Acidity of Wood and Corrosion or Contamination

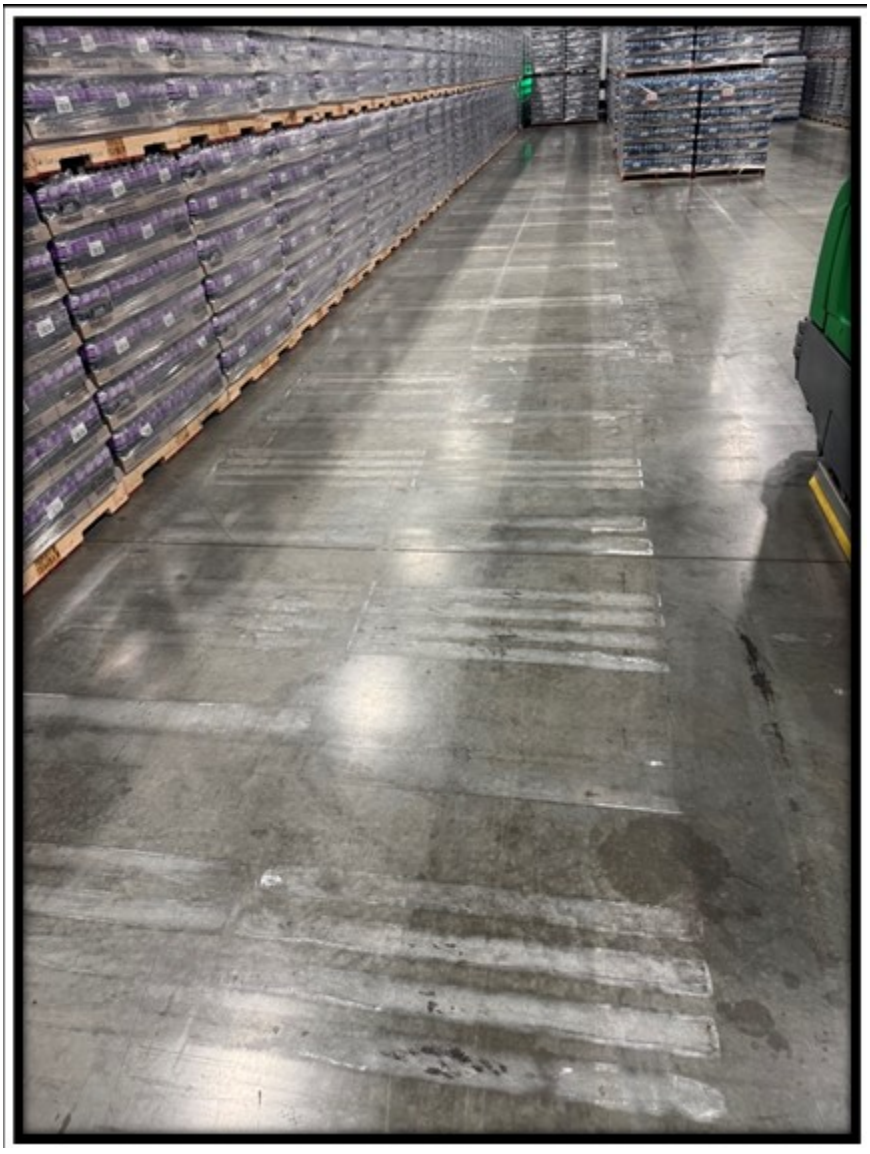
It is the chemical components of the extractives in the form of tannins and acetic acids, which render all woods somewhat acidic and corrosive to metals. The measure of acidity is pH, which is the logarithm of the reciprocal of the hydrogen ion concentration. The pH scale is numerically 0 to 14 with 7 as neutral or non-corrosive. Zero to 6 is acidic and 8 to 14, alkaline. Both conditions can be corrosive to metals. The water soluble matter in most woods is in the 3 to 7 range, or considered to be significantly or somewhat acidic, depending on the species. The lower the pH number, the more acidic or corrosive the wood will be. The pH scale is logarithmic, so small numeric differences in the scale represent differences in acidity or corrosiveness. For example, wood with a pH of 5 is ten times more acidic than wood with a pH of 6. Some typical pH values for wood are listed below:

HARDWOODS				SOFTWOODS	
Ash	**5.4**	**Elm**	**4.8**	**Western Red Cedar**	**4.0**
Maple	**5.4**	**Sweetgum**	**5.3**	**Southern Yellow Pine**	**4.8**
Red Oak	**4.7**	**White Oak**	**4.6**	**Douglas-Fir**	**4.1**
Hickory	**5.7**	**Tupelo**	**5.4**		
Yellow-Poplar	**5.4**				

Notice the oaks can be 10 times more acidic or corrosive than other hardwoods and that softwoods tend to be more acidic than hardwoods in general. In pallets, it is these acetic acids and tannins that cause blue streaking around nail heads, which can stain packaged products and corrode nail shanks. It is these same acids that can also corrode sensitive metal products being shipped on pallets.

Another problem caused by these groups of carboxylic acids in wood is the forming of salts such as calcium acetate, when green hardwood pallets are set on warehouse concrete floors. The alkaline, calcium carbonate in the concrete will chemically react with the acetic acid in wood to form calcium

acetate. This white salt is not toxic but could contaminate packaging and products. The salt appears wherever the pallet deck boards contact the concrete as shown in the figure below. It is important to remember that no matter how acidic the wood, less corrosion and contamination will occur when products are stored and shipped on dry wood that is kept dry.



Calcium acetate crystals forming where green wood contacts wet or unsealed contrete floors.

Preventing corrosion and contamination

- **Select wood species that have water-soluble pH values greater than 5.2.**
- **Use dry lumber or dry the pallet to less than 20% moisture. The pallets must be kept dry during use or corrosion will re-occur.**
- **Hermetically seal the product in a moisture barrier or plastic film.**