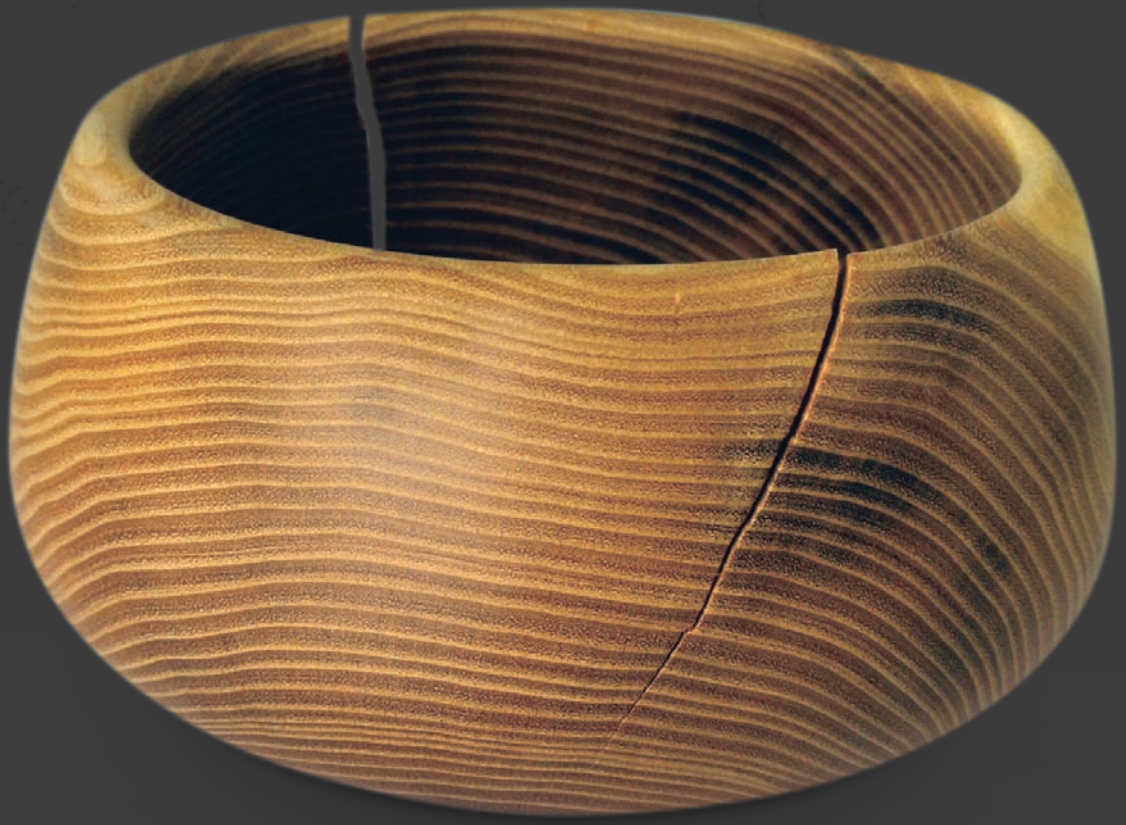
AVOIDING CRACKS in Bowls and Hollow Forms

David Ellsworth



I have always been fascinated by how intently woodworkers, woodturners, and the general public fear the word "cracks" when it comes to wood. We woodies are so meticulous when it comes to considering moisture content, grain direction, clamping devices, drying schedules, species characteristics, miracle glues, impregnable finishes, and, of course, design considerations—all in an effort to control cracks. The fact remains that with all our technology, both scientific and applied, the universal law of all woodworking remains: Wood moves. And it continues to move... forever.

The dynamics of drying wood

We know that wood has moisture, and as that moisture evaporates, the wood shrinks. But we often overlook the fact that wood also has tension and mass. Tension is inherent in the growth process of any fibrous material. And the mass? Well, just look at the difference between a log and a sheet of veneer cut from that log. Dry them out and the log cracks, while the veneer simply crinkles. Unlike the log, there is just not enough mass in the veneer to get in the way of the tension being released during the drying process.

Wall thickness and drying time

When turning a bowl from green, or wet wood to a finished shape, we have learned there are two basic options. One is to rough-turn the bowl and leave it fairly thick, let it dry for a few months and change shape to a slight oval as it dries, then re-turn the thick-walled form into a thinner-walled, round bowl. The other option is to turn the bowl straight through to a finished shape and thickness, then let it dry and warp into an oval shape in the hopes that it looks good and doesn't crack.

In both of these cases, the common denominator in controlling cracking is controlling wall thickness and drying time. We dry the thicker, rough-turned bowl slowly in order to control its change in shape. But if there is a thinner area either in the rim or the base, that area will dry faster than the thicker areas of the bowl. The result is that the fibers in the thin area become brittle and can't move with the rest of the bowl when the thicker area eventually dries and tries to change shape. The same is true in the second example. If, for instance, the rim is ¼" (6mm) thick and the bottom is ¾" (19mm) thick, the rim will become rigid and unable to move while the base is still drying and moving. A crack would be almost inevitable.

I regularly turn demonstration bowls of around 3⁄16" (5mm) wall thickness and place them on my woodstove in the shop, much to the horror of my students. Three to six hours later, they are bone dry and distorted by as much as 2" (51mm) out of round—but no cracks! Why? The wall thickness is consistent and there is relatively little mass in the way that would impede movement as the wood dries (*Photo 1*). Choosing a log section that does not include the pith also reduces the chances of a crack during drying.

Out of round but not cracked

This large maple bowl went out of round and distorted significantly during drying on top of the author's woodstove but did not crack due to its consistent wall thickness.

On occasion, I'll have a wood like hickory burl that is freshly cut and full of moisture and tension. If I turn small hollow forms 1⁄16" to ⅛" (1.5mm to 3mm) thick, I can hang them up above my wood stove and force-dry them in order to gain a nicely crinkled surface (*Photo 2*). But the walls must be consistently thin in order to prevent cracking.

Other causes of cracking

Recognize that the beginner-level turner is at a natural disadvantage when it comes to controlling cracks. This is because it may take him or her numerous hours to complete an open bowl, while a more experienced turner will be able to cut that time way down. Both turners are throwing moisture off the bowl through the endgrain fibers. But the novice is taking so much more time to make the bowl that the entire surface is actually drying out faster than can be controlled. That uncontrolled drying, combined with the potential for an uneven wall thickness, is an invitation for cracks.

Sanding is another process that induces cracking, especially in dry wood. Why? Heat. High-speed

sanding is death to wood; a sanding speed of only 100 to 200 rpm is ideal. Slow-speed sanding—what I call "cool sanding"—not only cuts the heat way down, but it also speeds up the sanding process by allowing the aggregate of the sanding medium to work more efficiently. High-speed sanding basically causes this same aggregate to burnish the wood. Sanding a bowl that was turned from green wood and became oval from drying can easily be done in one's lap or by using a jam chuck or vacuum chuck if sufficient vacuum can be achieved.

As with open forms such as bowls, hollow forms can be made from green or dry wood. But because of the excessive heat produced when cutting the interior of a hollow form, it is important to cool the interior by making small and more efficient cuts and by cleaning out the shavings frequently with a shot of compressed air. Similar to open bowls, cracking in hollow forms is basically a matter of preventing moisture from leaving the surface, while at the same time controlling wall thickness. One easy solution is to wrap the outside of the form with plastic wrap (*Photo 3*). This prevents moisture from leaving the surface and virtually eliminates the problem of cracking. The sheath can be removed when the piece is completed, and then the normal drying process begins, either by slow-drying thicker-walled forms or by hanging thinner-walled forms for quick evaporation. Almost any species with a wall thickness of 1/16" to 1/4" (1.5mm to 6mm) will dry in about four days in optimum humidity and temperature conditions.

Addressing cracks

If you do get a crack and want to salvage the piece, there are lots of ways to deal with it: inlays, butterflies, bridges, fillers, lacing, stitching, wire... I haven't seen chain used yet, but I'm sure it is coming. The one thing in common with most of these methods is that they require glue to fasten them. Woodturners often use cyanoacrylate (CA) glue, but this is not the best choice for fixing cracks in wood. CA glue is rigid and brittle when cured, and wood is constantly on the move. That is, when the climate or seasons change, humidity fluctuates and wood moves as it absorbs or loses moisture. Sometimes this wood movement is obvious and dramatic. Unfortunately, CA glue does not move with changes in humidity, and the result is that all those inlays and dust-filled glue plugs will eventually loosen and may even pop out. Epoxy is flexible, so it eventually bulges out of cracks. The best choice for gluing wooden inlays of any kind to a turned vessel or bowl is regular wood glue, or carpenter's glue, which tends to remain stable in this kind of application. It is not a quick fix like CA glue, but it works and it lasts.

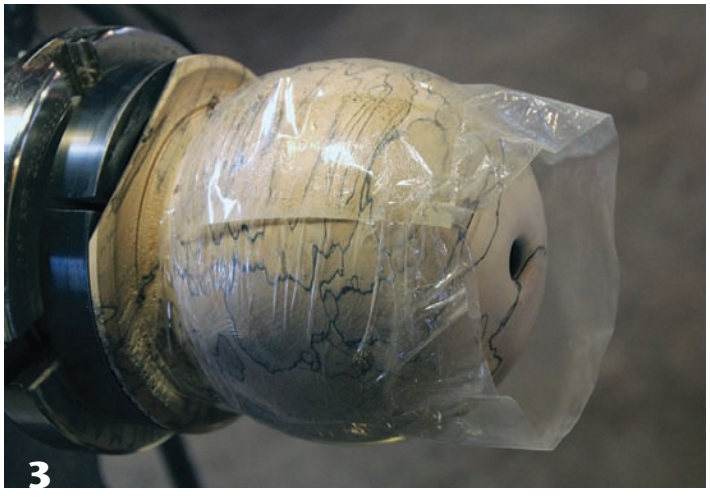
So the basic ways to prevent cracking are as follows:

- Try for consistency in wall thickness to prevent uneven drying.
- Stand at the lathe to hone your skills and cut down on the time it takes to make what you like.
- Reduce sanding speed to prevent heat.
- Contain moisture in the walls of hollow forms whenever possible and clean out shavings frequently to prevent internal heat buildup.

It should also be said that for all our best efforts, Mother Nature often has a mind of her own. So when we occasionally hear about cracks and other imperfections being "design opportunities," believe it! ■

David Ellsworth is a full-time studio woodturner and teacher living in Buck's County, Pennsylvania.

The author's *Spirit Forms* drying above his woodstove. Consistent wall thickness is the key to preventing cracks in the wood.



Plastic wrap traps in the wood's moisture during hollowing, postponing evaporation until the vessel's wall thickness is made consistent.