

Chapter 16: Wood floors

Uponor radiant floor heating systems can be successfully installed in a variety of floor constructions under a variety of floor coverings. Among the various floor coverings, wood floors present some unique design challenges. The designer and contractor should understand the boundaries of wood floor coverings and the methods used to maximize effectiveness. Communication between the heating contractor and the wood floor installer is key to a successful installation.

Wood flooring materials are fairly resistant to heat transfer (approximate R-value = 1 per inch). Nonetheless, wood floors can work effectively in conjunction with radiant floor heating systems when designed appropriately. Resistance to heat transfer is a significant factor in the design of a well-functioning radiant floor heating system — for all floor coverings, including wood. Pay close attention to the supply water temperature and the resulting effective floor surface temperature. Wide temperature differentials (greater than 60°F) from the bottom of the wood flooring to the surface can potentially damage the floor. Please contact the wood flooring manufacturer for safe limitations, as they can vary from product to product.

Design with wood floors

When designing any radiant panel heating system, it is important to first verify the heating load. In particular, it is essential to be precise in determining the amount of energy necessary to heat the space served by a wood-covered radiant floor. The Uponor radiant design program can help with this task. To assist with the heat-loss analysis, the R-values of various wood-flooring materials are listed in **Appendix D**.

After the heat-loss analysis is complete, consult the appropriate chart to determine the floor surface temperature and supply water temperature necessary to meet the calculated heating load. The surface temperature of a wood floor should not exceed 80°F. Surface temperatures above 80°F may, over time, cause the wood floor to become excessively dry. Such drying may cause shrinkage and exaggerate joint separation. If the design requires higher surface temperatures, consult the wood flooring manufacturer for maximum temperature limits.

Uponor's recommended wood floor maximum heating loads at 65°F room setpoint temperature and 80°F floor surface temperature is 30 BTU/h/ft². The recommended wood floor maximum heating load at 70°F room setpoint temperature is 20 BTU/h/ft².

Moisture and wood floors

When wood absorbs moisture, it swells. When wood loses moisture, it shrinks.

Sources of moisture from below include inadequate moisture barrier, ground water wicking through the slab or an unsealed subfloor. Moisture from above is generally the result of high relative humidity. If moisture negatively affects a wood floor, the source of the moisture affects the changes that one will see in the floor.

If the moisture content of the wood is relatively high near the bottom of the plank, the plank will cup upward on the edges. Cupping due to moisture below exaggerates cracks in the wood (see **Figure 16-1**).

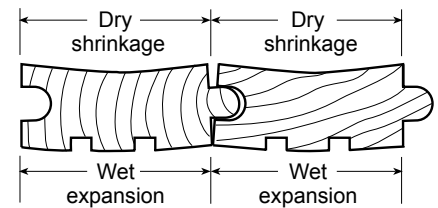


Figure 16-1: Cupping of wood floor

If the moisture content is relatively high near the top surface of the plank, it will crown downward on the edges (see **Figure 16-2**).

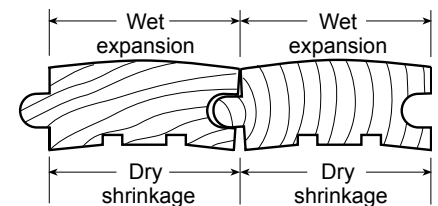


Figure 16-2: Crowning of wood floor

Cupping and crowning also occur because of moisture loss in wood floors. If the installed wood floor has high moisture content, the eventual drying can cause cupping or crowning regardless of the type of heating system used.

The wood flooring installer should follow the flooring manufacturer's installation manual or National Wood Flooring Association (NWFA) manual for acclimation and installation of the wood.

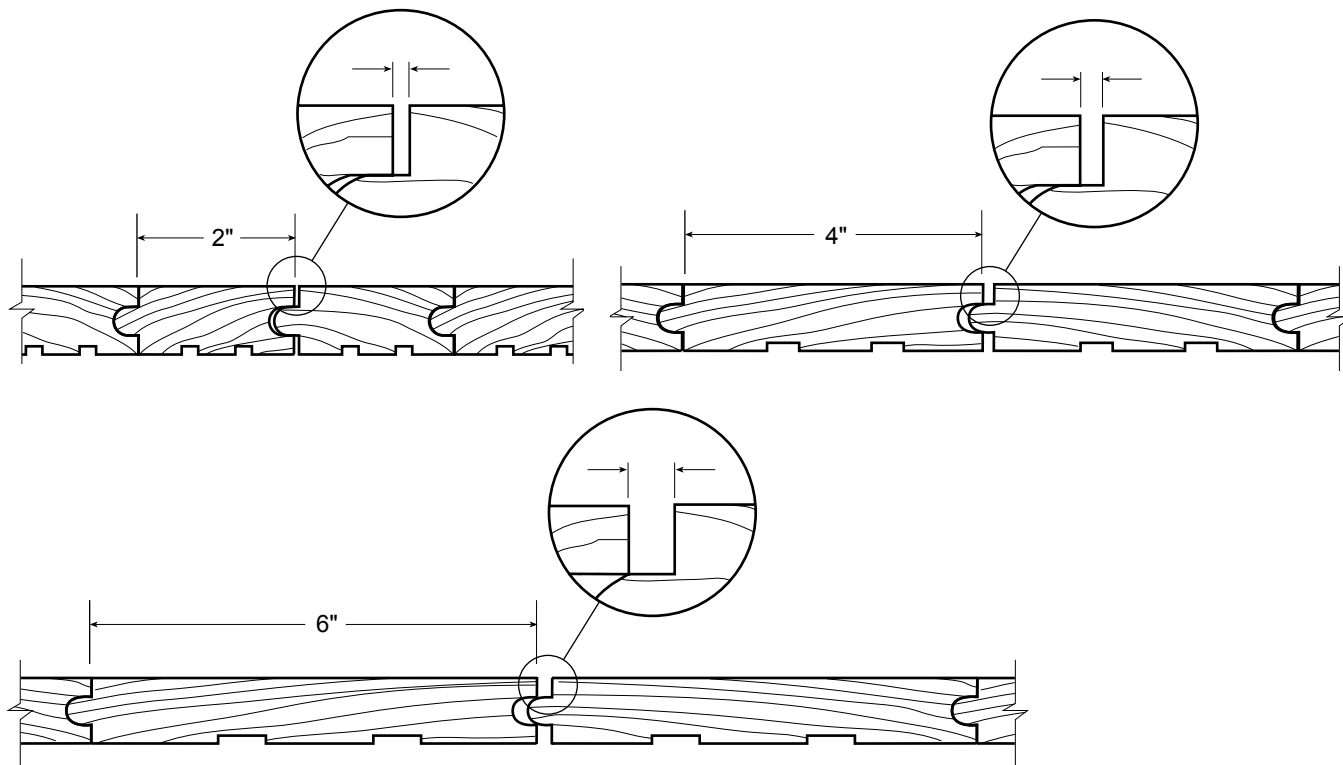


Figure 16-3: Board shrinkage and separation

Note: Never use the radiant system to speed up the acclimation.

Moisture changes will affect the width of boards proportionately. Wider-cut boards will shrink more than narrow boards. Separations between boards may be cumulative (see **Figure 16-3**).

Cumulative separation can be limited by installing the boards parallel to the longer dimension of the room (see **Figure 16-4**).

Selecting a wood floor with beveled edges helps reduce the appearance of shrinkage cracks (see **Figure 16-5**).

Panelization — Panelization is a phenomenon that occurs as a result of the wood planks bonding to adjacent planks within the floor. Bonding results from the adhesive or surface finish hardening between the planks. When shrinkage occurs, the bonding causes larger than normal cracks because the combined shrinkage of several planks is concentrated in fewer separations or cracks (see **Figure 16-6**).

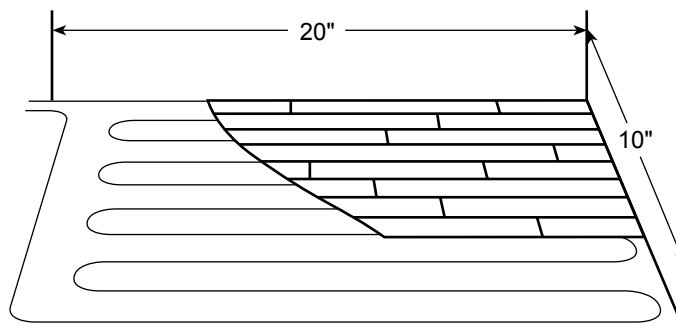


Figure 16-4: Wood floor installation to minimize cumulative separation



Figure 16-5: Wood floor with beveled edge

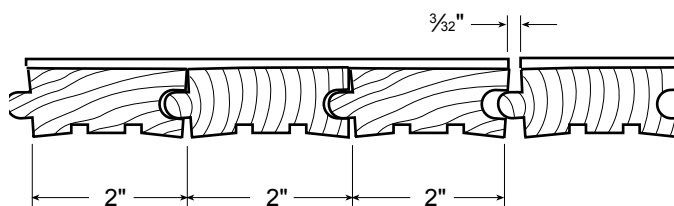


Figure 16-6: Panelization of wood floor

Laminate floors

Laminate wood-floor systems provide solutions to the potential problems associated with $\frac{3}{4}$ -inch solid wood floors. The most significant advantage of laminate floors is their ability to resist shrinkage. The shrinkage, cupping or crowning that occurs with solid wood floors is not likely to occur with laminate wood floors because they are biaxially oriented (similar to plywood). Also, laminate wood floors are typically thinner than $\frac{3}{4}$ -inch solid wood floors, and they have less resistance to the radiant heat (see **Figure 16-7**).

Installation

Wood floors can be installed over many types of radiant floor constructions.

Wood floor over poured floor —

The wood flooring is nailed to 2x2 sleepers placed between the PEX piping loops. The underlayment is poured to the top of the sleepers, leaving an exposed nailing surface to secure the wood floor. Follow the underlayment or wood manufacturer's recommendations on sealing their product prior to the installation of the wood product (see **Figure 16-8**).

Wood floor glued to underlayment —

Underlayment must be dry and sealed prior to the attachment of the adhesive. Follow the wood floor manufacturer's installation manual for specifics on vapor barrier or sealer prior to the installation of their product (see **Figure 16-9**).

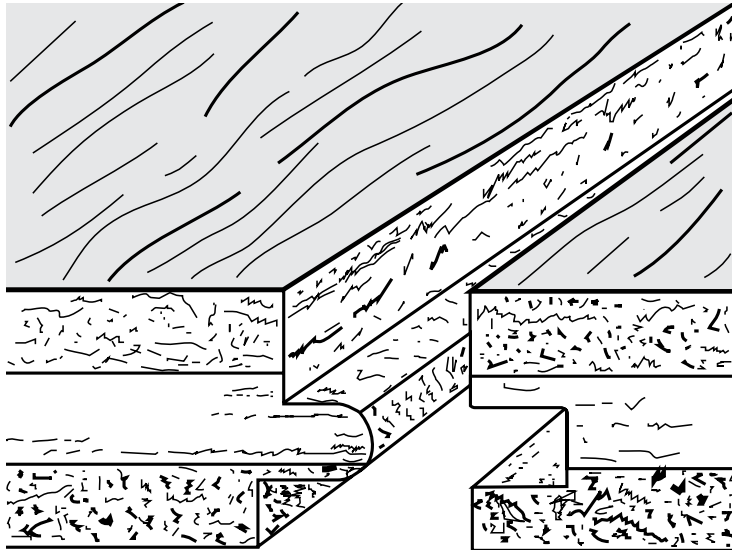


Figure 16-7: Laminate wood floor

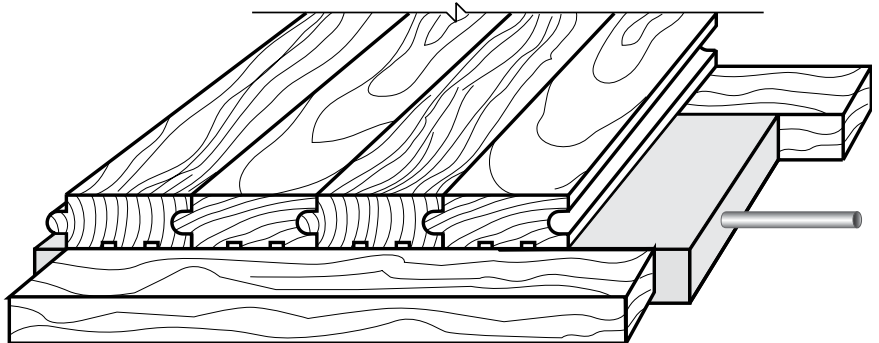


Figure 16-8: Wood floor nailed to sleepers in poured floor

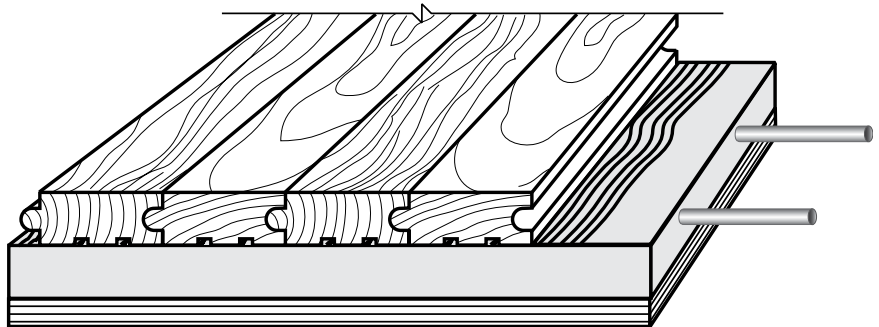


Figure 16-9: Wood floor glued to underlayment

Wood floor nailed to subfloor

— Wood must be acclimated to the subfloor. Check the wood floor manufacturer’s installation manual for requirements on vapor barriers or sealers. If the piping is mounted to the subfloor, the contractor must mark the piping location so the wood floor installer does not puncture the piping with nails (see **Figure 16-10**).

Wood floor over Quik Trak® —

Please refer to the Quik Trak Design and Installation Manual for information.

Wood floor over concrete — Wood floors installed directly on concrete slabs above grade typically require a vapor barrier and/or adhesives resistant to heat. Check with the adhesive manufacturer for specific instructions regarding the application of heat during the curing process (see **Figure 16-11**).

Floating wood floors and engineered hardwoods over concrete or underlayment —

Check the wood floor manufacturer’s installation manual for requirements on vapor barriers, sealers and/or temperature restrictions (see **Figure 16-12**).

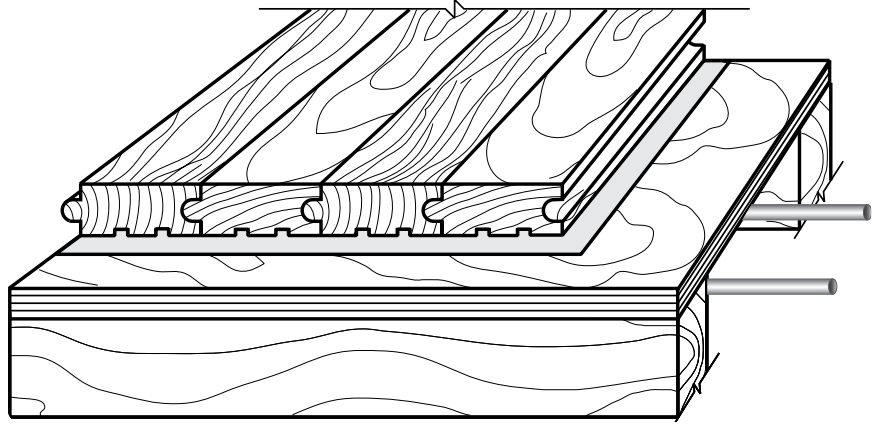


Figure 16-10: Wood floor nailed to subfloor

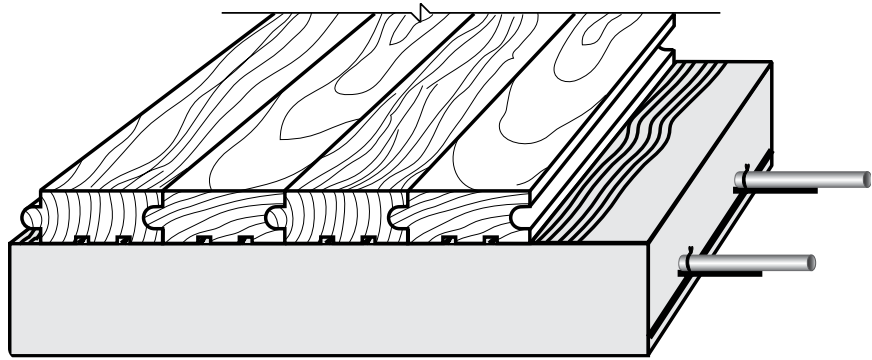


Figure 16-11: Wood floor over concrete

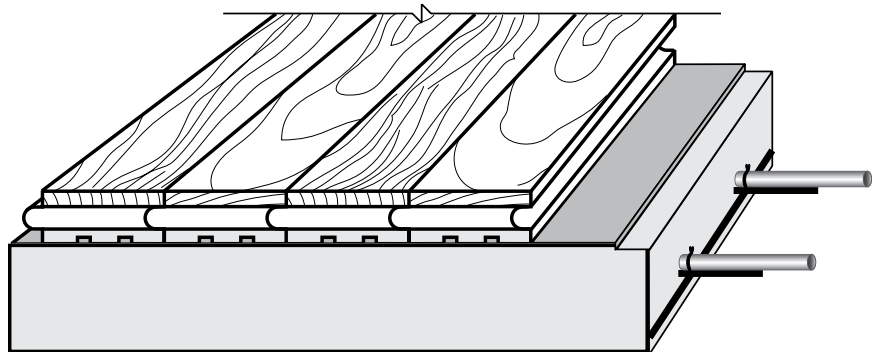


Figure 16-12: Floating wood floor