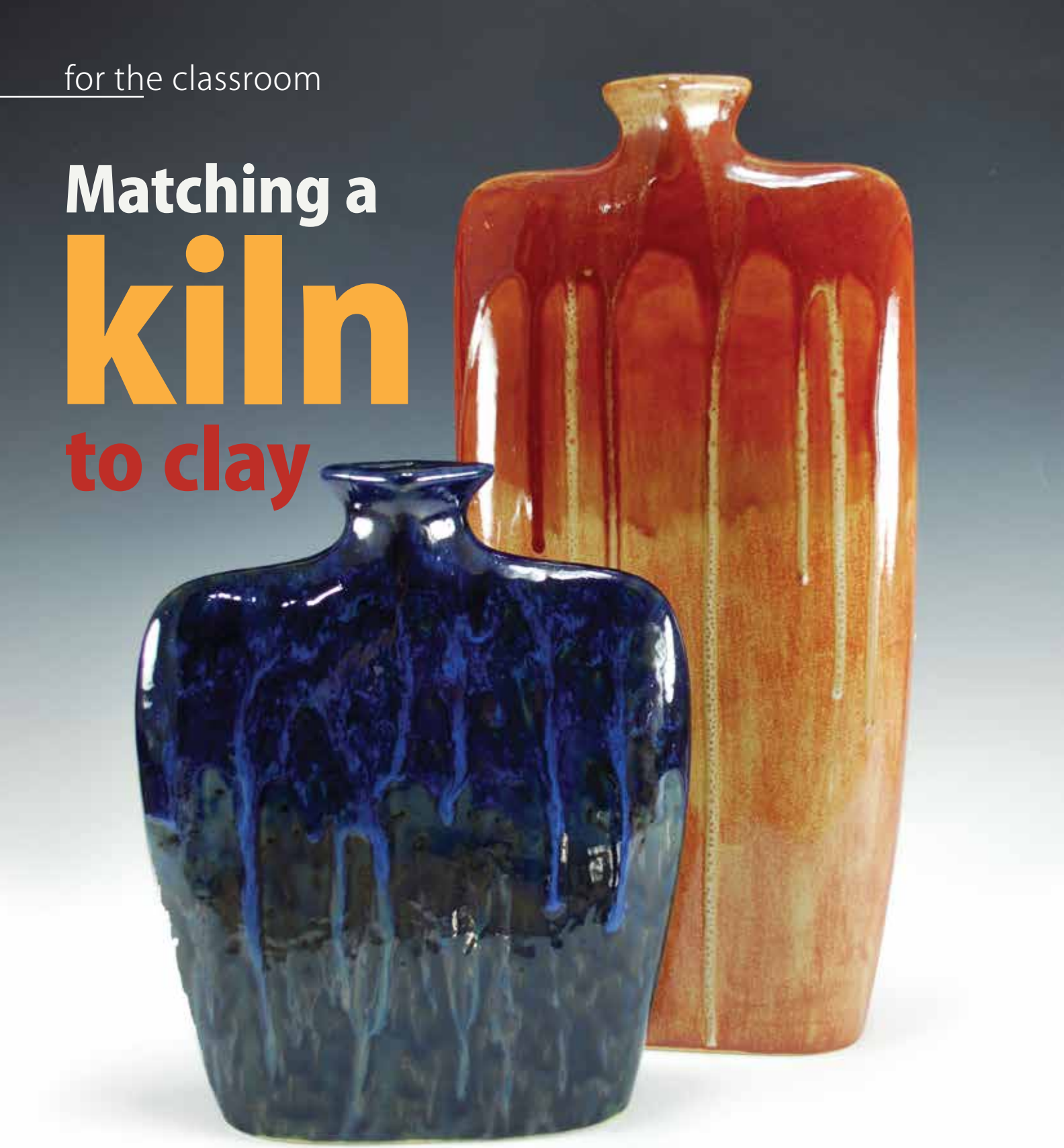
# Matching a kiln to clay



By Michael Harbridge

Which came first? The clay or the kiln? Some may think it makes no difference, but it really is important to match up the proper kiln to the type of clay you will be firing. Far too often, artists don't plan or anticipate what they'll want to do down the road, and end up having a kiln not capable of meeting their needs. And sometimes they don't ask the right questions and purchase the incorrect kiln right off the bat. So this month we will look at many of the things you need to know about clay, finishes and kilns, because they all need to work together.

Let's first clarify the various firing range options of low fire, mid-range and high fire. Low fire is generally any cone number starting with a zero. Earthenware, fired in the 04 to 06 cone range, is the most commonly used clay that fits this category. All of the

other firings used on earthenware bisque, like decals, mother of pearl, gold, and other overglazes would all fall into the low-fire classification. To give you a temperature range, it would be any firings below 2,000 degrees Fahrenheit.

Mid-range goes up to around cone 6. The majority of stoneware artists work in this range. Most low-fire earthenware clay bodies cannot be fired to these higher temperature, and will weaken and collapse or melt. Firing temperatures would be up to the mid-2,200 F area.

High fire goes up to 2,300 F and higher temperatures and includes some stoneware and porcelain clay bodies. You'll see reference to cone 10 on glazes and clay bodies. Many mid-range and low-fire clays cannot withstand these high temperatures and would melt into a puddle of what looks like molten lava.

When looking at clay options, manufacturers will give a firing range for clays. Some low-fire bodies can actually be fired into the mid-range. And high-fire and mid-range clays can be fired in the low-fire range. But the glazes may or may not mature properly — more on that later in this article.

| Clay Body | Firing Range | Microwave | Oven | Dishwasher | Colors |
|---|---|---|---|---|---|
| Low-Fire Earthenware | 06-4 | No | No | No | Yes |
| Mid Range | 5-7 | Yes | Yes | Yes | Yes |
| High Fire | 8-10 | Yes | Yes | Yes | Yes |

## Firing Temperatures

First look at what type of firings you plan to do. Even if you currently only work with earthenware, think about what you may do in the future. Do you want to dabble in stoneware or porcelain? If so, then be certain the kiln you purchase can fire up to the range you desire. Just like buying a new car, driving it off the lot, and deciding it's not the right car for you, trading in a kiln three months after you buy it can have costly consequences.

And even if you decide to play around with stoneware, verify the clay body. Not every kiln is capable of reaching cone 10. So research your clay options before selecting a kiln. Some cone 10 stoneware bodies are much more durable than cone 6, and the colors can have a different look. This means it's also important to explore your color options. If you discover an assortment of cone 10 glazes you like better than cone 6, then you may be looking at a completely different kiln.

Are all cone 10 kilns the same? Just because a kiln says it's capable of reaching cone 10 does not necessarily mean it is the best choice if you are going to consistently go to those temperatures. If the kiln does not have the correct features, it may struggle to reach high temperatures on its 20th firing, unlike it did on its first.

Many kiln makers have more powerful components, such as special elements, better relays, thicker wall brick, and other things that will help ensure years of reliable firings when consistently firing to the high temperatures. While there is an added charge for these components, changing them out a month after you purchase your kiln is much more costly. Look for the more powerful models or component variations to fit you firing needs.

## Power Requirements

I've encountered several cases of people purchasing smaller 110 volt kilns that plug into standard outlets, but they have a hard time getting the kiln to fire up to its maximum temperature. Owners of many of these smaller kilns need to be sure they are not plugging the kilns into a circuit shared by other appliances. If, say, both the kiln and a refrigerator are both are pulling power from the same circuit, it will slow the kiln. Sometimes the kiln is unable to get hot enough to turn off, or it slowly struggles. Most of these kilns will be most efficient when they are on a dedicated circuit. And this doesn't just mean plugged into the same outlet.

I know that our home is wired so that the outlets in the garage are on the same circuit with the outlets on our front porch and our patio in the back of the house. So say I plug a kiln into the outlet on the patio to fire. If the chest freezer in the garage — wired into the same circuit — is running, the kiln will struggle, although having a light or radio running on the same circuit probably won't slow the kiln. Just be aware of what else is drawing power from the circuit when setting up your kiln.

On larger 240 volt models, you want to be sure you have enough power coming into your location and be sure the wiring going from the power box to the kiln is sufficient. Don't try to cut corners on the wire. Thin wire can cause the circuit breaker to trip

## Cone Temperature Equivalents

| Cone Number | 27 F per hour | 108 F per hour | 270 F per hour | |
|---|---|---|---|---|
| 022 | na | 1087 | 1094 | Overglaze/glass range |
| 021 | na | 1112 | 1143 | |
| 020 | na | 1159 | 1180 | |
| 019 | 1213 | 1252 | 1283 | |
| 018 | 1267 | 1319 | 1353 | |
| 017 | 1301 | 1360 | 1405 | |
| 016 | 1368 | 1422 | 1465 | |
| 015 | 1382 | 1456 | 1504 | |
| 014 | 1395 | 1485 | 1540 | Soft firing range |
| 013 | 1485 | 1539 | 1582 | |
| 012 | 1549 | 1582 | 1620 | |
| 011 | 1575 | 1607 | 1641 | |
| 010 | 1636 | 1657 | 1679 | |
| 09 | 1665 | 1688 | 1706 | |
| 08 | 1692 | 1728 | 1753 | |
| 07 | 1764 | 1789 | 1809 | |
| 06 | 1798 | 1828 | 1855 | Low fire earthenware |
| 05 | 1870 | 1888 | 1911 | |
| 04 | 1915 | 1945 | 1971 | |
| 03 | 1960 | 1987 | 2019 | |
| 02 | 1972 | 2016 | 2052 | |
| 01 | 1999 | 2046 | 2080 | |
| Cooler temperature above; hotter temperatures below | | | | |
| 1 | 2028 | 2079 | 2109 | Mid range stoneware |
| 2 | 2034 | 2088 | 2127 | |
| 3 | 2039 | 2106 | 2138 | |
| 4 | 2086 | 2124 | 2161 | |
| 5 | 2133 | 2167 | 2205 | |
| 6 | 2165 | 2232 | 2269 | |
| 7 | 2194 | 2262 | 2295 | High fire stoneware & porcelain |
| 8 | 2212 | 2280 | 2320 | |
| 9 | 2235 | 2300 | 2336 | |
| 10 | 2284 | 2345 | 2381 | |




repeatedly. And here's a tip if you don't have an open space in your box: Look to see if there is something, like an electric clothes dryer, you can run a line off from. You may be able to run a line off the same breaker, but in that case, you can't use the dryer and kiln at the same time.

Check with the kiln manufacturer to see what size breaker is recommended for the kiln you select. Don't go by how much the kiln draws. If it's a 50 amp kiln, and you use a 50 amp breaker, it's likely you will have issues. You'd usually go with a 60 amp breaker.

It's also important to know what type of service you have coming in. Most U.S. households have single-phase, 120/240V service. But commercial locations can have that service or three-phase 208 service. Check — and then check again. If you're not certain, have an electrician or professional verify for you. Purchasing the wrong voltage can result in a kiln that does not fire. In some cases you can convert a kiln, but it can be costly and entail a great deal of work. It may mean replacing the entire control panel and all the elements.

## Space Requirements

Kilns get hot. Very hot! Not only are they hot if you touch them while firing, they throw off heat. Even with a kiln vent, the kiln will generate heat around itself and in the same room. So don't place the kiln in a tiny room with no ventilation. A couple of my kilns are in a 10- by 15-foot room, and even with kiln vents, the room gets very warm. This is great during the winter months when I want to heat the upstairs floors. But in the summer, it causes our air conditioning to work overtime. I've also installed a commercial ceiling vent in the room to draw warm air out when I don't want it. A window you can crack open will also be effective.

Also avoid storing things like clay and glazes in the same room — that heat can quickly dry them up. I recently discovered sticky-back sheets of foam I use on the bottoms of my finished ware were no longer sticky after being stored in the kiln room for prolonged periods.

Also note, when a kiln manufacturer tells you a minimum amount of space needed around the kiln, it doesn't mean you have to go with exactly that amount of space and no more. I recently went to repair a large kiln in a retirement facility, and they had basically turned a closet into a kiln room. I couldn't squeeze along the side or back of the kiln to access areas I needed to reach. At a couple of points, I thought I was going to be trapped or wedged in.

While this may sound silly and obvious, make sure there are no flammable items around the kiln. I can't tell you the number of times I've gone in to do kiln repair and discovered shredded paper, flammable sprays, and other items that should not be anywhere near a kiln.

## What Size Kiln?

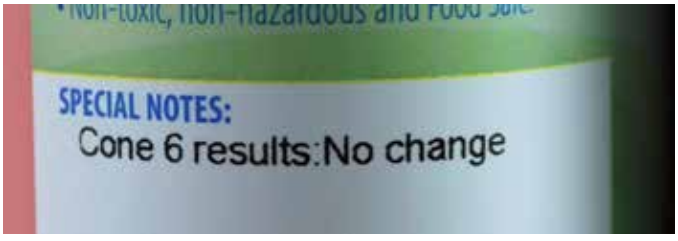
How big are the items you create currently? Do you think you will go larger in the future? Really give this some thought so you get the right size both for now and years down the road. Kilns are not that costly to fire. Firing a half-full kiln does not cost as much as firing a full kiln. On the other hand, if you're 5 feet tall, you'll have a heck of a time reaching the bottom of a 27-inch tall kiln. You may want to look at one that's wider rather than taller, or if you need the added height, consider a front-loading kiln.

Look at doorways and pathways. Will the kiln fit through all the doors on the way to the location where you want to place it? Can it make it around corners or steps that curve? Many kilns come apart in sections, but some are a single piece. Check the dimensions before you purchase. This is also the point where you will need to look at how much power you have to work with and the space for the kiln. See how it all ties together?

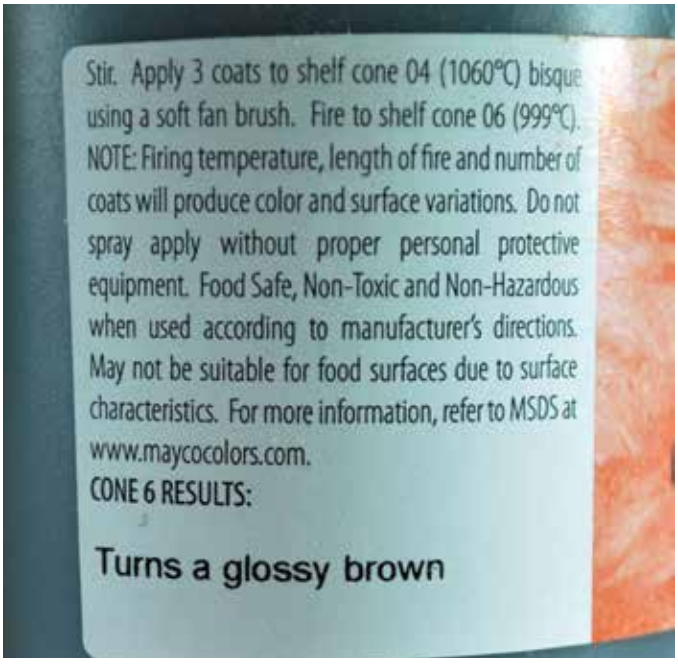
## Kiln Vents

Kiln vents not only remove fumes from impurities in the clay, but also in the glazes, overglazes, and other things in the firing process. You'll generally get brighter, better colors from a vented kiln. It will also even out temperature in a kiln that normally fire hotter on the top and cooler on the bottom (because heat rises). And don't forget, it will remove much of the heat from the kiln and kiln room.


**Most color manufacturers have a reference listing in their color guide or online showing what happens to low-fire colors when taken to higher temperatures.**




**Some companies list right on the color label the results of higher firings.**




## Glazes

Many artists start out working with low-fire bodies and work their way up to mid-range and high-fire methods. If you're one of these artists, you probably have a whole bunch of glazes and finishes that fire to cone 06. Well, you may be surprised to learn that many of these finishes can also be taken to higher temps. In some cases, the colors will fire out the same at both temperatures, while others may change. Most glaze manufacturers have information on the label, in a color guide, or online explaining what happens with each color when taken to mid- or high ranges. However, high-fire colors generally don't mature at lower heat levels. So when you see a cone 6 or cone 10 glaze on a high-fire creation, don't assume you'll get anywhere near the same look if you take fire it at cone 06.

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