Informational Bulletin #150

Subject: The Cut of Wood
Date: 12/21/21

All wood flooring is not created equally. From the differences in species, to the tree, to how and where it is grown, to where it is sawn and how it is dried, to how it is milled and manufactured, many important aspects can affect the performance and appearance of installed wood flooring. The way the wood is cut affects how it is dried, how it will look, and how it will perform in the home or office once it is installed.

For purely aesthetic considerations, the exposed grain is key to the character and look of the flooring. For performance considerations, the grain direction (whether running lengthwise, side-to-side, top-to-bottom, or across at angles) dictates how the wood will perform when exposed to humid or dry conditions.

Wood is a three-dimensional, anisotropic, and hygroscopic material.

A hygroscopic material is a substance that can absorb and retain moisture or lose or throw off moisture. Wood and wood products are hygroscopic. Wood expands with absorption of moisture, and dimensions become smaller when moisture is lost or thrown off.

An anisotropic material refers to a substance that has different physical properties when measured in different directions. The shrink/swell properties and the strength properties of wood differ in every direction.

The angle of the annual growth rings changes the look of the floor, and it determines the dimensional properties, as well. The strain characteristics of each of these cuts of wood are affected by the grain angle, which describes the orientation of the growth rings with respect to the wide face of the board. These grain angles reflect the path in which the water moves through the wood. Wood will either shrink or swell depending on the moisture gained or lost.

The shrink/swell properties in wood are unequal along the three primary directions (longitudinal, tangential, and radial) of any piece of wood. Wood shrinks and swells the most circumferentially around the growth rings (tangentially), about half as much across the rings (radially), and only in minuscule amounts along the grain (longitudinally). The strength properties in wood also vary along these three primary directions.

There are seven cuts from which wood can be cut from the log and used for flooring, each of which has its own unique characteristics:

PLAINSAWN

Wood that is cut parallel to the growth rings so that the grain angle is from 0° to 45° to the wide face of the board (a tangential cut) is called plainsawn in hardwoods (flatsawn in softwoods). Plainsawn flooring is more dimensionally stable in thickness (radially) and less stable in width (tangentially). Tangential movement of wood is a measurement of the amount the wood shrinks or swells across the circumference of the growth rings. Average values for tangential shrinkage from fiber saturation point to oven-dry are between 5-15 percent for most species of wood.

QUARTERSAWN

Wood that is cut perpendicular to the growth rings so that the grain angle is from 45° to 90° to the wide face of the board (a radial cut) is called quartersawn in hardwoods (vertical-grain in softwoods). Quartersawn lumber is more dimensionally stable in width (radially) and less stable in thickness (tangentially). Radial movement of wood is a measurement of the amount the wood shrinks or swells perpendicular to the growth rings. Average values for radial shrinkage from fiber saturation point to ovendry are between 2-8 percent for most species of wood.

RIFTSAWN

Wood that is cut neither parallel nor perpendicular to the growth rings so that the grain angle is from 30° to 60° to the face of the board is known as riftsawn in hardwoods (bastard-sawn in softwoods). This cut is more stable than the plainsawn cut, but not quite as stable as a true quartersawn cut. Clearly, there is some cross-over between the angle of the cut for quartersawn and for riftsawn. These two cuts commonly are sold together.

LIVESAWN

Wood that is cut from the outside diameter through the heartwood incorporating the full range of the previous characteristics on the face of the board is known as livesawn material. This cut of wood is typically wider and incorporates all of the previously described dimensional stability and aesthetic characteristics of plainsawn, quartersawn, and riftsawn.

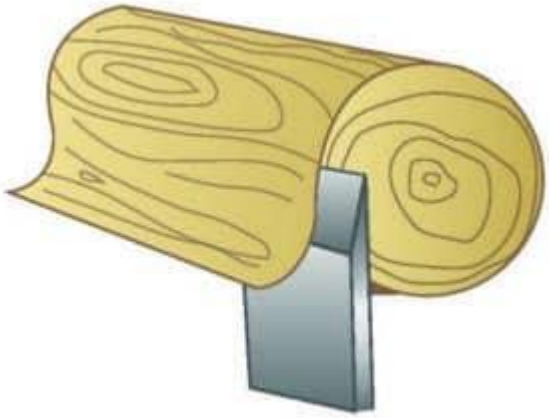
END-GRAIN

A cross-section of wood is cut perpendicular to the grain, or the surface exposed by such a cut. End-grain is wood that is cut so that the face of the board surface exposes the ends of the growth rings. This also is known as the transverse cut. End-grain flooring will shrink and swell according to the tangential value in the direction across the circumference of the growth rings, with essentially no movement in thickness.

SLICED VENEERS

Sliced veneers are used exclusively for engineered flooring and decorative panels. With sliced veneers, the log is cut into a block called a cant, or sometimes halved into what is called a flitch, which is drawn across a very sharp-angled blade. The process is repeated until the whole cant has been turned into a pile of high-quality veneers. The appearance of sliced veneer is similar to sawn lumber and will have the same natural, physical, and strain characteristics. However, the slicing process has thickness limitations and can stress the wood fibers, resulting in knife checks.

ROTARY-PEELED VENEERS



Rotary-peeled veneers also are used exclusively for engineered flooring and decorative panels. With rotary-peeled veneers, full logs are positioned on a large lathe and spun against a sharp blade. The log continues to spin until the entire log has been turned into a pile of veneers. This technique produces the least amount of waste. Rotary-peeled veneers have a distinct, purely tangential grain pattern. The grain pattern will repeat on wide sheets. However, the peeling process has thickness limitations and can stress the wood fibers, resulting in lathe checks.

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As nice as it sounds to be able to use this information to completely understand and predict how wood will perform, we must remember that wood is a natural resource that grows irregularly and is exposed to seasonal fluctuations through its lifetime. Wood grows in different soils, and can be exposed to different minerals within the same region. No two trees from the same species are identical, nor are two boards from the same tree identical, and properties can vary even within one individual plank of wood.

After species selection has been made, the next discussion item should be wood cut performance characteristics. This discussion with the end-user should be simple. When aesthetic considerations are less important than performance considerations, use the following general talking points:

- Narrow strips shrink and swell less than wider planks. The wider the plank, the more potential there is for dimensional changes in the wood.

- Quartersawn flooring is the most dimensionally stable cut of wood. Riftsawn flooring would be a good second choice.

- When hardness is the most important factor, end-grain is the hardest option. In general, end-grain may be 1.5x harder than the same board in the plainsawn cut. The next hardest cut would be quartersawn or riftsawn cuts.

- Engineered wood flooring generally is more dimensionally stable than its solid counterpart. If you were to then place the most stable cut of wood on an engineered platform, you will have a very dimensionally stable plank of wood.

How wood is cut from the tree plays a critical role in so many variables, including how the finished floor will look, how the floor will perform, and what the floor can withstand over time. When making the final selection of what wood floor should go into the home, one of the most important factors to consider is the cut.

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Additional information can be acquired from the manufacturer's technical department of the products used on your floor. The National Wood Floor Association (NWFA) can be an additional resource. They can be reached at 800-422-4556 or online at www.woodfloors.org.