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The Importance of Dry Lumber

The National Building Code of Canada requires that lumber used for wood-frame construction have a moisture content no greater than 19% when installed. The reasons for this requirement are discussed below.

The drying process

More than half the weight of a tree can be attributed to water. As soon as the tree is cut into logs, these logs begin to lose moisture. If the logs are then allowed to dry, they develop cracks and splits because the outside shrinks more quickly than the inside. To eliminate or minimize this differential between inside and outside, lumber manufacturers saw the logs into smaller pieces (boards) while they are still "wet."

The sawn lumber dries out in two stages. First, the wood cells give up "free" water. Loss of this moisture does not cause the wood to shrink or distort. When the moisture content of the wood has dropped to between 25% and 30% (the fibre-saturation point), the wood begins to lose the moisture in the cell walls. It is during this second stage of drying that shrinkage and warping occur.

The amount of shrinkage and warping that actually takes place in the board depends on the angle of the grain, on how dry it gets and on how it is stored while drying. With proper protection, stacking and restraint to resist warping, most spruce, pine or fir species of wood can be air-dried flat and straight in one summer. Drying can be accomplished in days if done in a drying kiln. The exact number of days required will depend on the species and the size of the individual pieces of lumber. This drying process is called seasoning.

The grade stamp on lumber indicates the moisture content at the time the rough-sawn lumber is planed (called "surfacing"). S-Grn

indicates a moisture content greater than 19% (i.e., unseasoned), S-Dry indicates that no more than 5% of the batch exceeds 19% moisture content, and MC 15 means that there is a 15% maximum moisture content. Lumber stamped S-Grn is not prohibited from use, provided that it has been given the opportunity to dry out, either in storage or after framing.

Why the requirement for 19% moisture content?

The requirement in the National Building Code for a maximum 19% moisture content is based on several considerations. They are as follows:

- The drier the lumber when installed, the less shrinkage and warping there will be. The point at which the moisture content for wood stabilizes depends on the region and the season. The moisture content for wood stored under cover during the summer varies from 11% to 12% in most inland areas, while in coastal areas it ranges from 14% to 16%. At these levels, about half to two thirds of the wood's total potential for shrinkage has occurred, and the lumber will remain relatively dimensionally stable in use. If, however, framing that has a high moisture content is enclosed and then subjected to indoor winter heating conditions, the moisture levels can drop to 5% or 6%. This loss of moisture causes shrinkage to occur, resulting in improper sealing of floor joists on sill plates and more apparent deflection and vibration as well as squeaking. Shrinkage can also increase the possibility of air leakage through walls, particularly around windows and doors.
- When construction proceeds rapidly, the framing may be enclosed before shrinkage has occurred and before any problems are

noticed. The effects of shrinkage are most apparent around windows and doors where the lintels shrink away from the supporting jack studs, creating gaps or cracks. The same problems can occur where metal joist hangers support unseasoned wood joists around floor openings. After the framing is enclosed, corrective action can not be taken.

- The phenomena of nail popping in drywall occurs when the wood shrinks due to rapid drying, forcing the nail head above the surface of the wood. If, however, the wood has been dried to a moisture content of 19%, the likelihood of nail popping is minimized because most of the shrinkage has already taken place. Using wood that has a moisture content below 15% reduces this possibility even further.
- The use of unseasoned lumber to build roof trusses contributes to the potential for truss-uplift problems. If the ceiling is installed before the moisture level of the trusses has had an opportunity to stabilize, the chances of bowing stresses and deformation are increased.
- The drier the lumber, the less prone it is to decay. The development of fungi on wood is largely controlled by moisture content. Most wood-decaying fungi require a moisture content above 25%. Even if there is insufficient moisture, once growth has started the fungi do not die; they merely become dormant. Active growth can start again later. Kiln-drying will kill the fungi, but the wood can get re-infected if it becomes wet again. Thus, the only way to eliminate the possibility of decay is to use wood with a moisture content below 20%.

Keep it dry!

The use of dry lumber makes it easier to build a quality product. However, some precautions must be taken to ensure that the lumber stays dry at the building site:

- Protect the lumber from rain and snow and don't pile it at low points where water may pond.
- Don't store the lumber on or next to bare ground, on concrete floors, near freshly plastered walls, or near other moisture sources.
- Keep S-Dry lumber sealed in its original wrapping until it is ready to be used.
- Store the lumber flat and support it well so that it does not deform. Encourage ventilation by separating layers in piles with sticks.
- Avoid materials or practices that might add moisture to the wood framing before it is enclosed.

This information was prepared by John W. Archer of the National Research Council's Institute for Research in Construction (IRC). The Technical Research Committee of the Canadian Home Builders' Association and Forintek Canada Corp. assisted in its review. For additional information, please contact IRC Client Services by telephone at (613) 993-2607, or by fax at (613) 952-7673.



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