

## LOG TECH NOTE 08-01

### LHC Log Grading Program

#### The History

In 1977 when the Log Homes Council (LHC) formed, the 22 charter members who met in Denver identified grading as one of the biggest challenges facing the log home industry. The call for log grading was driven largely by building officials who insisted that the code requirement for lumber grading applied to logs. To evaluate structures, engineers had to rely on wood design values associated with lumber and timber, but there was no correlation of those design values to the actual pieces used because timber grading was not consistently applied.

The LHC retained Steven Winter Associates (SWA) to answer the call for grading. The engineers at SWA immediately began work with ASTM's D7 Committee on Wood. In 1980, ASTM D-3957 *Standard Practices for Establishing Stress Grades for Structural Members Used in Log Buildings* was published. ASTM D3957 established, for the first time, a consensus standard for visual stress grading of non-rectangular wood for use in structural applications. It established two classifications for graded logs -- wall-logs and sawn round timber beams.

The next step was to establish a grading program that would implement ASTM D3957. The existing lumber grading agencies were not prepared to tackle this new standard, so the LHC again retained SWA to establish a grading program for the LHC and train its participants. In 1981, NES QA-154 was published by the National Evaluation Service, recognizing the LHC Log Grading Program as an accredited 3rd-party inspection agency, the first of its kind. Then on the SWA staff, Rob Pickett was given the task of developing the administration, documentation, procedures, and training to implement the new Log Grading Program (LGP). By 1983, company employees and independent inspectors had been certified by attending classes in Albany NY, Missoula MT, and Knoxville TN.

By the time the LHC reached the annual meeting in 1994, Timber Products Inspection had also become involved in log grading. It became possible at this point that all LHC Member Companies could participate in one of the two accredited log grading programs, and then-President Dana Delano led the membership to approve a mandate for all LHC companies – **All members of the Log Home Council are required to grade their logs under a certified grading program.** Since then, VTT of Finland has joined the list of accredited log grading programs to which LHC Member Companies subscribe.

#### The LHC Log Grading Program

The LHC Log Grading Program is now accredited through the International Accreditation Service (IAS), which is the enforcement arm of the ICC Evaluation Service (ICC-ES). To obtain an evaluation report on a building product or system, an IAS-accredited lab/inspection agency must be involved.

The IAS accreditation recognizes the LHC program of records, procedures, and governance. The LGP is administered by Dr. Ed Burke of the University of Montana School of Forestry, who reports to the Log Grading Committee (LGC). The LGC is comprised of all LHC LGP participants and cooperatively makes decisions regarding log grading and the grading program. Dr. Burke, acting as chief grading consultant and trainer since 1989, works with the LHC staff in Washington, D.C. to complete the annual audits necessary to maintain the IAS accreditation. He also oversees the activities of the Quality Supervision Agents (QSA) who provide independent third-party inspection services to the LGP participating companies. The group of 21 individual QSAs nationwide is comprised of licensed professionals (an architect and two engineers), two Ph.D.'s, four foresters, a harvesting systems specialist, two certified lumber graders, and ten inspectors with over 15 years each of experience with manufacturing, quality assurance, construction or other areas involving lumber, log homes and/or wood products.

The LHC LGP is limited to LHC companies, and the use of the grading program by a non-participating company is strictly limited. The current position of the LGC is that one-time only grading of the log products of a non-member company is contradicting the intent of advocating continuous quality control in the log processing and crafting stage.

The IAS certificates for accredited log grading agencies can be found at [www.iasonline.org](http://www.iasonline.org).

#### The Importance of Log Grading

As log home manufacturers, we have different views on the log home market, but we all have to ensure the structural integrity of our buildings. As long as the log home kit is coming from an LHC member, the customer, code official and others can be assured that each log has been graded under a credible standard. Ensuring code compliance is an important issue, because the truth is, there are many log home companies out there that do not grade their timbers or follow a standard building code.

The LHC truly believes in log grading as a means for quality assurance and control. By certifying the grade of a log, structurally unsound products are eliminated before they are installed in a home. While this is important, it is equally important that logs that span as headers and beams are structurally-sufficient to carry the loads placed on them. These conditions may require that a better grade be used, and the builder can identify the log graded for that use by the marking on the log and noted on the Certificate of Inspection (COI).

#### How Do I Know It's Graded?

The LHC LGP is quite flexible in how it allows for the marking of individual pieces in a package. The principal means of conveying the grade of any individual piece is the combination

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of marks made on the log and a written Certificate of Inspection (COI) that accompanies the package during shipment and is part of the document file given to the customer upon delivery. This COI serves as the principal document explaining the grading system, number of pieces and other information relevant to the duties of the building official. Each log is marked according to a system set up by the company and may include a standard grade stamp, crayon marks, tags or brands. In the case of many applications, the COI will indicate that all logs are of a certain grade or higher. A check of the plans will allow the building inspector to see that the minimum grade of log in all positions in the structure have been met or exceeded by all of the logs.

### LHC's Program vs. Others?

While the organizations operate in a similar manner and base their grading and stress grade development on ASTM Standard Method D3957, they have different grade names and slightly different grading criteria. For structural purposes, they are essential equal.

The IAS accreditation of the grading programs is a requirement and assurance that the program is operating in accordance with the ISO 17020 requirements for grading agencies. In other words, all accredited programs are held to the same high standards.

In both log and lumber production, the grading programs rely on the training, day-to-day practice of the certified grader employed by the company, and inspection of the total year's production records. Both also rely on the periodic arrival of an unannounced inspection by an independent third-party.

An inspection of a log home company often checks on average, 5% to 10% of the annual production of graded log products. On occasion, the inspection will check 100% of the graded logs on inventory. Comparatively, typical lumber inspectors only arrive often enough to check the grading on less than 0.1% of a sawmill's annual graded lumber production.

The difference between the log grading programs then becomes administrative. For example, in the Log Home Council Grading Program, wall-log grades are Beam, Header, Wall, and Utility, strongest to weakest. Timber Products uses the names Premium, Select, Rustic, and Wall.

### What Else Should I Know?

There are many differences between log building products and systems that must be recognized by accredited log grading programs. Also, the grading requirement is now established in

ICC400 and in the International Building Code (IBC) and International Residential Code (IRC).

ICC 400 *Standard on the Design & Construction of Log Structures* is the first consensus document on log construction and is the only source that publishes information for non-rectangular, large cross-section wood products. Prior to this standard, design professionals only had lumber standards that did not truly represent the products available in the log industry.

There are two classifications of log timbers in ASTM D3957: Sawn round timber beams and Wall-Logs. Sawn round timber beams can be full round or sawn only on one side (to a maximum of 0.3radius) and exhibit natural taper. Sawn round timber beams are graded for allowable sawing as well as for other limiting characteristics that are used to assign a grade of #1 or #2.

Wall-logs are defined by ASTM D-3957 as "normally stacked horizontally or laid-up vertically to form a load-bearing, solid-wood wall, in any building." When profiled from a sawn cant (timber), wall-logs are typically uniform in cross-section (profile) along their entire length. The criteria for grading the logs apply uniformly as well. However, when produced from a raw log, the wall-log will retain the natural taper of the tree and the grading criteria also changes. These wall-logs may not qualify as round or sawn round timber beams because of the amount of wood removed to form the wall-log. For example, some wall-logs only have two side cuts, producing two flat surfaces and two rounded, natural surfaces. Another more common example is the handcrafted scribe-fit method of log construction. Here, the scribed long groove (notch cut to fit over the log below) will likely go deeper into the log than allowed for the sawn round timber beam classification. It would, therefore, be considered a wall log. In both cases, the tapered wall-log would be reduced to an inscribed rectangle for grading purposes that change in size with the taper of the log.

The Committee has recently developed minimum criteria to give members in the program an added advantage: flexibility of engineering product specific design values, or adoption of the new Grading Program values based on those minimum criteria.

### Log Grading is Green

One of the goals of the LHC LGP is to promote internal quality control and good stewardship of the forest resource. Log grading, and the accompanying appropriate use of engineering stress levels associated with a particular grade, size and species of log, is a means to most efficiently utilize building logs and timbers at their highest rated capacity.

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