

Making the Grade

ENSURING THAT YOUR LOGS PASS THEIR FINAL EXAM

Expert knowledge of tree growth, wood anatomy and structural engineering is not required for a log-home buyer to know that wood timbers may have characteristics that take away from their strength, durability and longevity. Without a trained eye inspecting each timber used in log construction, however, you run the risk of having your dream home built with inferior products that could lead to severe problems down the road. Professional graders are the trained eyes that inspect each and every structural log or timber component of a home package and provide the peace of mind sought after when choosing a log-home company.

Log grading is so important to homebuyers, engineers, architects and building officials that the International Codes Council, the body that writes and administers the building code of the United States, requires the certified evaluation of all structural log and timber components of residential structures built in this country. This fundamental requirement for structural-log grading by an accredited agency is a critical component of the soon-to-be-published “ICC Log Construction Standard” and shall play an even greater role in the log-home industry.

For over 20 years, log-home companies have had the opportunity to structurally grade their logs and timbers through participation in a certified log-grading program. Dating back to the early 1980s, the standards defining the methods of grading have been incorporated into grading rules designed specifically for log structures. Two organizations, the Log Homes Council and Timber Products Inspection, currently provide grading services for domestic producers in Canada and the United States, while producers in Finland that export here can use a grading program that meets U.S. requirements. These programs are accredited by the International Accreditation Service and are set up to conform to international rules governing wood and timber inspection agencies.

To ensure the integrity of their products, all members of the Log Homes Council are required to participate in one of these three certified third-party log-grading programs.



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LOGOLOGY

Each log that a member procures through its process is certified and graded. In addition, several non-council members also grade their logs using TPI or the Finnish grading rules. Several companies, however, do not grade their logs or belong to an accredited grading program.

Without certification, engineers and architects cannot be certain that the grade and species of wood they specified will be supplied with the package. The strength values required for a particular application are checked against the design values for a particular size, grade and species of timber supplied by the manufacturer, and the company's ability to supply that component is critical to the structural integrity of the home. Certified structural grading is the cornerstone of engineered wood structures.

Structural graders look at logs and timbers as individual components in a large system. Using results from more than 100 years of research in testing the wood strength of thousands of trees of more than 75 domestic species, engineers and architects have the tools to design magnificent structures that will last for centuries. Relying on the eyes of the structural grader to evaluate the logs for bending, shear and compression strength, as well as stiffness, presence of decay, insect infestations and other strength-reducing features, design professionals are assured that the structural integrity of their design will meet their expectations.

Let's take a look at some of these key features in log grading. A single cubic foot of wood is made up of millions of hollow wood fibers that are designed to conduct water and nutrients from the roots to all other parts of the tree, as well as provide structural support for the tree's mass. The wood cells are produced by the vascular cambium, a tissue lying under, and protected by, the outer bark. Nearly all wood cells in the tree die a few days after formation and function as dead cells. The only living cells in the wood, or xylem, are found in the outer region of the woody trunk, known as the sapwood. It is here, in the sapwood, that the tree moves the water from the roots upward and that the few living wood cells are found. Inside the shell of sapwood is the heartwood, often darker in color and, in some species like the cedars, baldcypress and redwood, resistant to decay.

The orientation of these wood cells, also known as wood-grain orientation or just "the grain," is critical to the strength of a tree or log. If the grain is straight and parallel to the length of the log, then the bending strength will be high. If, however, the grain runs at an angle to the length of the timber, the bending strength is reduced, as is the grade. The ability to measure this "slope of grain" is critical to the proper evaluation of the wood. Research

has shown that the steeper the slope of grain, the weaker the timber.

Knots in a log or timber are where the branches enter into the stem of the tree. Classified as a limiting characteristic in log grading, they are absolutely necessary for the tree's life and growth, as they ultimately support and conduct the leaves' products of photosynthesis. Trees could not survive or grow to the size we are accustomed to seeing without branches. That said, they do impact the structural integrity of trees and the products derived from them.

The strength reduction that knots are responsible for is primarily caused by the bending of the wood fibers around the limb. The larger the diameter of the knot, the steeper the angle of the grain around that knot. Knots, therefore, induce localized excessive slope of grain that lowers the strength of the wood. The log grader is concerned with the slope of grain between knots, as well as with the knot diameter.

A third, critical limiting characteristic of logs, is decay. Decay is caused by fungi that enter the tree through breaks in the bark or fusion of a tree's roots with an infected neighbor. Some decays are caused by fungi that can only live and grow in a live tree, such as most pocket rots found in the cedars. Once the tree is cut down and dried, the decay dies and cannot be revived by rewetting. Other decays enter the tree after it has died, and begin the breakdown of the walls of the wood cells.

During the initial stages of decay, some decrease in wood strength may be noted but generally no more than the effects of slope of grain or knot size. In the advanced stages, however, the wood's structural integrity may be severely compromised, and the log may be unusable for structural purposes. It takes a trained, certified grader to determine the presence, stage and intensity of a fungal decay.

Other limiting characteristics of logs are holes, missing wood, insect infestations, warp and less significant features. All are evaluated in structural-log grading.

Log grading is a necessary part of the design and building of a log home that will stand the test of time and the elements. Successful log projects have structural grading by a grader certified by an accredited grading program as their foundation. When choosing a log-package provider, insist that the logs be graded to the strict standards of these programs, then you can rest assured that your wood has been inspected and should serve you well in the future.

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