

Firing Tips

FIRING LEAD FREE GLAZES

Changes in glazes

Lead free glazes are becoming the standard for commercial use. This is due to government regulation and health concerns by the manufacturers.

As the name implies, lead free glazes are made from compositions or materials where lead has not been added.

To eliminate lead, glazes are reformulated. This can change some of their properties. Some of the differences you may notice include:

- does not flow or run as much in firing as lead containing glazes
- brush marks may show after firing
- not as wide a firing range
- may not be compatible with as many bodies (improper fit). This leads to shivering or crazing of the glaze.
- color does not match lead glazes
- more surface defects

For problem-free results with lead free glazes, firings must be more closely controlled and kilns well vented. Bodies may have to be bisqued to a higher or lower cone number to solve a problem.

Why do problems occur?

Lead softens a glaze and allows it to be fired over several cone numbers. Glazes made without lead have a narrower firing range. Typically, lead glazes are able to be fired over a four cone number range (example 08 to 05).

Lead free glazes typically need to be fired within two cone numbers (example 06-05) - less than half of that for lead glazes.

Glaze and body fit

Since the glaze and the body on which it is fired (bisque) are made from different materials, it is important that they expand and shrink a like amount when heated and cooled. If they don't, then the fired glaze can be stretched to the point where it can crack (crazing), or it can be pushed together on to itself to a point where shivering or crawling occurs.

When using lead free glazes:

1. Make test firings of the body and glaze to their recommended cone number, first the unglazed body and then the glazed bisque.

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2. Use witness cones placed near the ware to be sure the proper cone number was reached. Differences may exist between the Kiln-Sitter® and a witness cone or from the top to the bottom of the kiln. Firing with a controller to a cone number or a temperature may not be adequate.
3. If crazing occurs and the witness cone indicates the glaze and bisque firings are properly fired, make some tests by firing the bisque progressively hotter (e.g. if you fire bisque to 05, test to 04, then 03).

When you fire hotter, the expansion of the bisque is changed and glaze on the bisque may fit better.

4. If shivering occurs, fire one cone cooler. You may need to select another body for your bisque. Firing too cool is not a good idea since the strength is reduced and porosity increased, both of which may cause problems during use of the final piece.

Is Your Kiln Uniform in Temperature?

If temperature in your kiln varies by more than 1 to 2 cones, then glazed ware in one part of your kiln may fire okay, while ware fired in another part of your kiln will have a problem.

Most kilns vary in temperature from top to bottom. To determine how much your kiln varies, place witness cones on each shelf when making firings. Usually, there is less difference top to bottom for hotter firings.

Each kiln has its own personality and the solution for improving temperature uniformity may vary.

If you have glaze firing problems because

of too much variation, then we recommend the following:

1. Make sure cracks and holes are repaired to keep heat in your kiln.
2. Fire slower during the early part of your firing, before red heat (below 1200°F). This allows heat to soak into the refractory and even out temperatures in the kiln.
3. Consider changing the switching pattern to even out top and bottom temperatures. Switch the bottom to a higher setting before the top or vice versa. Higher settings add more heat.
4. Consider adding an Orton KilnVent. These pull hot gases from the top to the bottom of the kiln and cut temperature variations in half. Hoods above the kiln will not help temperature uniformity problems.

Want to learn more?

Read more about glaze and body fit, heat distribution and measuring heatwork in the Orton Firing Line and Technical Tips publications. Published 8 times a year, each issue is packed full of articles to help you learn more about firing. Members of the Orton Firing Institute receive these publications at no charge. Single copies are available to non-members at a per issue rate.

For information on Orton products, see your Orton dealer or distributor.

For information on the Firing Institute or publications, contact

Orton Firing Institute, 6991 Old 3C Hwy., Westerville OH 43082
614-895-2663.

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