

Vermont Wood Utilization Fact Sheet



Drying Native Lumber

VT Dept. of Forests, Parks & Rec.

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Every year, many landowners utilize the services of portable sawmill operators to process logs harvested from their property. In some cases this wood is to be used for on-site building projects, and in others it is destined to be sold to generate income. While green wood may be acceptable for some uses, it will shrink and possibly warp as it dries. If lumber is to be used for furniture or inside homes, it must be dried before use.

Unfortunately, even lumber which has been properly sawn, can lose its value, simply because of defects caused by improper drying techniques. Checking, warping, cupping and staining (caused by microorganisms or chemical reactions in the wood) can all be caused by poor drying.

Maintaining Sawlog Quality

The production of quality lumber starts with good, well cared for logs. If logs must be stored prior to sawing, it is best to seal the log ends as soon after felling as possible, especially when dealing with high value hardwoods. Sealing the logs reduces moisture loss which can result in cracks and checks, reducing the volume of useable lumber. Several commercial wax based products are available for this purpose.

Some species of trees are also highly susceptible to insect attack and/or staining if left in the log form for an extended period of time. During warm weather significant staining can occur in a matter of days. White pine, red pine and sugar maple, for example, are especially susceptible to staining and are often affected by blue stain fungus when improperly handled. Winter is the only time when insects and fungus are not active.

In general, logs should be sawn within two weeks of cutting.

Handling Fresh Sawn Lumber

Lumber defects can develop as soon as the boards are sawn. **Lumber should always be carefully stacked and stickered** (placing narrow spacers made from dry lumber between the layers of boards to allow air flow through the pile) **as soon after sawing as possible**. Fresh sawn, green lumber contains large amounts of water and it begins to dry immediately after sawing. During the drying process the lumber shrinks, causing stresses within the boards which may lead to defects such as checking, cupping and warping. Proper piling, placement of stickers and weighting of the stacks will minimize these problems.

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Fresh sawn green lumber is also subject to a variety of stains (especially during warm weather) which can destroy its appearance. These stains can be avoided by the use of stickers, which allows the surface of the lumber to dry more quickly, reducing the likelihood of staining.

Drying Lumber

Left to itself, green lumber will eventually lose moisture until it reaches an equilibrium (neither losing nor gaining moisture) with the surrounding environment. The rate of drying, and the final moisture content of the lumber are dependant on temperature and relative humidity.

There are two basic ways to dry lumber to a desired moisture content: kiln drying and air drying.

In air drying, lumber is stacked out of the weather, in such a way as to allow air movement through the piles. In the northeast, properly stacked lumber, protected from the weather, and in an area with good air movement, can be expected to eventually reach a moisture content of 15-20%. While this is dry enough for framing or exterior use, wood to be used indoors should be dried to 12% or less for paneling or trim, and to a final moisture content of 8% or less for cabinets or furniture.

In kiln drying, lumber is placed in a dry kiln where temperature, relative humidity and air flow can be controlled. This decreases the time it takes to produce lumber which can be used indoors, and generally results in fewer drying defects.

Both methods can produce high quality lumber, but each has its advantages, disadvantages and limitations.

Kiln Drying	Air Drying
Rate of drying can be controlled by varying heat and relative humidity. Controlling drying rates minimizes drying defects in lumber.	Rate of drying is subject to the weather.
Lumber can be dried to 8% MC, or less, for use in interior applications.	It is not possible to dry lumber to less than about 15%MC, without further drying in a heated building.
Staining of lumber can be controlled by using heat and air flow to rapidly dry the surface of boards.	Warm, humid conditions with little air movement can promote some types of stain.
Drying time is normally less than one month for common northeast species.	Drying can take several months under ideal conditions.
Lumber must be trucked to and from the kiln.	Lumber can be dried on-site, in any area which receives good air-flow.
There is an out-of pocket cost associated with kiln drying.	Air drying can be a low cost alternative.

Kiln Drying

There are a number of businesses around the state who offer custom kiln-drying services. The capacity of individual kilns and their availability vary greatly. Landowners who wish to have lumber kiln dried should contact a kiln operator even before they have any logs cut, to check on available dates, maximum lumber

sizes and for any other special conditions. In order to ensure the highest quality lumber possible, it should be delivered to the kiln as soon as possible after sawing. If immediate delivery is not possible, it must be properly stacked and stickered.

Names of companies providing custom drying services can be obtained from portable sawmill operators, or from the Department of Forests, Parks & Recreation in Waterbury.

Air Drying Lumber

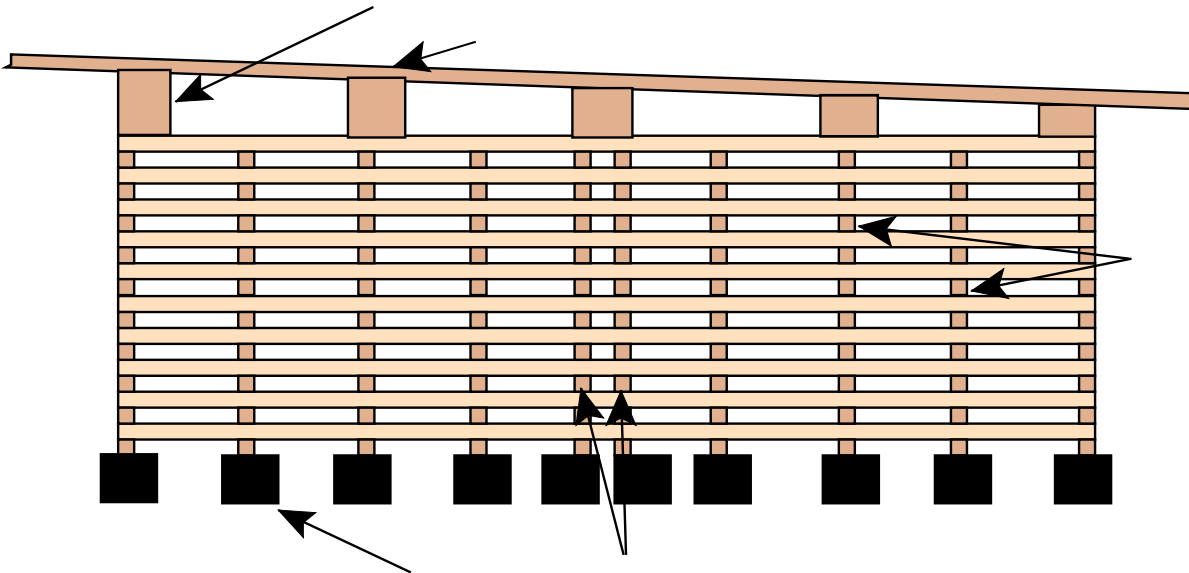
If the decision is made to air dry, there are a number of points to keep in mind:

Lumber should be stacked within one to two days.

Good air movement is the key to successful air drying. The first step in ensuring good air flow is to choose an open site that is not exposed to strong winds. Wooded sites tend to have less air movement and higher humidity which may slow drying.

Do not allow grass or weeds to grow near the piles to a height of more than 6 inches (preferably no grass or weeds at all). Avoid dusty areas as well.

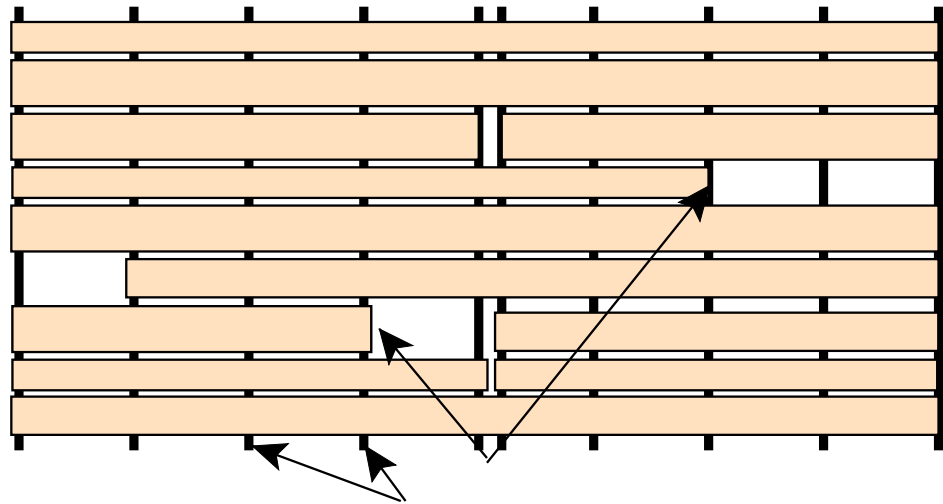
When stacking lumber, a good foundation is critical. The stack should be well off the ground, supported by cement blocks or bricks. Having the first course of lumber 16" off the ground is not too high. The foundation and bolsters (supporting beams) on which the lumber is to be piled need to be level. An uneven base **will** lead to twisting and warping in the lumber. (See Figure 1.)



Spacers (called stickers) must be placed between the layers of boards to allow air flow through the pile. Stickers should be one to two inches wide, one inch thick, as long as the pile is wide, and **made from straight, dry lumber** which is free from knots. **Uniform sticker thickness is critical.**

Stickers are placed across the stack, 12 to 18 inches apart (may be up to 24" apart in softwood) and directly over the support beams, to separate each layer of lumber. Placing stickers as close to the ends of the boards as possible will also help to limit end checking and reduce warp.

Each layer (course) of lumber should be neatly piled, and 6' wide or less. The lumber in each layer must be a uniform thickness. When stacking lumber of various lengths, a technique known as Box Piling may be used to ensure that all boards are properly supported. (See Figure 2)



The lumber pile should be protected by a roof that extends one to two feet beyond the ends of the pile. Lumber can be covered with plastic sheeting or tarps, but do not cover the air passages on the sides of the pile and remember that many types of plastic will eventually break down when exposed to sunlight.

Lumber piles should be weighted on top to help prevent warping and cupping of lumber. Large timbers, railroad rail, cement blocks or other heavy weights can provide sufficient weight.

Softwood lumber is generally easier to air-dry than hardwood. Protecting hard-to-dry species from direct sunlight and too much air flow allows the lumber to dry more evenly and helps to reduce drying defects. A commercial shade cloth can also be used to slow drying.

Coating the ends of the green lumber with a commercial wax emulsion sealer, helps to slow the drying process and reduces checking in the ends of the boards.

Before using air dried lumber ($\pm 15\%$ moisture content) indoors, the lumber should be kiln dried or stored inside a heated building until the moisture content averages 8%. The period of time required to air dry lumber in Vermont to an average moisture content of 15 to 20% varies considerably with the weather and species being dried. Very little drying occurs during the winter, when the lumber is frozen, or during damp rainy weather. In general, one inch lumber will air dry (15 to 20% moisture content) in 45 to 60 days of warm, dry weather. Two inch lumber may take as much as 90 days under similar conditions.

Measuring Moisture Content of Lumber

The actual moisture content of air dried lumber should always be checked prior to use. The moisture content of a piece of lumber can be determined by several methods, but the two most common of these are by the use of an electronic moisture meter or by weight. Moisture meters are available through most lumber yards and woodworker s supply stores.

To determine the moisture content of a board without a moisture meter, the oven-drying method can be used. Moisture content is determined by cutting a cross section of a board, weighing the section accurately, drying the sample completely (roughly 12 hours at about 200°F), and re-weighing the sample. Moisture content is then determined using the following formula:

Further Reading:

A Checklist For Drying Small Amounts of Lumber, By PJ Bois, EM Wengert & RS Boone, USDA Forest Service, Forest Products Utilization Technical Report No. 6, Revised 1982.

Air Drying of Lumber: A Guide to Industry Practices, By Raymond Rietz and Rufus Page, USDA Forest Service, Agriculture Handbook 402, 1971.

Dry Kiln Operator s Manual, Edited by William Simpson, USDA Forest Service, Agriculture Handbook 188, Revised 1991.

Guide to Drying Defects: A Supplement to the Drying Quality Assessment, By E Sprague & D Schumann, USDA Forest Service, NA-TP-10, 1984

For more information on lumber drying or businesses offering kiln drying services, contact:

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