

# Drying Wood at Home

by Eric Meier

Allowing lumber to passively sit at a given humidity level in order to obtain a desired [EMC](#) (air-drying) may be the simplest and least expensive method of seasoning wood, but it is also the very slowest. Drying times can vary significantly depending upon wood species, initial moisture level, lumber thickness, density, ambient conditions, and processing techniques.

## Drying times and kilns

The traditional rule-of-thumb for air-drying lumber is to allow one year of drying time per inch of wood thickness; this adage obviously only takes a few of the aforementioned variables into account, but it's at least a rough starting point in understanding the time investment required in order to properly air-dry lumber.

In situations where green wood is to be processed into usable boards, (especially in the case of thicker lumber), a kiln is frequently used to control the drying process. While there are various types of kilns used to dry lumber, the basic premise is usually the same: a large insulated chamber or room is used to balance and control humidity, temperature, and airflow to safely and efficiently bring wood down to an acceptable moisture content.

The main advantage of a kiln is that with the increased temperature and airflow—all while carefully maintaining and controlling the ambient humidity—the wood can be dried much more evenly, minimizing any sort of moisture gradient between the outer shell (which dries very quickly) and the inner core (which slowly equalizes moisture with the shell). Thus, a kiln is able to dry wood much more *evenly*, and it's this uniformity in drying that allows it to also dry the wood quickly—simultaneously avoiding the drying defects usually associated with rapid, uneven drying.

## Drying defects

But kiln drying may also introduce internal stresses into the wood—particularly if an improper kiln schedule is used, or if corrective measures are not employed—resulting in a condition known as **case-hardening**. This defect is caused when the outer shell begins to dry faster than the core: the shell tries to shrink, but is inhibited by the still-wet core. If the moisture difference between the core and the shell is too great, the shell can dry in a stretched condition. Later, as the core eventually begins to dry and shrink, the condition is reversed, and the stretched shell prohibits the core from completely shrinking. In extreme instances of case-hardening, the core can split and check in an irreversible condition called **honeycombing**.



This piece of Red Oak (*Quercus rubra*) exhibits honeycombing, which is among the worst of drying defects, both because it's irreversible, and it usually can't be detected by looking at the face of the lumber.

Kiln drying wood at elevated temperatures also has many other secondary effects as well, such as killing powderpost beetles (a destructive wood pest) in all stages of their development. However, it can also cause some woods—such as [Black Walnut \(\*Juglans nigra\*\)](#)—to lose the vibrancy of their heartwood colors, resulting in a more uniform and/or washed-out appearance.

For most woodworkers, running their own kiln to quickly dry lumber may be impractical or excessive. In most instances, simply storing project lumber at a targeted humidity level is the best option to ensure it will be at the correct EMC when building time comes. However, in some cases, such as when processing logs or other green wood into lumber, a more meticulous procedure will need to be followed.

## Home air-drying tips

- **Process logs in a timely fashion.** If a tree has just been cut down, or there has been recent storm damage, it's best to process the logs into lumber as quickly as possible; doing so will help to open up the wood and aid in drying, which can prevent rot or stain from marring the wood. Bark on whole logs can act as a natural moisture-barrier, and if left unsawn, can contribute to fungal decay and deterioration in some species. A hallmark of poorly processed, do-it-yourself lumber is the presence of spalted or partially rotted wood.
- **Cut the wood slightly oversized.** Remember that wood shrinks as it dries. This, along with the material that will inevitably be lost when the boards need to be jointed/planed smooth, mean that green wood should always be cut larger than the desired finished size. (And you usually don't need to bother jointing/planing the wood prior to drying, since it will no doubt distort at least slightly during the drying process, and the edges should be dressed after the wood has dried to EMC—an exception to this is that two surfaces of a log should be jointed level to facilitate getting even and predictable cuts on the bandsaw.)
- **Seal the ends.** In addition to processing logs in a timely manner to prevent stain and decay due to excessive moisture, the opposite is also to be avoided: allowing the wood to dry out too quickly will result in splits and endgrain checking. It is important to remember that moisture escapes from wood about 10 to 12 times faster on the ends than through other surfaces. Sealing the endgrain forces the moisture to exit in a slower, more uniform manner. If this is neglected, the ends will tend to shrink faster than the rest of the wood, creating tremendous stresses on the piece that's ultimately only relieved with endgrain checks—a very common drying defect. (Although there are [specially formulated endgrain sealers](#) on the market, just about anything will do in a pinch: paraffin wax, polyurethane, shellac, or even latex paint can be used to seal the endgrain surface. The key is to build up a thick, obstructing film that will inhibit moisture from escaping at the ends of the board. In order to minimize the risk of checking, it is best practice to coat lumber ends within minutes—not hours or days—after coming off the saw.)
- **Stack and sticker.** Having lumber of uniform lengths and thicknesses greatly aids and simplifies the stacking process; once a log is sawn up into planks of satisfactory dimensions, it's crucial to stack them in such a way that they will be exposed to air on all sides—stickers are typically used for such a task. **Stickers** are small pieces of wood (usually about 3/4" x 1 1/2") that are used to add space between sawn planks, which increases ventilation and aids in a more uniform drying process. Sticker spacing varies depending on the species and thickness of the lumber being dried; a conservative spacing scheme would be every 12", though usually 16" or 24" spacing can be safely used on thicker pieces.
- **Add weight.** Once the stack of wood is stacked and stickered properly, it's helpful to add

weight to the stack. The lumber at the bottom of the stack is probably weighed down sufficiently by the wood on top of it, but boards near the top greatly benefit from added weight. Weighing the stack of wood down helps to prevent warping or distortion, which is especially important during the initial drying phase when going from green to an ambient EMC. Neatly and properly stacking, stickering, and weighing wood will go a long way towards ensuring that the drying process will result in flat, stable, and usable lumber.



This small stack of Buckthorn (*Rhamnus cathartica*) half-logs has just been cut, stacked, stickered, and sealed with a water-based wax emulsion coating.

- **Add heat once EMC is reached.** It's important not to rush the drying process too quickly, but once a wood pile has safely reached EMC, it may be necessary (especially during humid summer months) to bring the MC down even further for a specific project. This can be as simple as moving the lumber stack from a garage or shed into a heated basement indoors. In cases where shorter pieces are used, a drying cabinet can be used to gradually reduce the MC down to 12% mc, 6% mc, or any other level that an application may call for.

A drying cabinet can be nothing more than a simple wood cabinet with an incandescent lightbulb on a dimmer to finely control the light output—which in turn dictates both internal temperature and consequently relative humidity. Many thermometers (both traditional and digital) sold by big-box retailers also feature a hygrometer with a somewhat accurate readout of the relative humidity; the ability to know the rh of both the drying cabinet and the wood shop proves to be a helpful and prudent investment.

## Warp and distortion

When a wood species has a high [T/R ratio](#), it will tend to shrink in one dimension more than another while drying, causing distortion or warp. A good way to visualize the tendencies of wood during drying and shrinking is to picture the arc of the growth rings trying to flatten themselves out. (This of course is not actually the cause of the shrinkage, but it serves as a good memory tool to help visualize

dimensional changes.)



This endgrain view of Plum exhibits cupping. The board was initially cut flat, with the top and bottom originally being parallel. Further machining will be necessary to ensure the board is flat and square.

The results of uneven shrinkage vary depending upon the particular shape and grain orientation of the board; flatsawn boards become cupped, riftsawn square stock becomes diamond-shaped, and circular dowels become ovoid.

Additionally, there are a number of warping issues that can occur which are not solely related to uneven shrinkage. In certain cases, a pre-existing flaw is present in the wood itself, which is only brought out and made apparent by the drying process. This can result in defects such as: bow, crook, twist, or a combination of two or more defects simultaneously.

Regardless of the specific names that can be applied to distorted lumber, most drying-related warping issues can at least be minimized using a few simple guidelines:

- **Use proper stacking techniques.** As mentioned previously, by far the most important deterrent to warp is the adequate stacking, stickering, and weighing of a lumber stack.
- **Avoid juvenile wood.** Juvenile wood is wood that is formed during a tree's early years of growth, and can be thought of as an extension of the pith. There is no officially determined width of juvenile wood, (usually excluding the first few central growth rings is sufficient), but generally, the further the wood is cut from the pith, the better. Much like the pith itself, juvenile wood is very unstable, and has an elevated rate of longitudinal shrinkage; this increased shrinkage rate pulls against the mature wood and causes it to contract and deform either along the face of the board (bow), or along the side of the board (crook).
- **Avoid processing branches or leaning trees.** Wood that has been growing at a slant doesn't have uniform growth ring spacing and varies from the topside to the underside. This abnormal wood is called reaction wood, and it can cause a number of unpredictable warping problems during drying. In softwoods, reaction wood forms on the underside of a branch or trunk, and is called compression wood. Conversely, in hardwoods, just the opposite is true: its reaction wood forms on the topside and is called tension wood.
- **Avoid knots.** Simply put, knots are sections in the trunk where limbs once grew. In addition to shrinking unevenly or possibly coming loose during drying, (leaving a knothole), knots can also create areas of concentrated abnormalities in the wood grain, and consequently impact its shrinkage properties. The presence of large knots can result in dramatic and exaggerated warp during drying.
- **Handle spiral or interlocked grain with care.** Some wood species have what is called spiral or interlocked grain. Just as the name implies, the wood fibers grow in a twisted or interlocking manner. Not surprisingly, this can result in drying problems, most commonly twist—where one of the corners of a board is raised up out of the plane of the other three corners. Careful drying, along with proper stacking, stickering, and weighing can help alleviate difficulties caused by irregular or spiral grain.