

## Gaps Between Strips in Hardwood Floors



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*If it's not marked NOFMA, it's not certified.*

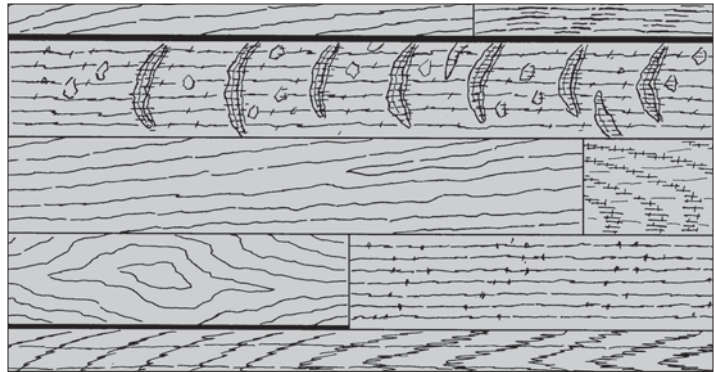
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## Gaps Between Strips in Hardwood Floors

### COMMON COMPLAINTS

A common complaint with wood flooring is gaps between strips in flooring. Often these gaps occur because of normal, seasonal conditions. However, occasionally gaps appear because of improperly manufactured or installed flooring. You can be assured that the wood flooring has been manufactured to proper standards for moisture content and configuration (two contributors to gaps in floors) by purchasing NOFMA-certified flooring. For proper installation, generally it is best to use an experienced, well-trained professional. After reading this TIP, if you believe the gaps are “abnormal”, contact the NOFMA office or hire a NOFMA-Certified Wood Flooring Inspector to help determine the cause of the gaps and possible remediation. For contact information, visit [www.NOFMA.org](http://www.NOFMA.org).



### NORMAL GAPS

The term “normal gaps” can have various definitions depending on the width of the strips, whether boards or parquet patterns, the size of the room, and the severity and duration of the low outside temperatures and hence the intensity of the indoor heating.

Gaps between strips that occur seasonally and close during seasons associated with higher humidity or the non-heating season are considered normal gaps. Normal gaps may vary in width from “hairline” gaps (thickness of stationary) to more significant gaps (up to or greater than the thickness of a quarter) depending upon the size of the strips of flooring. The larger gaps are expected in geographical areas associated with an extended dry heating season, and warm, mild, humid summers that require little air conditioning, i.e. the Great Lakes or New England area.

In addition, plank or strip floors sometimes “panelize” due to movement of underfloor construction and reflect gaps directly associated with the subfloor movement. To further complicate matters, normal wintertime seasonal shrinkage may be concentrated into only a few gaps if the finish glues individual boards into panels. Other joints between these larger gaps generally remain tight. In this event, some gaps may be considerably wider than the thickness of a quarter but still considered normal if the larger gaps nearly close during the more humid season.

Plank floors, because of widths involved, can shrink individually up to three or more times as much as  $2\frac{1}{4}$ " wide strip floors. Therefore, normal, seasonal gaps found in those floors can be much larger than in a strip floor. Again, if the floor expands so that gaps disappear during the humid non-heating season, they should be considered normal. For parquet patterns, seasonal shrinkage and movement at ends of units may be quite noticeable. Also, the installation procedures may leave gaps in the floor to maintain pattern lines. Therefore, some permanent gaps in parquet may be necessary. In addition, normal gaps between  $\frac{3}{4}$ " thick parquet units installed in mastic, can remain near perimeter walls if cork expansion joint filler is omitted. (See NOFMA's *Installing Hardwood Flooring*.)

### ABNORMAL GAPS

Large gaps in wood floors that do not close up in more humid months can be caused by job site conditions, handling and storage, or manufacturing variables. Generally, a site inspection is necessary to determine the actual cause or causes of abnormal gapping. NOFMA-Certified Wood Flooring Inspectors have been trained to know

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how to inspect wood floors and determine the probable cause(s) of problems such as abnormal gapping. These inspectors are located throughout the US. There is a current list available at [www.NOFMA.org](http://www.NOFMA.org).

When the complaint is gaps between flooring pieces, the moisture content of flooring will normally be significantly lower than when the flooring was installed. The subfloor and joists will also contain less moisture than when the flooring was installed. A very moist job site environment causing expansion about the time the flooring is installed may be the cause of gaps. When this extra moisture is lost, shrinkage and movement of the flooring and underfloor materials is the result.

Energy-conscious homebuyers have demanded building practices that sometimes increase the moisture within a structure during the building process. Vapor retarders, ostensibly made to prevent warm or cool air loss, may seal in the new home's moisture. The excess moisture may take far too long leaving the home. Literally, hundreds of gallons of water used in concrete (280-300 gallons per 10 cubic yards), masonry, thin-set tile mortar, plaster, drywall joint compound, latex paint, and many other building components evaporate into the home's interior. Not only is this moisture absorbed by a wood flooring system but also by other wood materials in the home. This moisture will often cause wood flooring to expand before, or soon after, installation. When this happens, the strips, planks or parquet units close on one another. The flooring will move or reposition itself and, if the pressure is sufficient, cupping or buckling may result. Once the dry (or heating) season arrives, the total moisture environment changes, and the flooring and underfloor structure will dry out. If the earlier moisture absorption was great enough, the drying season will produce "abnormal" or permanent gaps. From this point the gaps will most likely never completely close in humid months if seasonal environmental changes are normal.

One can identify abnormal versus normal gaps by making proper observations, measurements and moisture content readings of the flooring and underfloor materials.

**FOR EXAMPLE:** Flooring moisture content: 6% to 9% (average of readings)

Measurement characteristics: Using the 2 1/4" strip as our example, it is difficult for a set of twenty 2 1/4" strips to span only 45" due to slight variations. The actual measurement may be 45" to 45 1/8" slightly more or less.

If the flooring is exposed to extra moisture prior to installation, the flooring will absorb the moisture and expand. It may be too moist when installed and therefore oversized: the 20-strip span will be well over the 45" to 45 1/8" range. Once these expanded strips are installed and the environment is brought to normal occupied conditions, the installed flooring strips will lose moisture to the drier environment and shrink. Now the individual boards will measure very close to 2 1/4" at 6 to 9% average moisture content. The shrinkage back to the normal conditions will show up in gaps. If individual boards have gone through an extreme moisture introduced expansion, their edges may have been crushed so their actual width is perhaps slightly less, on average, than the original manufactured width.

Plank flooring will have all the characteristics described for strip flooring except that under identical circumstances, plank will exhibit more movement per board and hence larger gaps. Wide planks are more likely to cup. A slight amount of cupping is considered normal for plank flooring during seasonal changes.

Inadequate nail spacing can also contribute to gaps. Nails should be placed every 10-12" with a *minimum* of two nails per board within 1-3" of the ends. An inadequately nailed floor has more opportunity to move under pressure. Because inadequately nailed flooring strips can more easily move to new locations, gaps are likely to result from exposure of the flooring to high moisture conditions.

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Squeaky floors are another indication of floor movement after installation. Sufficient side movement will loosen nails slightly, resulting in squeaks when foot traffic puts pressure on the floors.

### **MATERIAL-RELATED CAUSES FOR GAPS**

Another cause of abnormal gaps can be improperly manufactured wood components. This usually occurs because lumber is not adequately dried before the flooring is milled.

NOFMA member flooring mills are operated to produce a product precisely milled to the intended width (i.e. 2 1/4") as the product exits the flooring machine. This is the case regardless of the moisture content of the wood being processed.

### **MEASUREMENT CHARACTERISTICS**

If the moisture content of the wood is too high when flooring is milled (generally in the range of 12% and above) the flooring will later shrink to the range normal for its environment, usually 6% to 9% moisture content. In this situation, 2 1/4" strips will shrink more than 1/32" in width leaving gaps between strips. These strips will be less than 2 1/4" even during the humid season.

The 45" span used in our earlier example may be very near, or even less than, that exact measure. The key is the face width of the boards within the set. As previously indicated, some will be below the normal 2 1/4" face width. The difference will be gaps between boards. As in the first assessment these principles also apply to plank flooring, except that the difference in width will be proportionately larger in relation to the width of the planks used.

### **OTHER CAUSES FOR GAPS IN STRIP AND PLANK FLOORS**

There are several other reasons for gaps in floors which have little relationship to job site moisture problems. Some are:

**SYSTEM MOVEMENT:** When outside walls settle, or the center supports under the house's center beam move, the area of the floor actually stretches, causing gaps over joints in plywood subfloors. This can be detected in foundation walls or by checking the flatness of the floors.

**OVER-DRYING AROUND FORCED AIR HEATING DUCTS AND VENTS:** When gaps are associated with areas above heating plants, heating supply vents (particularly closed vents) etc. (See NOFMA's *Installing Hardwood Flooring* for correct insulation techniques.)

**IMPROPER SUBFLOOR MATERIALS:** Nail-holding capability is very important in floor installation. If the subfloor does not hold nails well, gaps can occur from less-than-abnormal moisture absorption or heavy traffic.

The following are recommended subfloor materials categorized by construction:

- Wood Joist Construction: Either kiln dried boards of NO.1 or NO.2 Common Pine or other dense, Group 1 softwood, or exterior sheathing grade, performance rated plywood 5/8" (19/32") or 3/4" (23/32"). Also, 3/4" (23/32") OSB is comparable.
- Concrete Slab Construction: 3/4" or thicker sheathing grade exterior plywood over the appropriate vapor retarder.
- 3/4" Tongue & Groove Parquet Installation Over Joist Construction: The primary subfloor as recommended for joist construction (see above) should be overlaid with 1/4" or thicker plywood (offsetting seams or installing the 1/4" plywood on a diagonal) and nailed in 4-6" grids to the subfloor.

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Wood-fiber composition panels, commonly referred to as fiberboard, wafer board, MDF, particleboard, or others, are unsatisfactory subfloor materials for solid tongue & groove hardwood flooring. These types of materials do not hold fasteners well enough. Also, composition panels will expand from moisture absorption like most any wood product, but do not shrink appreciably when the moisture dries out, leaving floors that are not flat. Hardwood floors depend on lasting nail retention in the subfloor in order to perform well over the life of a home – perhaps 100 years or more. Inadequate nail-holding characteristics should be avoided at all costs.

### ASSESSING CAUSES FOR GAPS: PARQUET

Parquet patterns assembled from  $\frac{3}{4}$ " flooring are usually glued to the subfloor with a mastic. If the subfloor is concrete, a vapor retarder is required under the flooring (see NOFMA's *Installing Hardwood Flooring*). Absence of an adequate vapor retarder can result in moisture changes with associated movement of the parquet pieces causing gaps.

Cork is placed in the required perimeter expansion space to support the flooring at the walls. This specialized cork, with a very resilient binding resin, acts as a compression spring. It should be cut in small pieces to fit snugly between walls and each unit of parquet. If cork is not used, permanent gaps near the walls of the room may develop. Since there is nothing to push the parquet back as it dries during the heating season, these gaps will be larger than normal gaps as seasonal drying occurs.

Parquet with abnormally large gaps during the heating season has no doubt gone through the post-installation high-moisture cycle described earlier for nail-down products, and the proof is established by moisture checks and measurements, such as that described for strip or plank floors. Since many parquet patterns alternate grain direction, movement will occur in all directions, but only 50% as much as plank or strip in any direction. However, small gaps at ends of parquet units may be more noticeable than the side gaps.

### SOLUTIONS: GAPS BETWEEN BOARDS

Regardless of what moisture environment a floor has been exposed to, or exists when inspected, removal and replacement of a wood floor to alleviate gaps is usually both unnecessary and self-defeating. New flooring material is likely to have a different moisture content than the flooring that is in place and acclimated in the home.

All parties involved are usually well advised to leave the floor in place and make repairs if possible. Once an existing floor has been acclimated to a home's environment, it is likely to remain stable and, with professional repairs, can regain the appearance it had when new with no loss of service.

**NORMAL GAPS:** If truly normal, in the sense the gaps close up in summer months, no repairs are practical. Any filler used to fill up gaps when they appear (i.e., when the floor is dry) will be pushed out as the wood expands when it picks up moisture. These spaces are also necessary for humid season expansion and, if filled, can cause so much stress the flooring may buckle or the wood edges may be crushed during the expansion cycle. Thus, fillers may cause uglier gaps than those Mother Nature forced on the floors.

**ABNORMAL GAPS:** A professional flooring contractor can likely repair floors that have gone through a period of moisture absorption and then dried leaving abnormal gaps. With a proper repair, the gaps should not be prominent and should nearly disappear. In this case, it may be possible to properly fill occasional gaps  $\frac{3}{32}$ " or less, depending on residue in the gap, movement between pieces, and/or seasonal change.

As the boards expand and shrink, grain direction may also play a role in the evenness of the resulting surface. Boards with vertical (quartered) grain may become lower than adjacent flat-grain boards, thus requiring re-sanding.

**NOTE:** If the floor is cupped or crowned, or the edges of the boards move, contact NOFMA at 901.526.5016 or [info@NOFMA.org](mailto:info@NOFMA.org).

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## REPAIRING GAPS

After determining which gaps are abnormal, the time to initiate repair is midway between the seasonal extremes of heating and cooling. For much of the US this would occur near the months of April or October.

First, the flooring should be assessed for movement between strips. Strips may require face nailing, particularly near the groove edge to eliminate movement. (Face nail into the open grain of oak and ash so the nail holes, when filled, do not show. The filler may be scratched with a utility knife to imitate grain to further camouflage the hole.)

Next, thoroughly clean the gaps. Old filler and trash should be scraped and vacuumed away.

Filler is then applied down into the gap to the tongue level. For latex filler in the wide gaps, shrinkage of the filler may require more than one application.

After filling, coloring (stains), screening, and re-coating may follow where surface finish is applied. If refinishing the floor is determined to be necessary at the mid-season inspection, filling should probably occur after required face nailing and the first sanding cut.

For waxed floors, where wax has been embedded in gaps, the filler may not adhere to the strip edges even after cleaning. Test an area first.

For the occasional gap larger than  $\frac{3}{32}$ " , most often extending across the entire room and associated with an underfloor support or subfloor panel edge, some options for repair include:

- replacing a run of flooring with oversize strips;
- taking up runs of flooring adjacent to the gap and reinstalling them tightly together;
- or cutting an appropriate sized shim and gluing it into the gaps.

If a great many gaps in a small area (i.e. 10' x 10' ) are close to  $\frac{3}{32}$ " wide, then filling may not be the appropriate repair. More extensive repair options used for gaps wider than  $\frac{3}{32}$ " may be necessary.

When properly repaired, gaps should not be noticeable and filler should remain in the gaps after repeated seasonal changes.

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