

Most all wood floors will have an occasional squeak, pop, or creak. This is considered an acceptable condition that does not make the floor fail to perform. But like a lot of things that go into homebuilding, it's often the things that the homebuyer doesn't see that really count. And this is particularly true when it comes to fastening wood floors. It takes the right combination of materials, tools and techniques to properly install a wood floor. Done right, the homebuyer notices only the beauty of the floor itself. Done wrong, the problems stick out like a sore thumb: creaks, pops, moving boards, uneven boards and ugly nail holes. You only have one chance to get it right. So, use care and attention to detail, along with the right materials, tools and techniques, and you'll win every time.

The subflooring itself can contribute to noises. Particle board is well known for fastener movement and resulting squeaks. Some OSB products have shown low fastener retention as well. When coupled with typical moisture events during construction, OSB subflooring is at risk for producing noises related to moisture-induced thickness swell associated with reduced density and irregular flatness. Plywood on the other hand may show some delamination which affects fastener holding.

Since wood flooring is normally placed in homes that are not designed to meet the bare minimum subfloor performance requirements, a system that exceeds the minimum is recommended by NWFA. The APA has a recommended system called a Code Plus System that shows the use of thicker panels, a step above the minimum performance rating. A subfloor system should be sufficiently stiff to allow minimum movement.

The NWFA recommends the following for acceptable subfloor/truss systems;

1. On truss/joist spacing of 16" o/c or less, the industry standard for single-panel subflooring is nominal 5/8" CD Exposure 1 Plywood subfloor panels (CD EXPOSURE 1) or 23/32" OSB Exposure 1 subfloor panels, 4' X 8' sheets.
2. On truss/joist spacing of more than 16", up to 19.2" o/c, the standard is nominal 3/4" (23/32" T&G CD EXPOSURE 1) Plywood subfloor panels, (Exposure 1), 4' X 8' sheets, glued and mechanically fastened, or nominal 3/4" (23/32") OSB Exposure 1 subfloor panels, 4' x 8' sheets, glued and mechanically fastened.
3. Truss/joist systems spaced over more than 19.2" o/c up to a maximum of 24" require nominal 7/8" T&G CD EXPOSURE 1 Plywood subfloor panels, (Exposure 1), 4' X 8' sheets, glued and mechanically fastened, or nominal 1" OSB Exposure 1 subfloor panels, 4' x 8' sheets, glued and mechanically fastened — or two layers of subflooring. Or brace between truss/joists in accordance with the truss/joist manufacturer's recommendations and with local building codes. Some truss/joist systems cannot be cross-braced and still maintain stability.

The reason for the thicker requirement for OSB is that tests have shown the thicker 3/4" (23/32") OSB holds wood flooring fasteners only as well as 5/8" plywood. Better nail holding produces a quieter floor with less movement among boards. Less movement among boards for site finished flooring also produces less finish separation or flaking along board edges.

We hear the term, L/360, as the term for the greatest allowable deflection at center span. This means that for a span of 20 feet, the deflection can be just over 5/8" at center span. Today in order to accommodate the wide-open areas in homes, these and longer spans are typical, thus significant deflection can occur along the length of joists. For less deflection a stiffer joist system is needed, such as L/480 or L/560 and greater. In addition, wider spacing than the traditional 16" On Center between supporting joists allows for even more variation. **These systems all pass building codes and support the intended loads; however, with hardwood flooring the**

expected performance may not be achieved with maximum joist spacing, maximum spans, and minimum thickness subflooring. The stiffer systems are also generally also recommended for engineered flooring, since these products are normally thinner and add minimally to the strength of the system. Manufacturers have specific subfloor specifications, so always follow the manufacturer’s recommendations.

Prior to the flooring installation, the house environment must be at near occupied conditions. The subflooring should be clean dry and flat. Flat for the minimal framed system may not meet the minimum requirement. For the L/360 and a 20-foot span, the 10-foot deflection allowed can be 1/3-inch, which is more than the 1/4-inch most commonly required for flatness. Further, the subfloor may be flat enough before it is loaded with flooring, furniture, and people, but not after the loads are applied. Again where a minimum system is in place, inform the customer that the final performance may not meet their performance expectation.

The wood subflooring materials must not exceed 13% moisture content. Using a wood moisture meter, measure the moisture content of both the subfloor and the hardwood flooring to determine the proper moisture content. The difference between the moisture content of the wood subflooring and the hardwood flooring must not exceed 4% for strip and 3% for plank flooring.

The actual flooring fastener can contribute to noises if improperly placed or an incorrect fastener is used. Over driving the fastener has been shown to split the flooring tongue away from the board and compromise the fastener connection. Smooth shanked brads and other small nails don’t hold well and can contribute to noises.

Fastener Requirements

Hardwood Product	Fastener Requirements
3/4" Solid	1"- 2" from ends/spaced 8"-10" apart
5/16" Solid	18–20 gauge thick, minimum 1" long
7/16" Solid	18–20 gauge thick, minimum 1¼" long

Below, are the NWFA’s suggested installation recommendations; always follow manufacturer’s specific instructions for installing hardwood flooring.

Hardwood Product	Expansion Zone	End Joint Stagger	Nailing Pattern
*3/4" Solid Hardwood - Strip Flooring 1-1/2" - 2-1/4" wide	3/4"	6"	1"- 2" from ends/spaced 8"-10" apart
- 3" to 5" wide plank	3/4"	8" - 10"	1"- 2" from ends/spaced 6"- 8" apart
- Wider than 5" wide plank	3/4"	10"	1"- 2" from ends/spaced 6"- 8" apart
**5/16" & 7/16" Solid Hardwood	3/4"	6"	1"- 2" from ends/space 3" - 4" apart

*Before installing 3/4" Solid Wood flooring, place an approved vapor retarder over the wooden subfloor. Some examples of acceptable vapor retarders over wood subfloors include: An Asphalt-saturated kraft paper such as **AquaBar B** or #15 felt that meets ASTM Standard D-4869 or UU-B-790, Grade D.

** Before installing 5/16" & 7/16" Solid Wood flooring, place an approved vapor retarder such as a 6 mil poly over the wood subfloor.

Hardwood flooring can be affected by varying levels of humidity within homes. Maintaining the homes air relative humidity levels within the 35–55% range help protects the hardwood flooring. Advise your customers the following;

- Heating Season (Dry): A humidifier is recommended to prevent excessive shrinkage in hardwood floors due to low humidity levels. Wood stoves and electric heat tend to create very dry conditions.
- Non-Heating Season (Humid, Wet): Proper humidity levels can be maintained by use of an air conditioner, dehumidifier, or by turning on your heating system periodically during the summer months. Avoid excessive exposure to water during periods of inclement weather.

Tips on Solid Hardwood

As a general rule, a 3/4" expansion space must be left around the perimeter and at all vertical obstructions. The thickness of shoe molding is not an acceptable expansion zone.

Random-width plank is laid out with alternating courses varying by widths. Start with the widest board, then the next width, etc., and repeat the pattern.

Layout: Avoid "H" patterns. Stagger end joints of boards row to row.

