

### What is Crazing

Crazing is one of the most common problems related to glaze defects. It appears in the glazed surface of fired ware as a network of fine hairline cracks. The initial cracks are thicker and spiral upward. These are filled in horizontally with finer cracks.

Crazing is caused by the glaze being under too much tension. This tension occurs when the glaze contracts more than the body during cooling. Because glazes are a very thin coating, most will pull apart or craze under very little tension.

Crazing can make foodsafe glazes unsafe and ruin the look of a piece.

There are two types of crazing, each with a different cause:

#### **immediate crazing**

- appears when piece removed from kiln or shortly thereafter
- caused by glaze body fit (glaze fits too tightly to body)

#### **delayed crazing**

- shows up weeks/months later
- caused by moisture getting into ware

### Size Changes During Firing

All ceramic bodies change in size during heating (firing) and cooling. What

is desired is for the glaze to shrink a little more than the body during cooling. If it doesn't then glaze problems may occur.

It is important for ware and glaze expansion and shrinkage to match or crazing can occur.

### Glazes During Firing

1. during firing, glaze undergoes physical and chemical changes
2. as heating progresses, glaze melts
3. with further heating more liquid forms until viscous or thick fluid
4. more heating, more fluid glaze
5. at this point, viscous (thick flowing) glaze still conforms to size of the bisque
6. any gas evolving from body will form blisters which can heal if glaze is still fluid
7. when kiln shuts off, glaze and body cool together
8. during cooling, both the body and glaze shrink
9. eventually glaze becomes a hard glass that will no longer flow

Thermal expansion/shrinkage properties of both the body and the glaze determine if the glaze crazes.

Glazes are designed to shrink less than the body which puts them in compression, makes them stronger, and makes them less susceptible to crazing.

### Solution to Glaze and Body Fit

1. test samples for a good fit
2. bisque to 1-2 cone numbers hotter than glaze to insure body is mature
3. use Self-Supporting Witness Cones to verify heatwork
4. recognize that bodies and glazes will have different fits for different heatwork. A glaze might fit bisque fired to 03, but craze on 07 bisque.

### Delayed Crazing

This type of crazing shows up weeks or months later and is practically always caused by underfiring.

If ware is underfired (does not reach maturity), it can, in time, expand when moisture fills the pores causing the body to expand. Sudden changes in temperature can cause crazing if the body and glaze do not expand or contract uniformly.

Either the body expanding or the glaze shrinking can cause fine hairline cracking (crazing) to occur. Refiring to the proper cone will sometimes solve the problem.

### Proper Firing

Firing to the proper cone number is critical to help eliminate crazing problems. Witness cones must be used to verify the heatwork the ware receives.

If the Kiln-Sitter turns the kiln off and a witness cone is not properly deformed, then the ware is not fired to maturity.

Underfiring can occur because of:

- variations in kiln heating uniformity
- Kiln-Sitter out of adjustment and shutting kiln off early
- controller thermocouple inaccurate
- differences in heatwork between kiln shelf and Kiln-Sitter location

Crazing can also be reduced by slower cooling and slower firing.

### Lead-free Glazes

Lead-free glaze formulations today have less of a firing range. They develop their fired properties more quickly and this makes proper firing more critical.

### Want to learn more?

Read more about crazing in the Orton Firing Line and Technical Tips publications. Members of the Orton Center For Firing 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 Center For Firing or publications, contact Orton Center For Firing, PO Box 2760, Westerville OH 43086, 614-895-2663**