

## Drying Wood Flooring in ARID CLIMATES

I was trained in forestry in the 70s at Paul Smith's College in upstate New York. When I left lush hardwood country bound for southwest Colorado, I was driving a U-Haul van full of woodworking equipment. I had ahead of me more than 2,000 road miles, entrepreneurial adventures, and a tutorial in arid climates.

My first business venture in the Southwest was crafting decorative boxes from unusual domestic woods for American craft galleries. That was my training ground for moisture. In the early days of the "box shop," my wife and business partner, Karen, remembers feeding the shop woodstove with my "mistakes." These were boxes created from solid pieces of burlwood. Most were fueling the fire because when I worked the wood, it was holding too much moisture to function correctly in our crispy atmosphere. When I cut away a thin lid from the piece, it warped.

After decades of working with wood in an arid climate, mainly manufacturing wood flooring, I have learned some important guidelines that I'll share.

**What is Dry?** Moisture content (MC) in wood is the weight of the moisture in wood, usually expressed as a percentage of its oven-dry weight. In my training, 8 percent MC was considered good and dry. Not so between the western mountain ranges.

Relative humidity (RH) is the ratio of the amount of moisture in the air to the maximum amount of moisture the air could hold at the temperature. A flooring professional from Florida once told me that in a visit to the west, when he crawled into his hotel bed, to his surprise "there was lightning in the sheets!"

During the summer months in our area, outside humidity levels often drop into single digits. These conditions affect life

### MOISTURE CONTENT

AT 70 DEGREES F, 30 PERCENT RELATIVE HUMIDITY = APPROXIMATELY 6 PERCENT MC IN WOOD

AT 70 DEGREES F, 50 PERCENT RELATIVE HUMIDITY = APPROXIMATELY 9 PERCENT MC IN WOOD

in all sorts of ways: dry skin, chapped lips, static electricity, crunchy potato chips. Inside my home, with no cooling system and wood stove heat, we rarely register RH higher than 20 percent. We affectionately call it "nosebleed weather." In arid climates, "dry" wood generally means 5 to 6 percent MC. This is most often the range where it will not gain or lose moisture unless it is exposed to an unusual condition. You will have the best results by starting with wood that is milled as close as possible to this range.

**Check Points:** When checking moisture in wood flooring, don't just check moisture on the ends of planks, but also along different points along the length. If the wood arrived to you at 9 percent MC and you are trying to acclimate to 6 percent, it will lose moisture fastest from the ends. You will initially see lower MC on these ends, but higher in the middle of the plank, an indication that acclimation is not complete.

In addition to your moisture meter, a set of digital calipers is a valuable tool to help tell the moisture story. In the above example, the moisture loss will result in a measurable width loss on the ends, especially in an unstable species. In Hickory, a 3 percent MC loss on a



5" wide plank will result in about 1/16" shrinkage. This can be mistaken for milling error.

One difficulty in measuring moisture is on some sites where trees grow, mineral taken up by the tree can lead to wacky meter readings. We call these anomalies "spike" boards, a piece that is showing an unusually high moisture reading. In our mill, spike boards are marked, kicked out, and redried. After that second round of proper drying, if they still register high, we assume the reading is a false positive.

Per NWEA Guidelines, a large sampling of readings (40 in 1,000 square feet of flooring) should be taken before installation. If you happen on a reading that varies wildly from the others, I would pull that plank out and stand it against a wall. This way it will have air circulation around all sides, and you can continue to monitor it during acclimation.



MC readings of kiln-dried flooring blanks preparing to be redried to 5 to 6 percent. Remember to take width measurements in the middle of flooring planks, as well as the ends.

The method of checking moisture by most wood manufacturers is the oven-dry test. It is more involved, but the most accurate way.

**Grain Pattern Matters:** A plank may contain plainsawn grain on one end and rift grain on the other end. If it was milled at 8 percent and acclimates down to 5 percent or 6 percent MC, the width of the board will change, but not consistently. The plainsawn portion will shrink more than the rift portion.

## AT THE SITE

### Drying Wood Flooring (Continued)



Flooring blanks cooling down after redrying at Muscanell Millworks.

**Avoid Moisture Invaders.** Wood is hygroscopic, meaning that there is an "attraction" between dry wood and water. Dry wood will gain moisture from available moisture in the surrounding environment. If you are starting with properly dried flooring for an arid environment, it is especially important to not let excess moisture sneak in through the following avenues during acclimation and installation:

- Plywood on subfloors not dried to within 2 percent MC of the plank flooring
- Masonry work
- Drywall work
- Painting and plastering
- Concrete basements that are still curing, releasing moisture to upper floors

Proper use of moisture retarders in areas such as crawl spaces is important in preventing post-installation problems.

**Creating a Swamp.** In the west, evaporative coolers or "swamp coolers" are a common and low-cost way of alleviating summer heat in homes and businesses. They work most effectively in dry climates, but also create artificially humid conditions inside of buildings. Especially if the structure is not properly ventilated, but even with "normal" use of these coolers, they can create an environment where wood flooring absorbs moisture faster on the top surface than on the bottom, resulting in "crowning." In cases where their use is unavoidable, we recommend choosing a narrow width of a stable species and cut (such as quarter sawn white oak). Allowing as much ventilation as possible when the evaporative cooler is in use can also reduce the impact to the floor.

**Monsoon Season?** When I moved to Colorado, I was surprised to hear the locals talk about this phenomenon. Turns out, this is a pattern of thunderstorms that occur over large areas of the southwest U.S. and into Mexico between July and mid-September. After more than 30 years, I frequently see the occurrence of this phenomenon vary, sometimes bringing our high desert into full bloom, other years skipping over the landscape almost entirely. A robust monsoonal flow can bring unwanted expansion in wood floors that are normally very dry.

#### "Net Fit" Can Turn Into "Not Fit."

The preceding two points, evaporative coolers and rainy seasons, highlight my next point. While I have had flooring contractors from dry areas tell me they install floors with "net fit" (no allowance for expansion), we always recommend leaving expansion space for that "rainy day."

When solid wood flooring expands, it does so mainly across the width of the plank (parallel to the growth rings or tangential). The thickness of the flooring (radial) is affected far less, and the length (the long axis of the tree or longitudinal) is affected hardly at all. Potential expansion from unusual times of higher moisture is especially important to consider in larger rooms. The greater the span across

the grain of the wood, the more critical it is to plan for this possible movement.

**Big Snow.** Another reason to leave expansion room, especially in mountain areas, is springtime snowmelt after a lot of snow. While this can happen in other U.S. climate zones that are not arid, the effect can be especially negative on a floor that is normally very dry. Runoff can accumulate around the foundation and dissipate from stem walls if adequate drainage is not present.

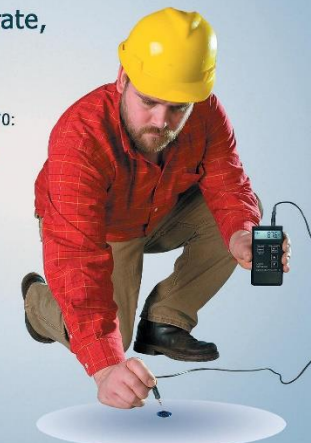
We love our arid climate, with more than 300 days of sun a year and unique geography. With a few adaptations, it can be an excellent environment for beautiful wood floors. ■

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