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UNDERSTANDING THE IMPACT OF RELATIVE HUMIDITY ON WOOD, PEOPLE AND HARDWOOD FLOORS

Wood is a living material and is not homogeneous. It is structured by growth rings that form a series of more or less concentric cylinders. The cylinders are made up of irregular tubes that support the tree and transport nutrients.

As the wood absorbs or loses moisture, the tubes expand or contract, causing the wood to swell or shrink.

The extent to which a piece of wood shrinks depends on its species, the orientation of the wood grain and variations in moisture content.

Wood has always been sensitive to moisture. It absorbs and loses moisture until an equilibrium is reached with the ambient air.

For every relative humidity and ambient temperature, there is a stable moisture content, when wood neither gains nor loses moisture. This balanced moisture content is called EMC (Equilibrium Moisture Content).

When the EMC is reached (6-8%) and the relative humidity and ambient temperature remain unchanged, the wood is stable.

The following examples show the difference in equilibrium moisture content (EMC) between dry winters (20% RH) and humid summers (75% RH).

At 21deg.C and 75% RH, wood moisture content reaches 14%.
At 21deg.C and 35% RH, wood humidity reaches 7%.
At 21deg.C and 20% RH, wood humidity reaches 5%.

Up here in the Northeast, we're exposed to extremely cold, dry winters and very wet summers. The effects on floors have always been evident.

When humidity fluctuates in a room or throughout the house, wood flooring shrinks or expands. **When wood loses moisture, it contracts, better known as the "shrinkage" phenomenon. When it gains moisture, its called « expansion ».**

The degree to which this occurs for a given wood species is known as the species' "**dimensional stability**". Generally speaking, red oak, white oak and walnut are examples of woods with better stability. Hickory, maple and some exotic woods are less stable.

It's important to know the stability of the woods you plan to use, especially if the floor is to be installed in a home subject to wide temperature variations or seasonal fluctuations in relative humidity.

Generally speaking, normal living conditions are considered to be 18-24 degrees Celsius (65-75 degrees Fahrenheit) with relative humidity between 30 and 50%. This is the range most favorable to your health, which is also the most favorable to your floor.

If relative humidity is left unchecked, a solid woodfloor will react with shrinkage between the planks during the winter heating season, and may end up with reverse expansion effects during a wet summer.

In the case of engineered hardwood flooring, there are three components that must evolve together: the structure (plywood or pine), the wood wear layer and the finish. Technically, this assembly provides greater stability to variations in relative humidity, but the entire floor is still made of wood.

When engineered wood flooring absorbs or loses moisture, below or above the fiber saturation point (around 30%), it expands or shrinks. To make matters worse, shrinkage and swelling are often accompanied by warping, checking, splitting, dry-cupping and even separation of the wear layer from its substrate.

Within the normal range of 30-50% relative humidity, minor problems may occur, but the further you move away from the recommended relative humidity range, the more likely it is that problems will occur. Wood behaves like wood.

Engineered flooring handles high humidity better than solid hardwood but fails when exposed to dry conditions more than solid. Solid wood flooring will shrink as a whole, while the top layer of solid wood on the engineered plank will shrink more than its substrate core causing the surface layer to check or crack.

If this happens, replacing the board or gluing the top layer to its core are suitable options.

Controlling relative humidity is a question of balance. Not enough humidity, too much humidity... You have to keep a close eye on it throughout the seasons.

Wood seasonal variations are to be expected, especially on wide planks. Throughout its life, wood naturally expands and contracts according to the wet and dry seasons, as well as the environmental conditions of the home, this is normal and not a defect.

Once the floors have been installed, the homeowner should check the relative humidity with a hygrometer and make any necessary adjustments with a humidifier and/or dehumidifier.

Adding humidity during the driest months is one solution. During the heating season, with its long periods of cold, not adding humidity to your home is detrimental to your health and your floors.

To prevent undesirable humidity conditions from developing and eventually causing damage to your floors, maintain relative humidity levels between 35%-50%, most importantly twelve months a year.