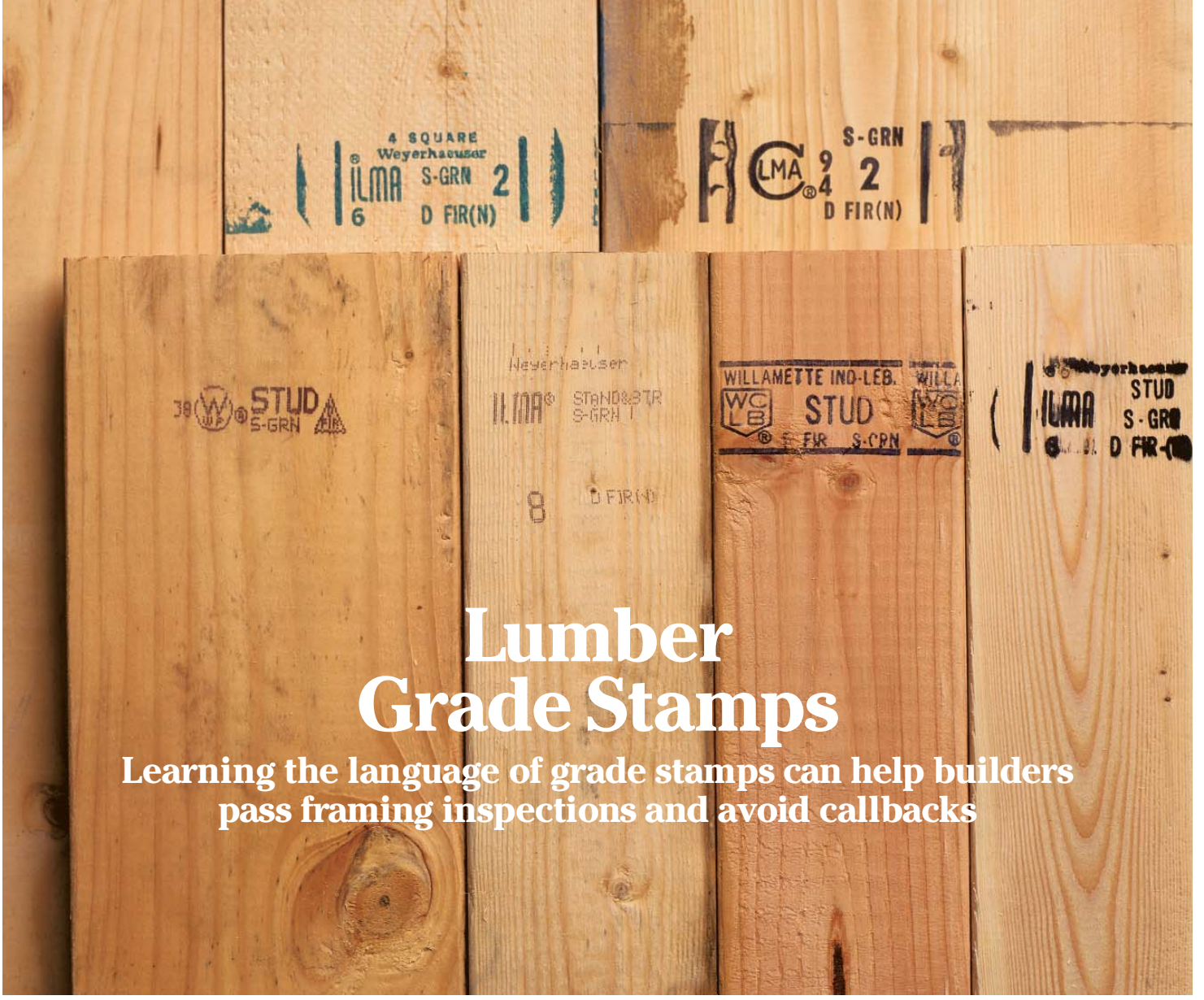


Lumber Grade Stamps

Learning the language of grade stamps can help builders pass framing inspections and avoid callbacks

by Stephen Smulski

The architect thought the 1x10 tongue-and-groove cedar siding looked great after it was installed and painted. But six months later, the irate homeowner was ranting about gaping joints and exposed, unpainted tongues. What went wrong?

The architect originally had specified dry B & Better western red cedar, but the owner balked at the price. After some discussion, they decided to use a less costly grade, #2 common red cedar. The architect checked the grade stamp on his samples and assured the owner there wouldn't be any shrinkage problems because the #2 was S-DRY (surfaced-dry).

What the architect didn't realize was that "dry" has a different meaning depending on the siding's grade. For higher grades such as B & Better, it means that when the siding was surfaced, or planed, most of the boards had a moisture content of 12% or less. But in "knotty" grades such as #2 common, S-DRY promises only that the moisture content of the wood didn't exceed 19% when surfaced.

The architect found out the hard way that it pays to know what the smudgy numbers and inky abbreviations of grade stamps really mean. They may look like Egyptian hieroglyphics or Anglo-Saxon runes, but you have to make sure the grade stamps are there if you design, build or inspect wood-frame buildings. Why? Because building codes throughout the country require that all lumber and wood-based panels used for structural purposes bear the grade stamp of an approved grading or inspection agency.

Building inspectors generally will not approve a structure that has been built with ungraded lumber because they have no reliable way of knowing whether joists, rafters and other members will support loads built on ungraded lumber. No stamp, no dice.

Cracking the code—Lumber is graded to provide builders, architects, building officials and other people with key information. A grade stamp tells you at least five things about the stick of lumber that it's printed on (sidebar facing page): grade, species, moisture content when surfaced, mill or manufacturer, and name of the agency that supervised the grading.

The grade of a given piece of lumber is based on its strength or appearance, or both. Some of the characteristics graders look for in dimension lumber include knots and holes, decay, splits, twist, bow and wane, or sections missing from the board.

Lumber grades are designated by number (such as #1), by name (Stud) or by abbreviation (Sel Str for Select Structural). Names (redwood), abbreviations (D Fir for Douglas fir) or symbols (PP for Ponderosa pine) identify the kind of wood, or species, from which the lum-

Photo this page: Scott Phillips

Lumber grade. *Listed below are grades established under the National Grading Rules for Dimension Lumber and used by inspectors at mills throughout the country. Nationwide grading rules were first established in the 1920s through the cooperative efforts of mill operators, builders, architects and officials from the U. S. Department of Commerce.*

Abbreviation of grade name	*Category*	*Dimension**	*Use*
CONST—construction STAND—standard UTIL—utility	Light framing	2 in. to 4 in. thick, 2 in. to 4 in. wide	This category is intended for use where especially high strength values are not required.
SEL STR—select structural #1 & BTR—#1 and better #1 #2 #3	Structural light framing	2 in. to 4 in. thick, 2 in. to 4 in. wide	These grades, typically used for trusses and tall concrete forms, are appropriate where higher strength is needed in light framing sizes.
SEL STR—select structural #1 #2 #3	Structural joists and planks	2 in. to 4 in. thick, 5 in. and wider	These grades commonly are used as joists and rafters.
STUD	Stud	2 in. to 4 in. thick, 2 in. and wider	A separate grade with lengths of 10 ft. or less. Relatively high strength and stiffness values make this grade suitable for use in load-bearing walls.

*Nominal

Mill. *The mill where lumber was sawn or manufactured, or the company that owns the mill, is identified by a name or a number. There are approximately 1,500 mills in the United States and about 500 in Canada. More than 95% of these mills belong to regional certifying agencies such as those listed in the box below.*

Reading a grade stamp

Lumber is graded to supply builders, architects, building officials and others with reliable information about its quality, characteristics and origin. Most grade stamps are composed of five elements: grade, species, moisture content, certifying agency and mill.

Species. *Species and species groups are identified by abbreviated symbols. Some of the more common symbols are shown below.*

DOUG. FIR-L	Douglas fir-larch
D FIR S	Douglas fir-south
HEM FIR	Hemlock-fir
SPF S	Spruce-pine-fir (south)

Certification. *Listed below are a few of the agencies that supervise lumber grading at individual mills. There are ten such agencies in the United States and 15 in Canada that are accredited by the American Lumber Standard Committee. ALSC writes standards under which lumber is milled and graded.*

Northeastern Lumber Manufacturers Association Inc.
272 Tuttle Road
P. O. Box 87A
Cumberland Center, Maine 04021
(207) 829-6901

Western Wood Products Association
Yeon Building
522 SW Fifth Ave.
Portland, Ore. 97204-2122
(503) 224-3930

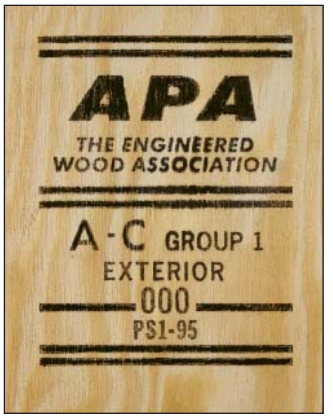
Southern Pine Inspection Bureau
4709 Scenic Highway
Pensacola, Fla. 32504
(904) 434-2611

Moisture content. *Below are the abbreviations typically included in a grade stamp that provide information about the lumber's moisture content.*

Abbreviation	
S-GRN	Surfaced-green. This mark indicates that the moisture content of the lumber when it was planed was more than 19%.
S-DRY	Surfaced-dry. Indicates moisture content of the lumber when planed was 19% or less.
KD-19 or KD	Kiln-dried 19%. Indicates the lumber has been dried in a kiln to a moisture content of 19% or less.
MC-15 or KD-15	Moisture content 15%. Indicates the lumber has been dried to a moisture content of 15% or less.

Drawings: Dan Thornton

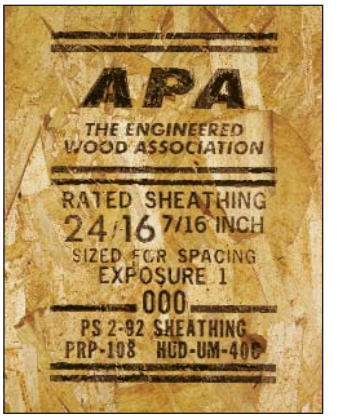
Plywood stamps provide information on strength and durability



Trade associations such as the APA use the letters "A-C" to refer to the grades of the face and back veneers, respectively. The number of knots, splits and other characteristics of the veneer determines the grade. The "C" designation also indicates that all plies inside the panel are C-grade or better. Group 1 panels are the stiffest and strongest of the five groups. Douglas fir and southern yellow pine are the two most common species of wood that are found in the Group 1 panels.

The exterior rating indicates the panel was made with exterior-grade glue. The mill number normally is stamped where "000" appears in this illustration. Criteria for the grades and other standards are contained in Department of Commerce Voluntary Product Standard (PS) 1-95.

Structural panels such as OSB are made to national standards



This 7/16-in. thick oriented strand board has been rated for use as sheathing. The numbers "24/16" indicate that the sheathing can be used on rafters spaced as much as 24 in. apart and on walls with studs 16 in. apart. The words "Sized for Spacing" mean that the panel is slightly smaller than 48 in. by 96 in., resulting in an expansion gap when installed over standard framing.

The sheathing is in the "Exposure 1" durability class, or made for limited exposure to weather. The mill number normally is stamped where "000" appears here. It complies with Voluntary Product Standard (PS) 2-92 and the APA's Performance Rated Panel Standard (PRP) 108. Finally, it meets requirements of the U. S. Department of Housing and Urban Development (HUD) Use of Material (UM) Bulletin #40C.

ber was sawn. Some softwoods, such as redwood and western red cedar, are identified and sold individually. Because of similar mechanical properties, others are marketed as species combinations. Purchase SPF (spruce-pine-fir) lumber from Canada, and you'll get a mix of red, white, black and Englemann spruce; lodgepole and jack pine; and balsam and alpine fir. Even the singular-sounding southern pine is a species combination of loblolly, longleaf, shortleaf and slash pines.

Stamp indicates moisture content—Knowing the moisture condition of the lumber at the time it was machined can help you minimize shrinkage, warpage and other moisture-related problems. Ignore the moisture designation, and you can get more shrinkage than you bargained for. For example, S-GRN (surfaced-green) lumber is sawn slightly oversize so that when it dries to 19% moisture content, it has the same dimensions as S-DRY lumber. An S-GRN Douglas-fir 2x10 is 1⁹⁄₁₆ in. by 9½ in., for example, and an S-DRY 2x10 checks in at 1½ in. by 9¼ in.

The mill that sawed and graded the lumber is identified by name (such as Meryl Lumber) or by an assigned number (453). Finally, there is the acronym or logo of the agency under whose supervision the lumber was graded.

Grading is consistent industry-wide—Grade names and limitations on the defects allowed within each grade for dimension lumber are the same under all softwood-grading rules, regardless of the species or species combination being graded. This condition ensures that lumber of the same grade has the same range of defects and appearance, regardless of who sawed and graded it. But because of natural differences in density, stiffness and strength among species, load-bearing abilities vary greatly for visually graded lumber. As a consequence, lumber grades are not interchangeable among species and species combinations.

Therefore, a builder framing a floor with 2x10s can't arbitrarily substitute #1 SPF for #1 southern pine just because it's the same grade. A designer has to specify not only the grade of lumber required for a certain structural application, but the species or species combination as well.

Graders look for defects—Softwood structural lumber is graded or stress-rated either visually or mechanically and, except for rough lumber, after surfacing. When working by eye, the grader scans all four sides of each stick, noting the size and location of natural and processing defects that affect lumber strength, appearance and use. Knots, cross grain and decay, for instance, reduce lumber strength.

Location of knots is especially important. A large edge knot, for example, can substantially lower a joist's bending strength, but a centerline knot of the same size may have little effect at all. Warp and surfacing skips don't influence strength. But excessive wane (missing portions) can leave a narrow edge that won't meet bearing or fastening needs. As you would expect, fewer defects are allowed in higher grades than in lower ones.

Dimension lumber used for making trusses, I-joist flanges, glulams and other engineered components often is graded mechanically. This lumber, identified as machine-stress rated (MSR) lumber in the grade stamp (sidebar facing page), also has to meet certain visual-grading requirements, particularly those that apply to edge knots and wane.

Design value reflects strength—Assigning a grade to a stick of structural softwood lumber by eye is an indirect way of saying that this stick can be expected to have certain minimum-strength properties. Allowable design values have been developed for each grade of lumber for each species and species combination based on the results of strength tests conducted on small, clear specimens of wood as well as on full-size lumber.

Like lumber, plywood and other panel products used in structural applications such as subflooring and sheathing also are stamped (sidebars above). The presence of the stamp proves to building officials that the panel meets U. S. Department of Commerce standards, which spell out ground rules for manufacturing and establishing the properties of plywood, oriented strand board (OSB) and waferboard.

Deciphering the panel stamp—Panel grade stamps contain mandatory information about the panel's grade, span rating or species group

Photos this page: APA-The Engineered Wood Association

number, exposure durability class and thickness. They also include information about the agency that supervised the production and the standard to which it conforms. The name or number of the producing mill and other optional information often is included as well.

Panel grades are either names that describe the panel's intended use (sheathing, underlayment) or, in the case of some plywoods, letters that identify the grades of the face veneer and the back veneer (such as A-B). More repairs—such as those eye-shaped wood patches, for example—and bigger knots are allowed in lower veneer grades.

The more than 70 species of wood used for making softwood plywood are classified into five groups according to their stiffness and strength. The strongest woods, such as Douglas fir and southern pine, are in Group 1; the weakest are in Group 5.

How to read a plywood span rating—Nowadays, OSB, waferboard and most structural plywood isn't marked with a species group number. Instead, there is a two-number span rating, such as 32/16. The number on the left represents the maximum recommended spacing of framing (in inches on center) when the panel is used as roof sheathing. The right-hand number is the maximum recommended on-center spacing of framing when the panel is used as subflooring. Like softwood-lumber allowable design values, the span ratings were developed by breaking thousands of full-size OSB, waferboard and plywood panels.

Panels that are intended for use as single-layer flooring (combined subfloor and underlayment) have only one span-rating number (such as 24 OC).

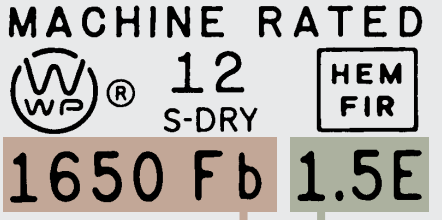
Which plywood or panel will hold up to water?—Exposure-durability class refers to a panel's ability to resist the damaging effects of exposure to the weather or to moisture. Exterior panels have a waterproof bond, and they are the only choice for panels that will be permanently exposed to the elements or to high moisture. Panels marked Exposure 1 also have a waterproof bond and are intended for use in humid locations or where long construction delays are possible.

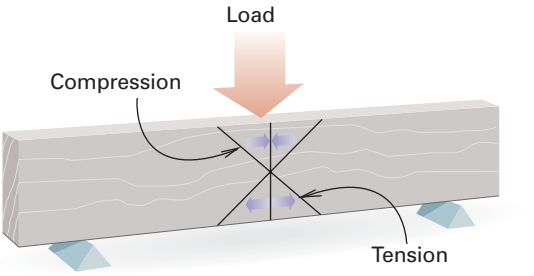
Bonded with a water-resistant adhesive, Exposure 2 panels are intended for protected applications and where only moderate construction delays are foreseen. Interior panels are meant for dry, protected uses only. □

Stephen Smulski runs Wood Science Specialists Inc. in Shutesbury, Massachusetts, a consulting firm specializing in solving wood-performance problems in light-frame structures.

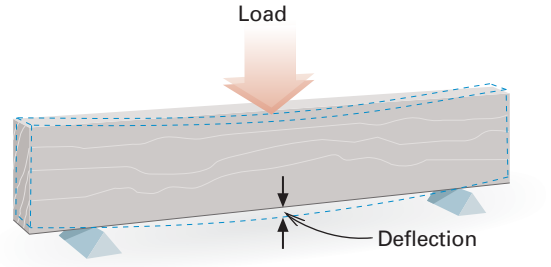
Machine-rated lumber

Lumber that bears the stamp "machine rated" or "MSR" (machine stress rated) has been tested by a machine that measures the wood's stiffness. The designation "E" stands for modulus of elasticity and is listed in millions of pounds per square inch (psi). "Fb" stands for extreme fiber stress in bending and is measured in psi. Machine-rated lumber is also inspected visually.





Extreme fiber stress in bending—Fb. *When a heavy load is applied to a structural member such as a joist, tension is produced in the surface of the opposite side of the board. At the same time, compression is produced in the fibers along the load-bearing surface. Extreme fiber stress in bending (Fb) is a measure of these forces, tension and compression.*



Modulus of elasticity—E. *Modulus of elasticity is a measure of stiffness. It is a ratio of how much a piece of lumber will deflect, or bend, in proportion to an applied load. E-values provide a conservative prediction of how much deflection might occur in a wall, floor or roof.*

How MSR lumber compares with visually graded lumber. *The table below shows four grades of visually graded lumber and their corresponding design values. The figures shown are base values that must be adjusted according to the width of the lumber. The figures represent the average that can be expected of a piece of lumber in a given grade. Each piece of MSR lumber is measured separately and marked with its particular strength and stiffness values.*

Species group	Grade	Extreme fiber stress in bending (Fb) (psi)	Modulus of elasticity (E) (psi)
Douglas fir-larch	Construction	1,000	1,500,000
	Standard	550	1,400,000
	Utility	275	1,300,000
	Stud	675	1,400,000

Source: Western Wood Products Association