Coping With Shrinking Wood Callbacks

by Paul Fisette

To avoid costly problems, pay close attention to wood moisture content, and control humidity at the job site

COURTESY OF PORTA-NAILER

If a new hardwood floor picks up too much moisture from curing concrete or drywall mud, it will swell. this crushes the wood fibers and leaves gaps in the floor when the wood dries out again. To prevent this, acclimate the wood to a dry job site, which may require ventilation or dehumidification of the site.

Complaints about misaligned wood moldings, floor squeaks, and drywall cracks are like fingernails on a blackboard to a builder's ears. Callbacks can lead to customer dissatisfaction that will threaten a builder's reputation. Regardless of how you resolve these problems, you can always count on one thing: The cure will cost you money. Prevention is always the least expensive and most effective remedy.

Here is a selection of callback complaints that builders ask us about over and over again. Each time the questions remain the same: What is causing this problem and how can it be prevented?

Gaps in the Floor Boards

Six months after a new home is occupied, large gaps may open up between the floor boards. The gaps are rarely uniform. Usually several individual boards appear to have shrunk significantly while large areas of flooring remain tight. The separations run in a connecting zig-zag pattern across the room.

Cause: Fluctuation in relative humidity causes wood to absorb and lose moisture and, consequently, to expand and contract. Wood shrinks and swells most in the direction tangent to the growth rings (across a typical flat-grained board) and about half as much perpendicular to them. Shrinking and swelling along the length of a board are insignificant.

Even if the flooring is delivered at a low moisture content and installed correctly, and the indoor humidity at the time of installation is kept at a reasonable level (between 40% and 60%), moisture can still be a problem. The floor can absorb moisture from the basement slab, fresh paint, and curing drywall mud. The wood expands as it takes on this moisture and the edges of the boards press against each other and compress. As indoor humidity drops, the boards shrink to a size smaller than their installed size — a condition known as *compression set*. Furthermore, polyurethane finish drips between the floor boards during finishing, gluing portions together, so areas of the floor shrink as a monolith. When this happens, it appears that only a few boards have shrunk, when in reality all the boards have swelled and then shrunk.

Cure: Contrary to conventional wisdom, leaving a 3/4-inch gap around the perimeter of the room does not solve the problem. Flooring nails would have to be sheared off or pulled out of the subfloor in order for flooring to fill the recommended 3/4-inch perimeter gap.

In this case, the only cure is prevention. Relaying the floor is the only fix.

To avoid similar problems with a new floor, only install wood flooring that has equalized to its in-use moisture content (see "Acclimating Wood"). Ideally, according to the National Oak Flooring Manufacturers Association, you should buy wood flooring at 6% to 9% moisture content. But even if the flooring arrives at the job site at 10% to 12% moisture content, it should still acclimate to job-site conditions in a few days, as long as indoor humidity at the site is controlled by mechanical ventilation and, if necessary, dehumidifiers. The floor may take on additional moisture from curing construction materials after you have left the job, but at least the chances for compression set are reduced. Advise your customers that continual ventilation during the first year after construction will reduce the swelling as long as no large sources of moisture are introduced into the home. Keep records showing the moisture content of the wood when it arrived and what the humidity conditions in the home were during storage and installation. Good recordkeeping will help reduce your liability when problems arise.

Miters Open Up

Often the miters on window and door casings are tight when you install them, but they open up at either the long point or the short point after you leave the job, so the angles look as if they were miscut.

Cause: A dry piece of wood casing, tightly mitered and installed during the winter months, can look much different during the summer months as the humidity in the home rises. Indoor relative humidity can drop to 20% during cold periods and rise above 75% during humid summer months. Under these conditions, the moisture content of the wood casings can swing from 4% to as much as 16%. A 6-inch-wide casing can expand more than 1/8 inch. Because wood swells by different amounts in each direction, mitered connections remain tight at the bottom, but separate at the top as the casing swells. Similarly, the miters open near the short points as the wood shrinks (see Figure 1).

Cure: To prevent miters from opening up, first install high-quality wood casing that has an 8% to

12% moisture content. The easiest way to check the moisture content is with a moisture meter (see "About Moisture Meters," below). At the very least, acclimate the casing material to indoor humidity conditions. You might try using biscuits at the joint. But beware that if the indoor humidity fluctuates too much, the wood will have to move somewhere. If the miters are held rigid, the casing may pull away from the window stool, warp, or, in extreme cases, split.

The best prevention is to educate your customers about controlling indoor humidity. Encourage them to maintain indoor humidity levels between 40% and 60% year-round. This range is healthy and will help keep your work looking good. Finally, be sure to lead your customer on a careful walk-through after the job is complete and point out the level of craftsmanship. Again, record and document humidity levels in the home and the moisture content of the trim stock during storage and installation.

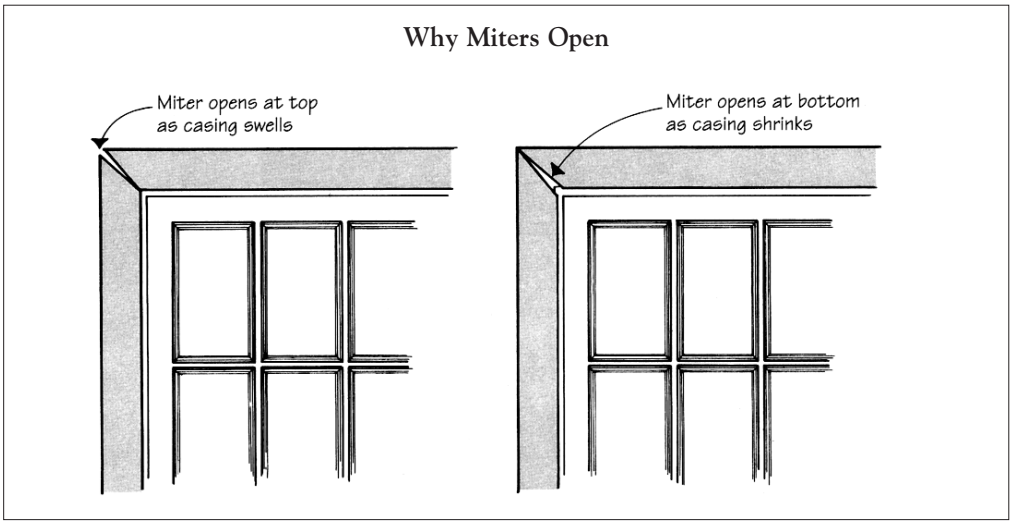


Figure 1. *As indoor humidity fluctuates, wood casings shrink and swell, causing miters to open up. As the casing swells, miters separate at the top but remain tight at the bottom (left). As the wood shrinks, the opposite occurs (right).*

Squeaky Floors

Squeaky floors rank high in nuisance value. Customers usually hold their complaints until the squeak has frayed their nerve endings. Then, when you attempt to fix it, they watch you like a hawk.

Cause: Squeaks result from wood rubbing against wood. Often the squeak occurs when a floor joist shrinks after it is installed. A space develops between the subfloor and the top of the floor joist, and when the homeowner walks over this spot, the subfloor moves against the joist and squeaks.

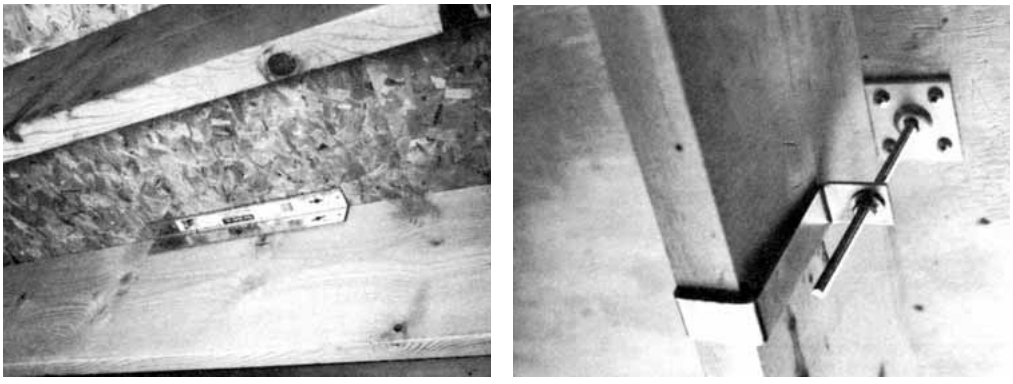


Figure 2. ***Two ways to fix squeaky floors:*** *The Floor Binder (left) has inclined nail slots, so as you drive the angle-iron sideways, the floor joist and subfloor are drawn together. The Squeakender (right) hooks under the joist, and pulls the subfloor down as the nut is tightened.*

About Moisture Meters

There are two types of meters for measuring the moisture content in wood — *electric resistance* meters and *dielectric* meters.

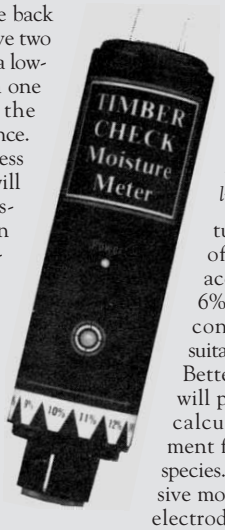
Dielectric Meters

Dielectric meters send out a radio signal that passes through the wood. The meter reads the return signal and measures either the power loss or the capacitance of the signal. These properties will vary depending on the moisture in the wood. Dielectric meters tend to be expensive ($300 and up) but they have one distinct advantage: You need only pass the device over the surface, so you can measure moisture content without damaging finished materials.

Electric Resistance Meters

In most cases, however, an electric resistance meter will be sufficient. You can tell an electric resistance meter by its two short, sharp metal prongs. To use the meter, stick these prongs about 1/4 inch into the back face of a board, which will leave two small holes. The meter passes a low-voltage electric current from one prong to another through the wood and measures the resistance. The wetter the board, the less resistance to the current it will have. Thus, an electric resistance meter is essentially an ohm meter, but instead of reading out in ohms of resistance, the meter translates the reading into percentage of moisture content. Readings will be slightly different for different species of wood; when you buy the meter, find out if there is some way to adjust for this.

There is a wide variety of electric resistance meters, ranging in price from $40 to $300. The less expensive models have built-in prongs, and read out at whole number percentages of moisture content. Most of these are only accurate between a 6% and 25% moisture content, but this is suitable for on-site use. Better low-end meters will provide a chart for calculating an adjustment for different wood species. The more expensive models have external electrode prongs that are connected to the meter by a cord, can be recalibrated for different species, and have a wider range of accuracy. For use on site, a medium priced ($140) meter with a durable shell is your best buy, as it will inevitably get dropped.



An inexpensive electric resistance meter with a strong shell, such as this one from Veritas, is adequate for gauging the moisture content of lumber on site.

— Clayton DeKorne

Moisture Meter Sources

Delmhorst Instrument Co.
51 Indian Ln. East
Towaco, NJ 07082
201/334-2557

Lignomat USA
P.O. Box 30145
Portland, OR 97230
800/227-2105

SDS Co.
P.O. Box 844
Paso Robles, CA 93447
805/238-3496

Veritas
1080 Morrison Dr.
Ottawa, ON K28 8K7
613/596-1922

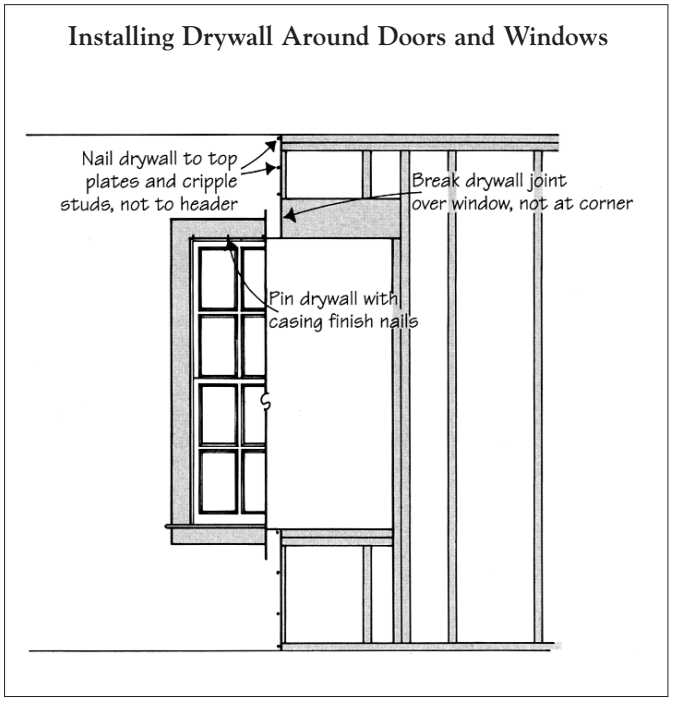


Figure 3. *To prevent drywall joints from cracking at the corners of windows and doors, place the sheet so the joint falls in the center of the opening, and then cut out the waste. Also, do not fasten the drywall to the header, but use the interior casing to secure the loose edge of the drywall.*

Acclimating Wood

The moisture content in woodwork is directly related to the relative humidity level inside a home. If the relative humidity rises, the wood will absorb water and swell. If the relative humidity drops, the wood will lose water and shrink. If the air remains at a fixed humidity level, the amount of moisture bound in the wood eventually stabilizes. At this point, the wood has reached its *equilibrium moisture content*.

The trick to keeping joints tight in finish woodwork is to use wood that has acclimated to indoor humidity levels. Finish stock should be brought into the house and stickered up to allow air to circulate around it. Wood that is brought from the lumberyard at an 8% to 12% moisture content should acclimate to jobsite conditions in a few days. If the wood is at 15% to 18% moisture content, allow at least a week. To be sure, check the wood with a moisture meter periodically until it reaches its equilibrium moisture content. The table below shows typical equilibrium moisture contents over a range of indoor humidity levels.

Once the wood has acclimated, make every effort to stabilize the relative humidity level in the building, at least until you've applied a finish.

— *P. F.*

Indoor Humidity vs. Wood Moisture Content

Relative humidity (%)	Equilibrium moisture content %
10	2.5
20	4.5
30	6.2
40	7.7
50	9.2
60	11.0
70	13.1
80	16.0
90	20.5

Note: *The equilibrium moisture contents shown here are typical for most softwoods at 70°F. The moisture levels will fluctuate slightly, depending on wood species and temperature.*

Cure: The best cure for floor squeaks is prevention. Use dry wood, keep it dry, and apply construction adhesive between all wooden surfaces. Also, use screws — not nails — to fasten subfloors and underlayment.

In theory, fixing floor squeaks is simple — stop the movement of the wood. But accomplishing this is often difficult.

If the squeaks are located in the first floor, you're in luck because you can usually get at the floor frame from the basement or crawlspace. One cure is to sister a length of 1x3 to the side of the offending floor joist. Holding it tight to the underside of the subfloor, attach the strip along the top edge of the joist using screws and glue. Make sure you also spread adhesive between the top of the 1x3 strip and the subfloor. The adhesive will help prevent future rubbing.

There are also a couple of products on the market designed to fix floor squeaks. One is the *Floor Binder* (510 Citizens Bldg., Aberdeen, SD 57401; 605/229-4332) — an angle-iron with inclined nail slots. The device is loosely secured to the underside of the subfloor and the joist. Then, you use a punch to drive the angle iron sideways, pulling the floor down by the inclined slots. Another device, the *Squeakender* (E&E Engineering, 11941 Harper Ave., Detroit, MI 48213; 313/371-2000), has a carriage bolt, which is secured to the subfloor, and a bracket, which hooks under the joist. When the nut on the carriage bolt is tightened down, the framing and decking are pulled together (see Figure 2, previous page).

The solution is not so simple when the squeak is located on an upper level of a home. To fix these adds the extra step of opening and repatching the finished ceiling.

Cracked Drywall

Drywall cracks when the framing moves. This happens most often at the upper corners of windows and doors.

Cause: If the drywall joints fall at the edges of a window, the finished joint will crack when the header shrinks. Headers with a moisture content of 19% can shrink 1/4 inch across their width.

Cure: Don't break drywall sheets at the corners of an opening. Instead, lap the sheet over the corner so the joint falls in the center of the window or door span, and then cut out the opening (see Figure 3). Also, do not fasten the drywall to the header. Screw the drywall into the cripples and wall plate above the headers. This lets the wallboard float down over the header. Use the interior window casing to hold the loose edge of the drywall secure.

Faux Truss Uplift

Have you ever seen drywall cracks at a ceiling corner or a center partition separate from the ceiling? This is

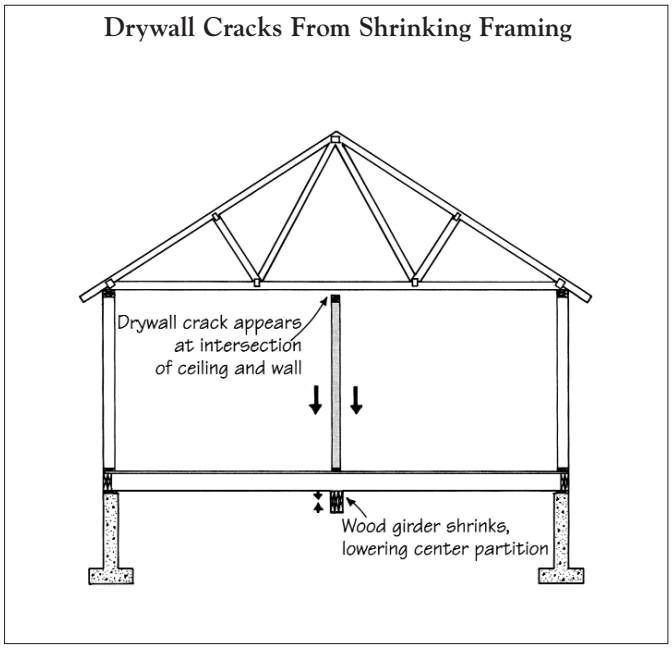


Figure 4. *Drywall cracks at the ceiling can open up when the basement girder shrinks and pulls the partition downward. The only fix is to install crown molding over the crack. Attach the molding to the ceiling but not to the wall.*

often caused by truss uplift, but not always.

Cause: In many cases, the triple-2x12 girder in the basement that supports the floor joists is the cause (see Figure 4). Since the beam is located directly beneath the center partitions and the partition sole plates are nailed securely to the deck, shrinkage of this beam can pull the partitions downward, opening a crack at the ceiling. This happens frequently with lumber that is grade-stamped "S-DRY," meaning that it was surfaced at a moisture content of 19% or lower. Yet once the house is occupied and heated, the moisture content of the girder, joists, and partition studs can fall to 11%. The cumulative shrinkage of all these members can easily equal 3/8 inch.

Cure: While the cause is not true truss uplift, the effect is the same. Fasten trusses to partitions with hardware such as the Truss-Float-R (5370 Chestnut Ridge Rd., Orchard Park, NY 14127; 716/662-7877), which allows the ceiling drywall and wall partition to float independently.
Use dry framing lumber, especially for girders. Lumber stamped "MC 15" is a good choice.

The fix is the same as with truss uplift. Install a molding in the corner at the ceiling. Attach the molding to the ceiling only, allowing the wall to move.

By the way, this problem can occur in houses without roof trusses, too. To prevent this, break ceiling joists over a center bearing partition. As the partition settles, this break will act like a hinge, allowing the ceiling to drop as the center bearing shrinks.

Interior Doors Won't Close

The doors closed properly when they were installed, but after a couple of months the doors began to rub against the strike jamb and now they are too wide to be forced closed.

Cause: The doors have absorbed moisture, but to find the exact source requires a bit of investigation. Determine whether all doors have swollen or if just certain ones have, like the bathroom or basement doors. Isolated swelling suggests local humidity problems.

Cure: Wood doors should be delivered and installed at a moisture content between 6% and 12%. But even those doors can become unstable in houses with fluctuating humidity levels. For best results, doors should be sealed as soon as they are delivered (right after they are made would be even better). If the doors are prehung units, remove all the hardware and seal the undercut edge and all hardware cutouts, including hinge mortises and the inside of lock bores. Endgrain is very absorbent. An unsealed edge will suck up moisture rapidly under humid conditions. If doors arrive at the job site unsealed, check the moisture content by inserting the probes of a moisture meter into the endgrain. Then seal it when conditions are right.

To solve the immediate problem, plane the door to size and reseal the edges. Also, as with all wood movement problems, control the indoor humidity. ■

Paul Fisette is a wood technologist and director of the Building Materials Technology and Management program at the University of Massachusetts in Amherst.