MAXIMO™

TECHNICAL BULLETIN
Wood Acclimation and Drying

Wood products naturally adjust their moisture content to match the surrounding environment. They achieve this by absorbing or releasing moisture as temperature and humidity levels change. When wood absorbs moisture, it expands; when it loses moisture, it shrinks. It is common for wood to develop surface checks or cracks as it acclimates to the project's conditions. These checks and cracks do not compromise the wood's strength or durability; they are a natural response to the drying process.

When a log is freshly cut, it is filled with water. As it is processed into lumber, the drying process begins, leading to shrinkage. Acclimating wood causes stresses, and moisture loss results in shrinkage, which can cause deformation. The degree of shrinkage varies with the wood species and grain patterns, often resulting in a change in shape. If drying stresses exceed the wood's strength, failures such as splits or fiber separation may occur.

Wood dries through the movement of free water in fiber cavities and walls, as well as water vapor movement. Wood is not homogeneous, so it shrinks more along the growth rings (radial) than across them (tangential).

Tangential dimensional changes are often nearly twice that of radial movement in most wood species, while longitudinal changes are negligible. These variations can cause drying responses like warping and checking. Shrinkage and swelling stop as the moisture content of the wood approaches equilibrium with its environment. Wood species vary in shrinkage rates and amounts. Each piece of wood exhibits unique shrinkage or swelling patterns in these three planes of the lumber. Timbers containing the pith, or center of the log, tend to have more drying responses than those without the heart center.

To minimize shrinkage, warping, checking, and splitting, lumber must be acclimated to the middle range of expected in-use moisture equilibrium. This can be achieved through air-drying (natural/slow) or kiln-drying (artificial/accelerated). Air-dried lumber for exterior use generally has a moisture content of 18% to 25% for dense hardwoods and 15% to 20% for softwoods and low-density hardwoods. Kiln-dried lumber for exterior use typically has a moisture content of 12% to 18%. As the wood acclimates, water is removed, and the lumber may warp, twist, cup, and bow. The extent of these drying responses depends on the species and the drying rate. In much of the United States, thoroughly air-dried lumber has a moisture content of 12% to 15%. For seasonal EMC levels in your region, refer to the US Forest Labs website, www.fpl.fs.fed.us, and search for the document titled "Equilibrium Moisture Content of Wood in Outdoor Locations."

The following describes some responses wood may exhibit during the acclimation process:

- Checks: These are responses that develop along the grain due to drying stresses and are classified into three types: end, surface, and honeycomb. Some woods are more prone to checking than others.

- Honeycomb or internal cracking: Visible only when looking at the end grain, this type of cracking is

20807 Biscayne Blvd, unit 304. Aventura, FL 33180
(888) 987-2224 | info@MaximoWood.com

usually caused by improper kiln-drying.

- Shakes: Check-like openings, typically at the junction of growth rings. Shakes may originate on end grain surfaces and look like end checks but follow the growth rings rather than wood rays.

- Splits: Longitudinal and radial separations of the wood, usually occurring in the radial direction. Splits are generally located at a board's end but may occasionally occur along the board's length. A split along the length may or may not extend entirely through the thickness of the piece. Splits are sometimes associated with longitudinal stresses present in the log and board when it was freshly sawn. When a split originates, these stresses cause it to open wide and extend along the piece's length.

- Cracks: Similar in appearance to surface checks or splits but formed differently. Cracks occur in pieces containing the pith or heart center of the tree. Their characteristic width is caused by the difference between tangential and radial shrinkage. Cracks are common in poles, posts, and boxed-heart timbers.

- Warping: Caused by differences in shrinkage in the three grain directions and irregular or distorted grain. The shrinkage differences result in distortions of a board's cross-section, classified as cup, bow, crook, and twist.

Checking often remedies itself as the timber's core reaches equilibrium, though this is not guaranteed. To minimize end-checking as hardwood lumber acclimates, the end grain of the timber must be sealed to slow down moisture release. Apply a heavy coat of a wax-based end grain sealer to all end grain cuts immediately after cutting to length. Wood is an organic material with variations from board to board. Many contractors order an additional percentage of material to allow for waste as pieces are selected for installation. When specifying lumber, it is important for the architect/engineer/specifier to recognize the potential impact of the acclimation process on the appearance of the completed project.