |
| Georgia Kaolin 6 Tile Clay | 13.4 |
| Flint | 25.9 |
| | 100.0% |
| Add: Red Iron Oxide | 1.8% |

**Gray White Glaze**
(Cone 10, reduction)

| | |
|---|---|
| Dolomite | 19.58% |
| Whiting | 3.10 |
| Custer Feldspar | 34.66 |
| Bentonite | 4.00 |
| Georgia Kaolin 6 Tile Clay | 20.28 |
| Flint | 18.38 |
| | 100.00% |

**Tessha Glaze**
(Cone 10, reduction)

| | |
|---|---|
| Whiting | 17.98% |
| Kona F-4 Feldspar | 23.60 |
| Bentonite | 6.74 |
| SGP 1 Ball Clay | 22.47 |
| Flint | 29.21 |
| | 100.00% |
| Add: Red Iron Oxide | 13.48% |

This saturated iron glaze is used only to emphasize small areas.

The techniques used in making, glazing and firing are apt to vary from one person to another. In general, being confident and direct will go a long way toward successful single firing.

### Making

The one overriding problem I have had with throwing has been thin spots. Areas that wouldn't make any difference with bisqued pots can lead to single-fired defects. For instance, the belly of a round pot can become thin on the upper part of the swell. I'm not saying that single-fired pots should be thick, but there is a point when they can be too thin. This will vary from clay to clay and glaze to glaze, and will also vary with the integrity of your throwing or handbuilding. Faults usually show up as areas that look like (although are unrelated to) bloating; there the clay has separated in the center of the wall, leaving a pocket with a corresponding lump and sometimes a crack on the surface. This happens soon after glazing, and usually can be seen and heard. With quick action and luck, the clay can be rejoined by squeezing that spot between your fingers.

Thin spots can also lead directly to cracking. Overly thin rims are a natural place for cracking to occur. A slightly thickened rim is good insurance for single firing, though by no means absolutely necessary.

If trimmed areas are left rough, as opposed to burnished, more water may be absorbed and possibly lead to cracking where the thrown area of the pot meets the trimmed area. A very similar problem can occur if the pot has not dried thoroughly (or is not uniformly leather hard) prior to glazing. A partially dry pot will absorb water from the glaze unevenly. Damp areas will whisk the water into the clay, while dry areas will resist it. I work in a basement studio that is often very humid and frequently use a space heater to finish the drying process (even in the summer).

For the most part, making pots for raw glazing is not really that demanding. Pots don't need to be even in wall thickness—they just can't be too thin. Pots can be made very loosely or tightly, but it's better if they're not labored over. Any unnecessary stress applied to the clay will potentially show up as a defect when single firing.

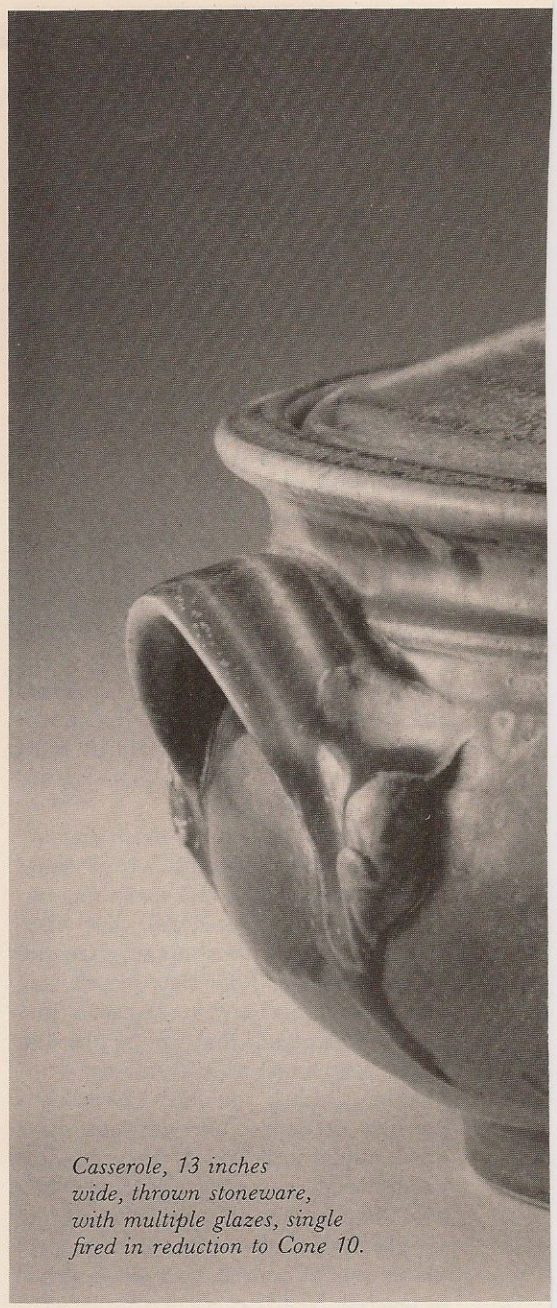
### Glazing

The first time I dipped a raw pot into glaze, pulled it out and waited for it to fall apart in front of me, I felt a lot of uncertainty. But with experience, my techniques demanded more of the clay. Eventually I discovered that most anything worked as long as water absorption was minimized.

For instance, glazes can be layered to increase depth and richness of surface. If you try to apply several layers of glaze by dipping, the clay will finally give up no matter how much dry strength it has. But if you dip one layer and spray successive light layers, it's possible to apply a great deal of glaze without too much water absorption.

Raw pots can even be slapped into a glaze in order to get wave motion and corresponding marks. They can take this sort of abuse if when holding them you spread pressure over as large an area as possible. Obviously, glazing tongs are out. And you can no longer squeeze the foot of a pot to hold it for glazing; that can pop the foot right off!

If you're pouring or dipping the work, it is important to glaze the outside as quickly as possible after glazing the inside. This allows expansion and contraction to occur in unison. No more assembly line glazing!



*Casserole, 13 inches wide, thrown stoneware, with multiple glazes, single fired in reduction to Cone 10.*

Though I've heard others say that it is important to glaze *both* the inside and outside of a form, in my experience this is not the case. In fact, it is really easy on the clay if only one surface is glazed. Defects almost never show up unless the clay has been exposed to water from both sides.

Resisting with wax is important for areas where unwanted glaze might be applied, as any method of removing glaze involves damaging the surface of the clay. I have always used liquid wax emulsion, and have just found a great substitution for the old Mobil Cer A. The wax resist

sold by Aftosa (Box 1338, El Cerrito, California 94530) resists much better and dries to a harder surface. The one problem with any wax is that it can stick to slick surfaces such as Formica bats and cause little chunks of clay to pull off the next piece placed there. I do a lot of banding after glazing and find that if the bat is moistened, waxed areas are less likely to stick. It also helps if the resist is allowed to dry for a day or so before glazing and decorating.

### Firing

For the most part, the early stages of single firing should proceed exactly like a bisque firing. Most clays contain impurities in the form of carbonates or sulfates. If these are not burned out in the early stages of the firing cycle, they may escape as gases when the glaze is melting, leaving blisters or pinholes in the glaze. To effectively burn out these impurities, the firing should be strictly oxidized from early red heat through normal bisque temperatures (Cone 010–04). With my fairly tight clay body, which doesn't allow the gases to escape readily, I've found it helpful to slow the firing and soak the kiln somewhat during this period.

After reaching bisque temperature, the firing can proceed as a typical glaze firing. I fire in reduction starting at Cone 04. If you fire all the way in oxidation, it might eliminate the blistering problem I've experienced.

As with any ceramic process, single firing has its own set of problems and solutions which will vary from one person's requirements to the next. Obviously, not everyone will respond positively to the aspects of single firing that appeal to me. For them, bisquing probably seems like a small price to pay for the insurance it provides.

After all these years, however, I feel as committed to single firing as some potters are to firing with wood. It has exerted its influence in subtle ways that have had a very positive impact on my development as a potter. Making good pots requires a flow of energy that must extend beyond interruptions inherent in the process itself. Single firing can enhance this energy flow by having a unifying effect on one's work cycle.

**The author** *Studio potter Steven Hill resides in Kansas City, Missouri.*