

FORESTRY FACTS



UW
Extension

COLLEGE OF
AGRICULTURAL
& LIFE SCIENCES
UNIVERSITY OF WISCONSIN-MADISON

Department of Forest Ecology and Management • School of Natural Resources

No. 67

August, 1993

Drying Rewetted Kiln-Dried Lumber

Gene Wengert and Dan Meyer

Lumber is rewetted in two ways: prolonged exposure to high relative humidities, or exposure to liquid water, as is the case with flooding. (Flooded lumber is discussed in the sidebar on the reverse.) Lumber that is rewetted from high humidities usually has surface moisture contents (MC) of 15% to 20% MC, with cores at or above 10% MC. With prompt attention, however, the increase in moisture content will do little damage - lumber is typically left bright and without any new checking. This lumber can quickly and easily be redried to previous conditions, without much risk of staining, checking or warping, using the procedures outlined below.

Redrying Procedures

Step 1. Determine the present, average moisture content of the lumber, MC_p using sample moisture sections and the same oven-drying methods used for standard kiln drying. Sections should be 1-inch long, along the grain, and the full width and thickness of the lumber. Cut sections from at least 12 representative pieces of lumber. Sample from within and on the edges of lumber stacks. Good sampling will assure that the final MC is at the desired level.

Step 2. Stack the lumber with stickers at least 3/4-inches thick, spaced no further than 24-inches, on center. Submerged lumber needs to be cleaned prior to stacking. (Note: If part of the lumber stack was submerged and part remained above water, it will be necessary to separate the lumber into two sorts and dry them separately.)

Step 3. Establish the desired final moisture content, MC_f .

Step 4. Begin kiln drying as soon as possible after stacking. Long storage after rewetting or after stacking is not recommended due to the risk of fungal staining and insect damage. Set and maintain the initial dry-bulb temperature at 110°F for hard-to-dry species, such as oak, beech and hickory; 120°F for moderately easy-to-dry species, such as hard maple and ash; and 130°F, for easy-to-dry species, such as pine, poplar and soft maple. Keep vents closed and spray lines "off."

Step 5. Once the desired kiln temperature is reached (usually within a few hours), set the humidity. The initial EMC should be halfway between MC_p , and MC_f , but never higher than 18%. {*Kiln humidity is specified as an EMC (equilibrium moisture content) percentage. Convert EMC to wet-bulb temperature, depression or relative humidity as required for your particular equipment.*} Maintain this initial condition for approximately 24 hours. Thick, hard-to-dry lumber may require more time at this setting; thin or easy-drying pieces, less.

Step 6. After 24 hours, increase the dry-bulb temperature to 150°F and decrease the EMC to 2% below the desired final moisture content, MC_f . (Common sense may dictate a cooler dry-bulb temperature or may suggest a 6- to 8-hour transition period at an intermediate temperature and EMC, before jumping to 150°F.) Continue drying until MC_p equals MC_f . Stress relief should not be required, but stress checks should be conducted to be certain.

Example

Previously kiln-dried, 4/4 oak lumber is presently at 15% MC. The desired final MC is 7%. After stacking and loading the kiln, maintain the initial dry-bulb temperature at 110°F, and the initial EMC at 11% (halfway between 15% and 7%). After 24 hours, raise the temperature to 130°F and decrease EMC to 8% for 6 to 8 hours. Following this intermediate setting, change the temperature to 150°F and the EMC to 5% for the remainder of the schedule. When the lumber reaches 7% average MC, check for drying stresses in the usual manner.

Redrying Flooded Lumber

Flooded lumber may have surface and core moisture contents at or above 25% MC, especially if the lumber was underwater for more than a few days. Light-colored lumber reaching these moisture levels may develop fungal sap stain and non-fungal gray stain. In addition, there will typically be residual grit on flooded lumber surfaces which quickly dulls knife blades in machining.

As with humidity-soaked lumber, however, fast action will prevent water-soaked lumber from being a total loss. Lumber that has been submerged can easily be redried, using the same procedures outlined above, with only minimal risk of creating new damage – checks or splits – or aggravating pre-existing damage. Fungal stains are hard to eliminate, but delayed redrying will make them worse. Non-fungal surface staining can be removed, in many cases, with a mild solution of oxalic acid. A high-pressure spray will rinse most of the heavy deposits from lumber surfaces, and carbide cutting tools will not be affected by any remaining grit. (Note: Although washing with water may aggravate checking, this brief rewetting will usually not do any damage the flood has not already done.)

Gene Wengert is Wood Processing Extension Specialist, **Dan Meyer** is Associate Outreach Specialist, University of Wisconsin - Madison, Department of Forestry, 1630 Linden Drive, Madison, WI 53706