

# Firing Tips

## CRACKING AND WARPING CAUSED BY DRYING AND CASTING

In some instances cracking and warping problems share a common source: the casting and drying of the piece. In other cases, cracking may be related to how the piece is fired. This Tip looks at problems related to casting and drying

### DRYING CERAMICS

Ceramics contain clay which can absorb and hold water. Before firing, it is important to remove all of the physical water so that the piece will not crack or explode when heated. This is often accomplished in steps with firing being the final stage. During firing, the chemical water is removed from the piece and it gains strength while developing physical surface characteristics.

### UNDERSTANDING DRYING

Simplified, drying is the removal of water from body by evaporation. As the ware is dried, the film of water separating the clay particles gets thinner and thinner, the solid particles get closer together and the piece shrinks. Shrinkage stops when the particles finally contact each other.

### DRYING FAULTS

Cracking, distorting and warping are problems that may not become evident until after firing. They are usually caused by drying too fast or unevenly.

If ware is heated too fast, the pressure from water vapor inside the piece can cause cracking. Ware dried only on one side, can shrink more on that side causing warping or bending of the somewhat plastic (flexible) piece. When one surface finishes drying, the piece is now too stiff to recover and the warping becomes permanent. This can lead to cracking.

Bodies made of very plastic clays or compositions having a high clay content require attention to uniform, slow drying.

Thicker walled pieces will often have a greater tendency to warp or distort.

Care needs to be taken to allow for uniform air movement around all sides of a piece to avoid drying problems. Sometimes drying must be slowed down to avoid cracking.

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Handles on cups can have a tendency to pull away from the mug. Doll heads and chest cavities may deform inward.

## **REDUCING WARPING AND CRACKING**

To reduce warping and cracking, take steps to dry more slowly and more evenly from all sides.

Don't dry a flat object on a wet or cool surface like a formica or plastic table top or damp newspaper. The piece can only dry on one side. Instead, dry objects on something porous like wood or plaster or set them so air can circulate around them. If necessary, turn pieces over during drying for more even result.

Slow the drying of thick walled pieces and hand built ware.

Support areas during drying that might cause stresses to build up.

## **DRYING TECHNIQUES**

**slip cast ware** - may warp or crack if stressed (deformed) when removed from the mold. Even if the ware is gently returned to the original shape, the created stress will ultimately cause the piece to warp or crack.

**wheel thrown ware** - should not distort during drying unless subjected to further mechanical forces - let the ware dry naturally on a bat or shelf and it should be fine.

**thick handbuilt ware** - needs to be

dried for a very long time before it can fired or it may explode during firing. Several days may be required or a low heat drying in an oven may be necessary to remove all the water.

**plates** - even drying is particularly important with plates. Warping can cause the center of plate to fall or arch up. Rims and centers must dry evenly to prevent warps, humps and cracks.

**drying tiles** - drying tiles can present a particular challenge because it can be difficult for the piece to dry evenly. Usually air is passed over the top of the tile. This results in warping because the bottom of the tile remains wet. Drying tiles in tile racks can help air movement for more even drying.

## **Want to learn more?**

Read more about Solving Cracking and Warping Problems in the Orton Firing Line and Technical Tips publications. 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. Orton's 80 minute video, *Key Principles of Successful Firing*, is also an excellent resource on firing.

For information on Orton products, see your Orton dealer or distributor. For information on the Firing Institute or publications, contact

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