

# LAYING WOOD FLOORS OVER CONCRETE SLABS

*A floating plywood subfloor will handle seasonal movement — but not without a good vapor barrier*



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*A flooring contractor finishes a parquet floor installed over a slab foundation.*

Wood flooring is a quality finish material that is fine for applying over concrete slabs. In contrast to tile materials, which can feel hard and cold, or carpet, which can act as a reservoir for dirt and mildew, wood flooring provides warmth, comfort, and natural beauty. But installing wood floors over concrete slabs requires careful attention to the different characteristics of the two materials. In this article, I'll review the choices in wood flooring over concrete, discuss the risks and appropriate precautions involved, and explain how best to apply my favorite system: wood strip flooring with a plywood subfloor.

## Reviewing the Options

A number of different types of wood flooring are used over concrete:

- glue-down laminated strip and plank
- glue-down laminated and solid slat parquet

- floating strip flooring
- traditional strip or plank flooring

The first three types of flooring are generally applied directly over concrete subfloors. Applying traditional strip or plank flooring over concrete, which I'll describe later, is a more complicated procedure.

**Glue-down laminated products.** For overall dimensional stability and resistance to changes in shape, laminated flooring products, whether parquet, strip, or plank, are the simplest products to install. They are glued directly to the concrete with elastomeric chlorinated solvent-based mastic.

These materials are typically made with a thin finish layer of hardwood veneer bonded to a hardwood plywood substrate. The more plies in the construction, the more stable it is. However,

the laminated construction limits the thickness of the top layer of veneer. The service lifetime of these products is limited by the thickness of the finish veneer: One or two sandings and refinishing will bring the material down to the substrate.

**Glue-down parquet.** Solid slat parquet (sometimes called "mosaic" parquet) counters the problems of dimensional stability by reducing the size of individual pieces to  $5/16 \times 7/8 \times 6$  inches or less (see photo above). Very small spaces are left between individual pieces during installation so that normal expansion and contraction does not accumulate. Also, 80% of the individual pieces are quartersawn, which minimizes dimensional changes. Like laminated strip or plank flooring, this parquet is also installed directly over concrete with PVA (polyvinyl acetate) or elastomeric chlorinated solvent-based mastic.

# MEETING THE MOISTURE CHALLENGE

For many years, I ran a training school for wood floor installers. At the beginning of the course, I asked each new class to stand, raise their right hands, and repeat after me: "I do solemnly swear that I understand that wood expands when it absorbs moisture and shrinks when it loses moisture, and that I will take this undeniable fact into consideration whenever I design and construct anything made of wood."

Swearing the oath was a humorous way to impress into everyone's memory just how important moisture is when you're installing wood flooring. If moisture isn't properly taken into account, the wood can dry and create shrinkage cracks, or swell up and buckle or warp. You need to address this problem carefully any time wood flooring is installed, not just when working over a concrete slab.

Wood floors should only be installed after the interior moisture content of the building has reached equilibrium. This prevents the excessive moisture present during any major renovation or new construction project from being absorbed into your carefully kiln-dried wood floor. Ideally, the proper moisture content for the installation of any wood floor is midway between the high humidity of summer and the seasonal low moisture levels that occur near the end of the winter heating season. It is your responsibility to check the moisture content of the subfloor and wood flooring with a moisture meter and make sure that the proper conditions exist prior to delivery and installation.

**Moisture problems with concrete.** A concrete slab in contact with the ground presents two main concerns: There may be excessive moisture present before and during the installation of a wood floor that will cause problems, and there may be an incursion of excessive moisture after the building is completed that will cause similar problems.

Somewhere in many people's collections of commonsense "facts," along with the idea that "A dog that wags its

tail won't bite," is the statement, "Concrete is waterproof." After all, if concrete wasn't waterproof, how would Hoover Dam hold back all that water? But in fact, concrete is porous. Millions of microscopic spaces throughout a concrete slab allow water, and especially water vapor, to pass through.

To prevent moisture from entering a building through concrete, builders must place and build the foundation



*To test for water vapor coming through a slab, tape a 2-foot-square piece of poly to the surface (left). After 24 hours, if condensation appears on the poly or the slab is damp (right), enough moisture is present to make a wood floor risky.*

Place several solid, smooth-backed rubber or vinyl mats on the surface of the concrete for 12 to 24 hours. If the area beneath the mats is damp, or even darkened slightly, this indicates excessive moisture coming through the slab. A variation of this test is to tape 2x2-foot squares of clear polyethylene to the surface of the concrete with duct tape and observe it after 12 to 24 hours (see photos). When moisture is pre-



properly, including good perimeter drainage. Wood flooring manufacturers also specify a 6-inch layer of gravel and a 6-mil poly vapor barrier under the slab. The few hundred dollars it costs to install the vapor barrier is well worth it for the large reduction in the risk of moisture coming through the slab (see "Sub-Slab Vapor Barriers," 5/94).

With an existing slab, the only way to be absolutely sure the gravel and poly are in place is to cut or core the slab, which will puncture the vapor barrier if there is one. Sometimes you can see the vapor barrier around the perimeter before backfilling and grading are completed. But it's always advisable to test the slab for moisture before you install wood flooring.

**How to check a slab for moisture.** If there is excessive moisture present under the slab, it is continually evaporating up through the surface of the concrete. There are electronic meters made to check concrete moisture levels. I have never used them, though — I always employ the rubber mat test.

sent, putting any kind of wood flooring down is a bad risk, even when you place an additional vapor barrier on top of the slab.

**Limiting your own risk.** In the real world we all deal with the ultimate boss, the customer. Many times the client wants work completed as quickly as possible, and will try to push you to "Just do it!" If you fail to point out potential problems to the customer and make him understand the risk, you assume the risk for the customer.

When my flooring company encounters a moisture problem, I prepare a letter explaining the situation, along with an unconditional release of liability, with signature blocks for the customer. I request a meeting with the customer, and present the facts calmly and professionally. I then present the letter and release for his signature, and explain that I am unwilling to assume the increased risk of proceeding with delivery of materials until excessive moisture conditions are eliminated. If the customer refuses to accept the risk, I refuse the job. —H.B.

**Floating floors.** There are two major types of floating floors. The most widely marketed is a laminated product that looks very similar to regular strip flooring after installation (see Figure 1). Since it isn't nailed or glued to the substrate, the subfloor has to be very flat. First, a 1/8-inch-thick closed-cell foam padding is placed on the concrete. The pad cushions the floor and compensates for irregularities in the slab surface that might make the floor "noisy." Then the individual tongue-and-groove pieces of flooring are edge-glued to each other by placing ordinary carpenter's glue in the grooves before tapping each piece into place. The next question I usually hear is, "What keeps it down?" to which I answer, "The same thing that keeps a rug on the floor: gravity."

The second major type of floating flooring is made by Junckers (pronounced "Yonkers"). It is solid wood, 7/8 inch thick, fastened together with metal clips that snap into slots in the bottom of the flooring (Figure 2). Junckers flooring is also placed over a 1/8-inch closed-cell foam pad.

A critical design factor with any floating system is to allow enough space around the perimeter of the installation so that when the floor expands in the summer there is plenty of room. Likewise, when the floor contracts during the heating season the perimeter molding must be wide enough to cover the space that occurs. I always leave as much space as the trim will cover.

### Installing Strip Flooring

Of all the flooring products available, I prefer solid wood strip flooring. To install it over a concrete slab, you need to first provide a vapor barrier and a good nailing substrate. I always install a double layer of 6-mil poly directly on top of the concrete. Where sheets overlap, I tape the seams with duct tape, and extend the poly up the walls several inches.

It's important to understand that even this double vapor barrier won't eliminate the risk if there are signs of vapor coming through the slab. The vapor barrier I install is meant to deal with an occasional burst of moisture — say a temporary seasonal rise in the water table, or the effect of a heavy rain. The vapor



**Figure 1.** Floating laminated plank floor sections are edge-glued to each other and laid over a foam pad. The floor is said to "float" because it isn't fastened to the subfloor — only gravity holds it down.



**Figure 2.** The Junckers floating floor system uses metal clips to hold the thick hardwood strips together. You can remove the floor by unsnapping the clips.



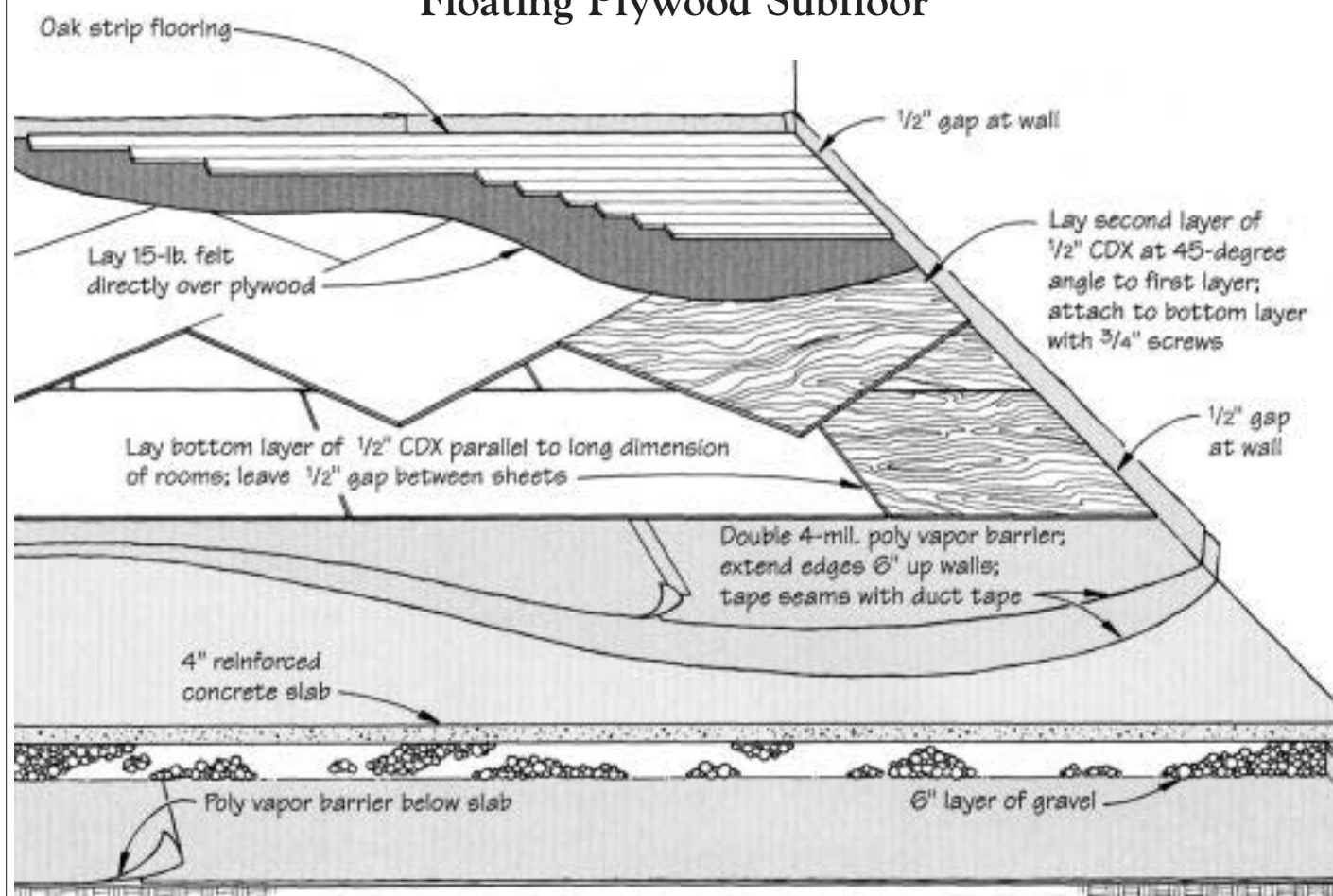
**Figure 3.** To prevent the nails from striking the concrete, the author places shims under the foot of the nailing machine when he has to nail into a 1/2-inch plywood subfloor.

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## Floating Plywood Subfloor



**Figure 4.** To construct a floating plywood subfloor for strip flooring, the author places a double poly vapor barrier directly on the concrete. Then, he places two layers of 1/2-inch CDX plywood, one layer parallel to the length of the floor, the second at a 45-degree angle to the first. He leaves a 1/2-inch space between sheets, and screws or staples the two layers of plywood together, making sure not to puncture the poly. Finally, he rolls out 15-pound felt and installs the strip flooring with a standard floor nailer.

barrier spreads out the effect of this kind of surge of moisture over a longer time. But no vapor barrier is 100% effective. If moisture is continuously present, you'll have big problems, even with the poly in place.

With the vapor barrier in place, you have two choices for a nailing substrate: plywood fastened to the slab, or floating plywood. Over the years, some installers have used 2x4 or 1x3 sleepers fastened to concrete for nailing strip flooring. The reason often given for the sleeper system was to provide space for the flooring to breathe. In my opinion, wood flooring does not need to breathe, and plywood offers better nailing.

**Plywood fastened to slab.** For this method, lay out 3/4-inch plywood sheets, leaving 1/4-inch spaces between panels and at least 1/2 inch of space at the perimeter walls. Fasten the plywood directly to the concrete with powder-driven concrete nails. The poly vapor

barrier will still be 99% intact, with a small puncture every square foot. Under normal conditions these punctures should not affect the installation. Next, roll out 15-pound asphalt-saturated building paper or felt over the plywood. You'll have to use a special 13/4-inch flooring fastener to nail the finish flooring, or else slightly tilt the nailing machines to prevent the nails from striking the concrete, puncturing the vapor barrier and damaging the nailing machine (Figure 3, previous page).

**Floating plywood.** Where moisture is a big concern, I recommend building a floating plywood subfloor (Figure 4). In fact, I use this method every time unless the customer insists on another.

To start, place a layer of 1/2-inch plywood parallel to the long dimension of the room. Space the panels 1/4 to 1/2 inch apart, and leave at least 1/2 inch of space around the perimeter. Do not fasten this bottom layer to the

concrete. Then lay a second layer of 1/2-inch plywood over the first, orienting the panels at a 45-degree angle to the first layer. Again, space this second layer of panels 1/4 to 1/2 inch apart, and leave at least 1/2 inch around the perimeter. At this point, staple the two layers together with a pneumatic stapler, making sure that the staples don't go completely through the bottom layer of plywood. You can use screws instead of staples, but again, be careful not to penetrate the underside of the bottom layer of plywood.

Once this two-ply floating subfloor is built, continue as usual with 15-pound asphalt-saturated building paper. You won't have to use special short nails with this type of subfloor — the full one inch of plywood provides plenty of thickness for ordinary flooring nails. ■

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