



Clayworks Kiln Loading Pottery

As with most things we do, successful results depend a lot on careful planning. That especially applies to how you load your kiln. The objective is to allow heat to distribute evenly throughout the kiln. How you load your kiln can either encourage or discourage even heat distribution.

Shelf placement

Where you place the shelves in the kiln will affect how evenly the heat is distributed.

- **Too close to the thermocouple** can cause the controller to read the wrong temperature.
- **Level with, or too close to, an element** can cause the shelf at that level to be a different temperature than shelves at other levels.
- **Too close to the lid** can cause the ware on the top shelf to get more heatwork than shelves below.
- **Firing ware on the kiln floor** will cause ware on that level to take longer to heat up and, because the kiln floor retains heat during the cooling, will receive more heatwork than shelves at higher levels.
- **Loading large items on a lower level and small items on a higher level** will ensure the smaller upper level items receive more heatwork than those on the lower level. Placing smaller items at lower level and larger items at higher level will ensure more even heatwork.

Kiln Wash

Kiln wash is a material painted onto a kiln shelf to prevent glaze from sticking to the shelf. You can make your own but most artisans buy already mixed kiln wash. A common kiln wash mix is 50% kaolin and 50% flint.

Applying Kiln Wash

Just as glaze will permanently bond to clay it will also permanently bond to clay kiln shelves. To prevent this happening, kilns shelves are protected with a coating of kiln wash. It can be applied with a brush or a roller or it can be sprayed on. Different artisans have differing opinions on how to apply kiln wash and what the kiln wash consistency should be.



Clayworks Kiln Loading Pottery

My routine practice for kiln wash is:

- **Mix 5 to 1.** 5 parts water to 1 part kiln wash. A handy way to measure is to use a plastic bottle (like a soda pop bottle). Measure the height of the bottle and mark 1/5th of the way up. Pour in, or spoon in, dry kiln wash powder to that level then fill the bottle with water. Shake up the bottle to thoroughly mix the powder and water and pour some into a container to use to apply the mixture.
- **Paint on** with a brush or roller. Apply evenly.
- **Allow the 1st coat to fully dry** than apply a 2nd coat. You can apply more coats if you wish. It's MUCH better to apply many thin coats than few thick coats. Allowing each coat to fully dry before applying the next coat is important. Applying another coat over damp kiln wash encourage the kiln wash to crack and chip in the kiln firings. Taking the time to allow each coat to dry allows you to get more firings before you need to scrape off and recoat.
- **Reuse the shelf** in the next firing if the kilnwash hasn't chipped or cracked. You can keep reusing the shelf many times until the kiln wash starts to blister off.
- **Chipped, cracked or blistered kiln wash should be removed** and fresh kiln wash applied. You can scrape off or sand off all the previously applied kiln wash but that isn't essential. Just remove whatever easily comes off.
- **Start wet.** You will get the best bond of kiln wash to kiln shelf if you start by wiping the shelf with a wet cloth or sponge.
- **Bisque firings** do not need kiln wash. You can fire your bisque projects on bare kiln shelves. An exception is any clay with **speckles**. The metals used to create speckles will embed into the kiln shelf during the firing. Shelves used for bisque firings with speckled clay should be protected with kiln wash.
- **Glaze firings** on shelves uncoated with kiln wash risk glaze dripping onto the shelf and permanently fusing to the shelf.

Bisque Firings

- **Fire only totally dry projects.** I suggest a minimum 2 weeks drying time before sending to the kiln. Because greenware is often at first covered to slow drying to prevent cracking I suggest 1 week under cover then 1 week uncovered.
- **Damp clay will** explode in the kiln. Often explosively enough to ruin everything else in the kiln. It can also seriously damage your kiln elements or significantly reduce how long the elements last. If you have any suspicion the clay isn't completely dry, but have need to fire, you should candle it. Heat if up to 300F (150C) and hold at that temperature for 2 hours to steam out any moisture. You can do that in your kitchen oven with the door open or in your kiln with the lid propped open.



Clayworks Kiln Loading Pottery

Loading for Bisque



- Ware being fired to bisque can be in contact with other ware – even stacked on top of each other.



Clayworks Kiln Loading Pottery

Loading for Glaze



- Glaze ware must NOT touch the kiln walls or other ware. If pieces touch they will permanently fuse together where they touch.
- You must leave space between the pieces to allow for expansion during the first stages of the firing. A recommended spacing between pieces is $\frac{1}{4}$ inch (6mm). More is better. Less is dangerous.



Clayworks Kiln Loading Pottery

- **Running glaze.** Glaze applied too thick can run off the bottom of the pot and stick to the kiln shelf. A good coating of kiln wash won't prevent the glaze from running but it will prevent it from sticking to the shelf.
- **Clay cookies** placed beneath the project will provide extra space from the shelf and reduce the likelihood the glaze drips onto the shelf.
- **Stilts** can be placed beneath the project to elevate the project from the shelf and can be used when you want to glaze the underside of your project.
- **Kiln wash flaking.** Pieces of kiln wash on the edge rim of a kiln shelf can flake off during the firing and embed into the glaze on anything if falls onto. Some artisans make a point of wiping the edge of the shelf to remove any kiln wash. Edge flaking is much more of a concern when using half shelves then full shelves where you can easily position pieces to not sit under the edge of a kiln shelf.

Cookies



Cookie are clay rounds made by rolling out slabs of clay and cutting into circles. You can use a round baker's cookie cutter, any of the circle cutters sold for pottery or even a glass or jar from your kitchen. Most potters kiln wash their cookies to protect against glaze drips but you can use them bare. They're cheap and easy to make so it's no great loss if you need to dumpster a few. It's important to make them from clay that is rated as high as, or higher temperature than, anything you will be firing.

A cookie stuck to ware can be removed by inserted a slot head screwdriver between the ware and the cookie and tapping it with a hammer.



Clayworks Kiln Loading Pottery

Stilts



Stilts are ceramic stands with high temperature wire prongs embedded in them. The clay ware stands on the end of the wire prongs. Because the only contact is with the wire prongs, these allow you to fire projects that are even glazed on the bottoms.

Heatwork - Time + Temperature = Heatwork

- Heatwork is the term used to describe the combination of time and temperature. More time will produce more heatwork and higher temperature will produce more heatwork. It's like cooking a roast in your kitchen oven. You can cook it to a higher temperature or hold it longer at top temperature. Either will provide more heatwork and cook it more.
- You can assume a direct 1 to 1 time/temperature relationship to estimate heatwork. Every extra degree of temperature F will produce the same extra heatwork as holding at top temperature one more minute.

Metallics Firings

Glazes, like lustres, that contain metallics will release toxic fumes during the kiln firing and should ALWAYS be vented to send fumes outside.



Clayworks Kiln Loading Pottery

Venting

Venting has 2 purposes - to remove noxious or toxic fumes and to draw in oxygen.

It can be done either with an overhead fan (usually with a hood) to draw air up and away from the kiln or underneath to draw air down and away. A variety of equipment is available for both methods. If nothing else, you can install a fan to draw or push air away from the kiln and direct it to outside.

Bisque firings benefit from venting by drawing out the unpleasant smell created at the beginning of the firings. Glaze firings benefit from venting by drawing in oxygen to encourage better glaze results.



Measuring Temperature

Ceramic artisans have historically referred to “cones” to measure temperature. They use pyrometric cones engineered to soften at a set temperature to signify the level of heatwork produced. Older kilns use a device called a “kiln sitter” to use cones to turn the kiln off when it achieved the desired level of heatwork. With the introduction of electronically controlled kilns, many artisans have switched to programming to a specific temperature and adding hold time to add any extra heatwork desired. Some users continue to use “witness cones” to record the heatwork produced in the firing.



Clayworks Kiln Loading Pottery

How long to fire?

How long it takes your kiln to heat up depends on the temperature you programmed it to fire to and how fast you programmed it to increase temperature. A fast fire program will take less time than a slow fire program. A glaze firing to 2200°F will take longer than a bisque firing to 1900°F. You can accurately calculate firing time by doing the math. A typical slow fired bisque to cone 04 (1950°F) will take about 12 hours to reach bisque temperature. Although a glaze firing is to a higher temperature, glaze firings usually increase temperature faster than bisque so a typical glaze firing to cone 6 (2250°F) would be about 10 hours. However, kiln elements wear out and as they wear they take longer to reach top temperature. Inevitably, they will wear enough they are no longer capable of reaching the desired temperature. I keep a firing log of everything firings to record how long it took to reach top temperature and see a steady increase in firing time as the elements wear. After about 100 firings the elements are likely to have worn enough to need replacement.

How long to cool?

The same as how long to heat up – it depends on the temperature fired to but also depends on how full the kiln is. The more mass of material in the kiln the longer it will take to cool. Rate of temperature drop depends on difference from room temperature. From top temperature it cools super fast but as the temperature lowers it takes increasingly longer to keep cooling. A good working guideline is to assume it will take as long, if not longer, to cool than it did to reach top temperature.

3 – 2 – 1 Cooling

You can significantly decrease cooling time with a 3-2-1 system

- at 300° F crack the lid a few inches.
- at 200° F full open the lid.
- at 100° F remove the load and reload the next one.

I often do this at even higher temperatures using oven mitts to unload but that's risky and should be treated the same as breaking the speed limit when driving. If you're willing to take the risk, be willing to suffer the consequences of thermal shock cracking your projects. How safe it is depends directly on how uniform the thickness is of the clay. Uniformly thick projects can be safely cooled must faster than those with some parts thicker than other parts.