

JUST THE FAQs

questions we made up about...
Wood Design Codes

Visually-Graded Southern Pine Dimension Lumber

New Design Values

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The American Lumber Standard Committee (ALSC) Board of Review approved changes to design values for all grades and all sizes of visually-graded Southern Pine and Mixed Southern Pine lumber, with a recommended effective date of June 1, 2013 to allow for their orderly implementation.

Accordingly, new design values for all sizes and grades of visually-graded Southern Pine dimension lumber were published in the Southern Pine Inspection Bureau's (SPIB) Supplement No.13 to the 2002 *Standard Grading Rules for Southern Pine Lumber*. As a rules-writing agency, SPIB must follow a rigorous approval process to establish design values for Southern Pine lumber. SPIB and Timber Products Inspection worked cooperatively to complete a full In-Grade testing matrix as required by consensus standard ASTM D1990, *Standard Practice for Establishing Allowable Properties for Visually-Graded Dimension Lumber from In-Grade Tests of Full-Size Specimens*. More than 7,400 full-size samples of commercially-produced Southern Pine were destructively tested in a two-step process, result-

ing in more than 300,000 data points.

The following frequently asked questions and answers were developed to assist designers with implementation of new southern pine design values.

Q: Do new design values affect existing structures?

A: No. New design values only apply to new construction, not existing construction. Like other building materials, wood products used in construction must meet building code requirements enforced at the time. The integrity of existing structures designed and built using design values meeting applicable building codes at the time of permitting does not change.

Q: Why do design values change?

A: Design values have changed multiple times over the years based on available test data. The lumber industry conducts ongoing testing and invests millions of dollars to provide the most accurate and reliable design values for structural lumber. Comprehensive lumber testing is conducted as new technology becomes available or as warranted by changing resource data. The first significant lumber tests began in the 1920s, resulting in design values based on the strength of small clear-wood specimens. The last major change occurred in 1991 when design values for Southern Pine and other North American species were first published based on In-Grade testing of full-size samples of commercially produced lumber. SPIB did not specifically study why a change occurred

this time, but a change in the timber resource mix is one of many variables that can affect the strength of structural lumber.

Q: How are lumber design values derived?

A: Design values provide guidance for designers to calculate the performance of a structural system and are assigned to six basic lumber properties. Design values for stiffness, as well as the major strength properties of bending, tension, and compression parallel-to-grain, are based on data from destructive testing of samples of commercially-produced structural lumber. Design values for the minor strength properties of shear and compression perpendicular-to-grain are based on published clear-wood properties.

Design values for structural lumber undergo a rigorous approval process. SPIB is responsible for developing and publishing design values for Southern Pine. All testing and data analysis must be completed in accordance with approved standards. Proposed design values are submitted to the Board of Review of the ALSC, and approved following a careful review and recommendation from the U.S. Forest Products Laboratory.

Q: Which lumber properties have new design values?

A: Four lumber properties:

- Bending (F_b)
- Tension parallel-to-grain (F_t)
- Compression parallel-to-grain (F_c)
- Modulus of Elasticity (E and E_{min})

Q: Which lumber properties have the same design values?

A: Two lumber properties:

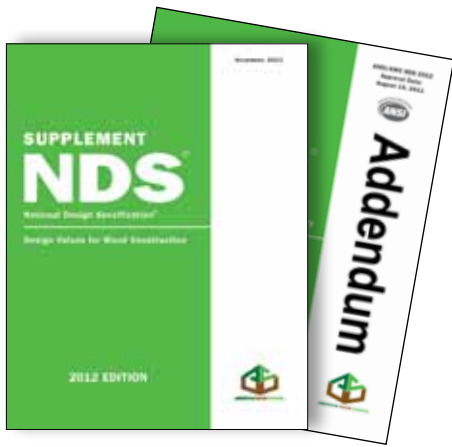
- Shear parallel-to-grain (F_v)
- Compression perpendicular-to-grain ($F_{c\perp}$)

Q: Did design values for other Southern Pine lumber products change?

A: No. Design values for other Southern Pine lumber products covered by SPIB's Grading Rules – such as mechanically graded lumber, timbers, Radius Edge Decking and other specialty items – are derived differently.

Q: Are design properties for structural glued laminated timber (glulam) beams affected by a change in lumber design values?

A: No. Laminating lumber has more stringent grading rules that have not changed. Glulam beams use special grades of laminating lumber evaluated based on more restrictive characteristics, particularly in the critical outer lamination. For more information, refer to the October 12, 2011 white paper, *Changes to Lumber Design Values and Their Effect on Structural Glued Laminated Timber (Glulam)*, published by the American Institute of Timber Construction and APA – The Engineered Wood Association.



Q: How are design values implemented into the building codes?

A: Building codes reference design values certified by the ALSC Board of Review in accordance with *American Softwood Lumber Standard DOC PS 20*. The American Wood Council (AWC) publishes these design values in a supplement to the code-referenced *National Design Specification® (NDS®) for Wood Construction*, titled *Design Values for Wood Construction*. AWC developed addenda and other updates to use with new construction designed in accordance with its standards and design tools.

Q: How do design value changes affect span tables and other prescriptive requirements in the building codes?

A: Prescriptive code requirements based on old design values need to be amended to reflect new design values. This includes ceiling joist, rafter, and header span tables. AWC worked with the International Code Council to incorporate the new design values into span tables in the *2015 International Building Code (ICC)* and *2015 International Residential Code (IRC)*. AWC also developed recommended revisions to previous code editions, and developed recommended amendments to span tables for new construction designed in accordance with ICC model building codes.



Q: When will the new design values be enforced?

A: Building codes are enforced by the state, regional, or local jurisdiction; exactly when enforcement begins can vary by jurisdiction. Users relying on prescriptive code requirements should use new span tables based on the new design values effective June 1, 2013.

Q: How can I get similar load-carrying capacities as before?

A: Southern Pine users continue to have many available product options. One option is to specify a larger size and/or higher grade

of visually graded Southern Pine lumber. Another option is to specify an increasing supply of mechanically graded lumber, which includes Machine Stress Rated (MSR) lumber and Machine Evaluated Lumber (MEL). Refer to SFPA's table, *Southern Pine Mechanically Graded Lumber (MSR & MEL) Grades & Design Values*, for a complete listing from Supplement No.12 to the *SPIB Standard Grading Rules for Southern Pine Lumber*. Also refer to SFPA's table listing sample Southern Pine grade substitutions for comparable spans.

Q: What is the impact of design value changes on stud tables?

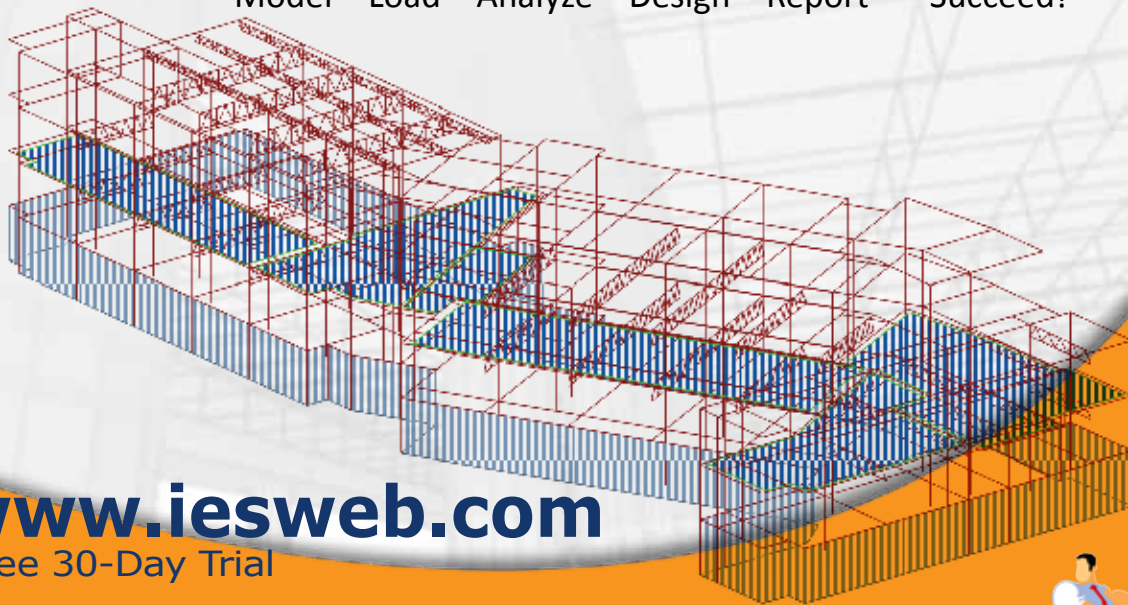
A: The answer varies for single-family, multi-family, or engineered commercial buildings, as well as for tall studs (>10 feet) and for walls

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subjected to high-wind loads as included in the AWC's *Wood Frame Construction Manual*. For example:

- There is no change for studs based on the *International Residential Code*. IRC Section R602.2 Grade states, "Studs shall be a minimum No.3, standard or stud grade lumber". This requirement is prescriptive and based on historical performance, not on a specific species or grade.
- Likewise, there is no change for studs based on the *International Building Code*, IBC Section 2308 Conventional Light-Frame Construction.
- There is a change for tall studs (>10 feet), however, based on IRC Table R602.3.1. Footnote b to that table states an assumption which translates to the requirement for a bending value not less than 1140 psi (1310/1.15), and an E value not less than 1,600,000 psi. The interim design values for studs are insufficient to meet this requirement. This IRC table didn't change as a result of design value changes, but the grade required to meet this assumption changed.
- Species-specific stud tables for resisting wind loads (Tables 3.20A, 3.20B, etc. in Chapter 3 of AWC's 2012 *Wood Frame Construction Manual*) also changed. Visit www.awc.org to download the *Addendum to the 2012 Wood Frame Construction Manual for One- and Two-Family Dwellings*.

Q: What is the impact of design value changes on wall plates?

A: Design value changes have a different impact on lumber used as wall plates, depending on whether it is used in conventional or engineered construction. The performance of wall plates in conventional construction is typically governed by compression perpendicular-to-grain. Because design values for compression perpendicular-to-grain have not changed, the overall impact on plate stock used in conventional construction is negligible. If the performance of wall plates in engineered construction is governed by a property such as bending with a design value change, however, then wall plates could be impacted. Following are more specific answers:

Q: What about double top plates?

A: For conventional construction: double top plates are applicable to all species as prescriptively specified per the IRC and Section 2308 of the IBC.

For engineered construction: the capacity of double top plates should be determined using new design values.

Q: What about single top plates (e.g. advanced framing and 24-inch on-center stud spacing)?

A: For conventional construction: single top plates are applicable to all species and prescriptively specified with a limited offset of the joist or rafter from the stud per the IRC and Section 2308 of the IBC.

For engineered construction: the capacity of a single top plate and spacing requirements should be determined using new design values.

Q: What about shear walls and diaphragms?

A: For conventional construction: detailing of braced wall panels is independent of species per the IRC or Section 2308 of the IBC.

For engineered construction: the capacity of studs at ends of shear walls, and the capacity of plates used as chords in diaphragms, should be determined using new design values.

Q: What is the impact on joists, rafters, headers, and beams?

A: The impact is smaller than originally projected due to smaller reductions for the wider widths commonly used for joists, rafters, and headers. Refer to SFPA's table, *Maximum Span Comparisons by Species*, for sample comparisons.

SFPA has updated its easy-to-use tables for specific sizes and grades of Southern Pine lumber. Refer to SFPA's span tables for *Maximum Spans for Southern Pine Joists & Rafters* and *Southern Pine Headers & Beams: Size Selection and Allowable Load Tables for Southern Pine Lumber and Glued Laminated Timber*.

Q: What is the impact of the new design values on structures built in the future?

A: Building designers may configure the individual pieces of lumber differently in the structural system. Building materials used in construction have guidelines for proper use. Wood construction incorporating new design values will continue to include a series of safety factors, and checks and balances, to ensure that wood products – specifically Southern Pine lumber – are safe and effective when used properly in the construction of a residential or commercial building. Refer to the *Southern Pine Design Value Forum Report* that includes a review of the margin of safety for in-market lumber.



Q: What is Southern Pine and Mixed Southern Pine?

A: Southern Pine is a commercial grouping of individual tree species that includes the four main species of loblolly pine, longleaf pine, shortleaf pine, and slash pine. Mixed Southern Pine includes the minor species of Virginia pine and pond pine.

Q: Did the Southern Pine Grading Rules change?

A: No. Lumber grades and the rules that define each grade did not change. Only the design values associated with visually graded Southern Pine dimension lumber changed.

Q: Did grade stamps change?

A: No. The grading requirements are unchanged.

Q: How will I know when updated information on new design values is available?

A: To aid users in the transition to new design values, the wood products industry will continue to publish helpful design information as it becomes available. Visit industry association websites for:

- Southern Pine design values, span tables & product use information from the Southern Forest Products Association
- Codes and Standards from the American Wood Council
- Southern Pine Grading Rules from the Southern Pine Inspection Bureau

Conclusion

New design values for all sizes and grades of visually-graded Southern Pine dimension lumber became effective June 1, 2013. New design values apply only to new construction. The integrity of existing structures designed and built using design values meeting applicable building codes at the time of permitting does not change. ■