



RADIANT HEAT GUIDELINES FOR CONTRACTORS & HOMEOWNERS

With a little extra care, wood flooring over radiant heating can provide a comfortable living space.

The inherent natural beauty of traditional wood flooring lies in its variability — in each plank's unique expression as a product that was once a living tree. While this variability is what we tend to admire aesthetically, it also underlies the challenges wood flooring installers must overcome. These include:

- Expansion and contraction of the wood due to temperature changes;
- The humidity of the wood at the time it's installed;
- The effects of the way in which the wood was sawed, dried and stored;
- The humidity of the jobsite where it will be installed;
- Seasonal and regional climate conditions; and
- The materials in the subfloor.

The key to installing wood floors over radiant heating systems is to give extra care to wood species, wood width and thickness, moisture levels, installation practices, the heat output requirements of your system and radiant heating control. The result is a rewarding combination of a floor that's beautiful and warm — and provides a comfortable living space.

MOISTURE, HUMIDITY CONTROL

The maximum surface temperature of a wood floor should be limited to 85° F. Use a control strategy that assures this will not be exceeded and brings the floors through temperature changes gradually.

Wood naturally expands and contracts in response to changes in moisture. With this in mind, avoid installing wood flooring during stages such as sheet rocking or painting, when significant moisture may be introduced into a structure.

When radiant floor heat is installed in concrete, mortar beds or gypsum cement, it is very important to operate the heating system until these materials are completely dry before the wood flooring is installed on top. This can take several weeks. Be patient.

It is possible to check for residual moisture in the cementitious materials by tightly taping a 1' square piece of clear, heavy mil plastic to the floor and allowing it to set for 24 hours. If at the end of that period moisture is still trapped beneath the plastic, you need to keep heating the floor and ventilating the space. Move the plastic to another location and continue this process until no more moisture is visible beneath the plastic.

Operate the heating system until the humidity in the structure stabilizes to the average level expected for the area in which the wood floor will be installed. Then allow the wood to acclimatize to this humidity level by “sticking” (usually several weeks) before installation. This will minimize dimensional changes due to moisture.

Make sure the wood flooring is dry, since radiant heat itself can be drying. Experienced flooring installers recommend buying wood for radiant at around 6% to 8% moisture content. This figure may change regionally. Use a moisture meter during the construction process and then use the average of many readings.

Remember, the average expected humidity level of a structure is an average of seasonal conditions. So if the structure is expected to average 30% humidity in the winter and 50% in the summer, the average would be 40%. This equates to about a 7.5% moisture content in the wood. Most installers consider this average the ideal moisture level at which to install wood flooring. These numbers can vary by region.

In climates with large humidity variations, install humidity controls. In vacation cottages with intermittent use, consider back-sealing boards before installation to make them more stable to changes in moisture in the structure.

If the flooring is being installed on other subflooring, consider the subfloor's moisture level and material. Most industry experts recommend the moisture content of the flooring and subflooring materials are within 4% of the expected average. Most installers prefer plywood for subflooring since it has a long, successful history of working well beneath wood floors. Oriented strand board also is beginning to gain acceptance as a subflooring material.



Pairing an oak floor over radiant heating system provides comfortable living space in any home.

TROPICAL WOODS

If you're importing tropical or exotic woods, pay close attention to the source, age and how the wood has been dried. Tropical wood needs to dry slowly; quick-drying creates stresses that can affect the wood later as it expands and contracts. If your supplier has stored the wood in your region with no problems for one to two years, surprise stress-related problems are much less likely.

Though it can be fun to be unique, avoid pioneering the use of a wood where little information is available on its dimensional stability.

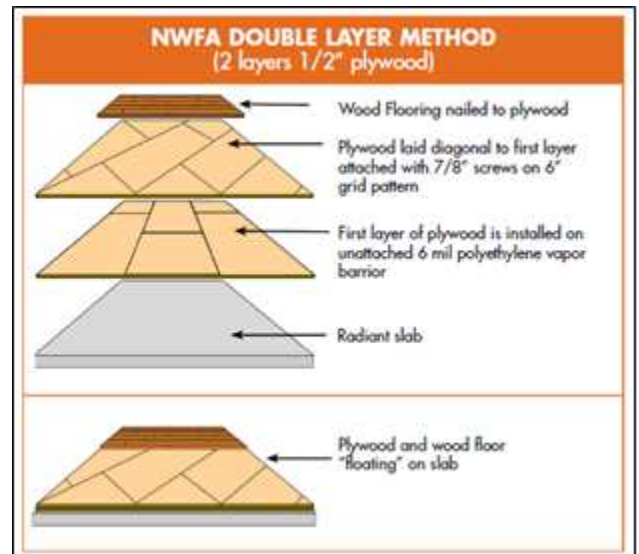
DIMENSIONAL STABILITY AND BOARD WIDTH

Quarter-sawn wood is significantly more stable than wood that is plain-sawn. Select a wood variety known for its dimensional stability. American cherry, ash, most softwoods and teak fill this bill, and oak is reasonably stable. By contrast, hickory, maple, madronne and American beech are known to be less stable.

When using plain-sawn flooring, narrow board widths are preferable, usually 3" or less. Since plain-sawn wood tends to move from side to side, narrow boards provide more gaps for expansion and contraction across a floor; therefore, gaps resulting from natural movement are much less noticeable. The maximum recommended board depth is 3/4". Thicker boards add too much resistance to heat transfer.

WOOD FLOOR INSTALLATION METHODS

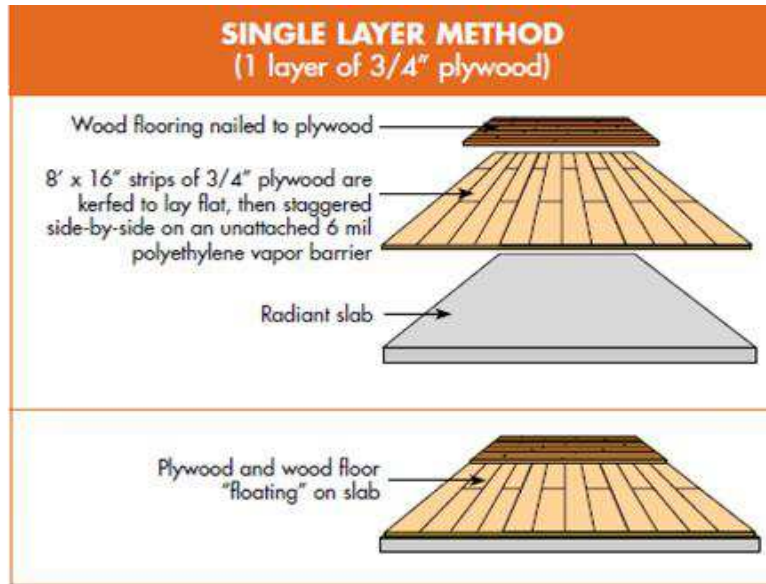
When possible, use a "floating" method of installing wood floors over slabs. The National Wood Flooring Association (www.nwfa.org) developed general guidelines for installing traditional wood floors over radiant floor heating systems. It is strongly recommended that these guidelines be studied prior to installation. You can see graphic examples of these methods on the following pages.



- Floating. Basically, floating a wood floor over radiant slabs involves attaching the flooring to one or more layers of plywood that "float" independently, unattached to the slab. This way, the wood flooring can expand and contract separately from the thermal mass of the slab.

The NWFA guidelines for installing strip wood flooring over radiant call for two layers of 1/2" plywood installed at 45° angles to each other and screwed together. The wood flooring is then nailed on top. Since the 1" thickness of the two layers of plywood adds R-1.1 to the resistance to heat transfer, a less-resistant alternative may be required.

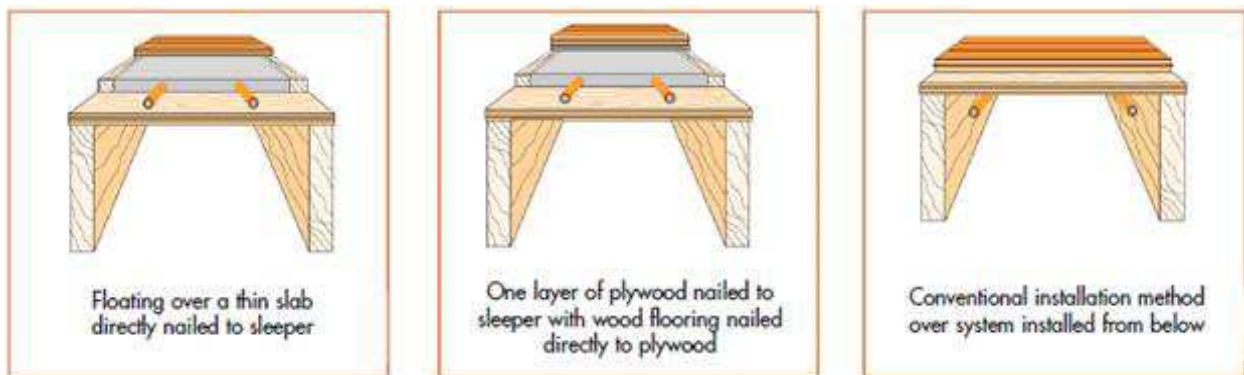
In this method, 3/4" (R-.78) plywood is cut into 8' x 16" strips laid side-by-side. The plywood strips are kerfed on the bottom to get them to lie flat. Then the strip wood flooring is nailed to the plywood. Since this system adds less resistance to heat transfer, it's more attractive in projects with a high heat load.



- Installing over a thin slab. Floating also can be used over a thin slab. When a thin slab with sleepers is used, the NWFA suggests either the “direct nail to sleeper” method or methods that include layers of plywood nailed to the sleepers. The direct-nail method, with fewer layers of wood, obviously offers better heat transfer. This method is particularly useful when using materials with temperature limitations, such as gypsum cement.

However, since the wood doesn’t “float” in this method and is closer to the thermal mass, a good control system is crucial. It allows the floors to change temperature gradually, putting less stress on your wood flooring system.

- Installing from below. When the radiant system is installed from below the subfloor, traditional wood flooring is attached to the top of the subfloor in the normal way. In this case, proper nail selection is essential. Otherwise, the nails may penetrate through the subfloor and damage the radiant system.



BEAUTY AND STABILITY

Engineered wood flooring has a true wood top layer and transfers heat well.

Don't rule out engineered wood floors if you're thinking of wood. With its authentic top layer, you get all the beauty of real wood, yet less of the sensitive temperament. Engineered wood floors are more resistant to higher moisture levels than solid wood flooring. This makes them appealing for use in damp basements or in areas that have higher relative humidity levels.

Edge-glued, "floating" engineered wood floors have a host of advantages for use with radiant floor heating. Because of this unique installation design, they are free to expand and contract separately from the radiant floor heating system. Made of multiple wood veneers and dimensional wood products that are glued or adhered together, these floors are inherently dimensionally more stable than traditional wood flooring systems. Plus, being thin, they transfer heat well.

Over a slab, the modest R-value of a 5/8" thick engineered floating floor system has considerable heat transfer advantages over floating traditional wood flooring systems, which require additional layers of plywood to float. The R-value of a 5/8" engineered wood floor (R-0.625), plus a thin pad (R-0.3), is less than R-1.

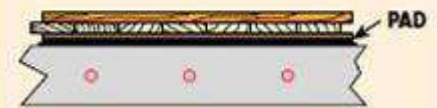
Compare this to a traditional wood floating system of 3/4" hardwood (R- 0.8), plus two layers of 1/2" plywood (R-1.1), for a total of R-1.9, or nearly double. You'll often find cost-savings in installing an engineered wood floor in a floating application.

However, not all engineered wood floors are recommended for use over radiant floor heating. Maximum recommended surface temperatures differ by product. They need to be followed.



Because of the unique installation design of engineered wood floors they are free to expand and contract.

FLOATING ENGINEERED WOOD FLOORS



Engineered wood can be edge-glued and "floated" over the radiant heating system. A thin foam pad is usually placed under the wood flooring. This allows the flooring and the radiant system to expand and contract separately.

COMPARISON OF WEAR LAYERS



Notice how in traditional wood flooring (top) the resurfaceable thickness is limited by the nails. The top wear layer in engineered flooring (bottom) may be similar in thickness, or is often hardened by acrylic.

For added comfort, a thin pad may be used between the engineered flooring and thermal mass, which puts some give back in the floor. This is particularly welcome when the wood flooring is installed over concrete.



A fireplace may not be necessary in this Sunroom with a radiant comfort system installed under wood flooring such as this 7" wide European French Oak engineered plank floor.

It's important, though, that the pad you choose be recommended for use with radiant heating — and don't forget low R-value for optimum heat transfer. Not only will a pad soften the feel, but the proper thin pad can also attenuate sound on the floor.

Engineered flooring such as parquet or wide plank can be glued down in radiant applications with recommended radiant heat approved adhesives. This method works very well; however, it is a less preferred method since the floor doesn't float independently from the heating system.

Please feel free to contact our office at 847.758.9600 with any questions. Thank you.

RESOURCES:

Radiant Flooring Guide published on February 18, 2013.
Retrieved from www.RadiantandHydronics.com/radiantflooringguide