

Felt Tips

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Wood Design Values Change

We're baaaack! Many [actually most] things have changed since the last Felt-Tip was published in December 1980. For those of you who remember them you are excused to feel your maturity. This month's Felt-Tip is concerned with something which is changing now.

If the conversion to the ACI-ASCE Masonry Design Code and Specification has affected your masonry design and detailing, we have news for you! The lumber [timber, for those of you who prefer the European term]¹ industry, through the National Forest Products Association (NFoPA), has updated their design specification.

As a result of a program initiated in 1977 [see, we *did* find a way to bridge the time gap between the last Felt-Tip and this Felt-Tip], United States and Canadian lumber grading associations and lumber producers, NFoPA, and the U.S. Forest Product Laboratory, conducted a series of stress tests on full size framing lumber and timber framing members. Nearly 70,000 pieces of dimensional lumber were tested to destruction.² These new "In-Grade" tests differed from previous tests which only used 2-inch cubes of wood to determine the allowable stresses. The tests resulted in a series of changes to the design values permitted for design of wood framing.

In addition to changing the allowable stresses to reflect life-size framing members, the allowable stresses are now combined with a series of modification factors to account for the many conditions of wood use and detailing [life is getting more complicated]. With the new design specification, the allowable design stresses are now modified (similar to concrete and masonry design) instead of being pure values. As a result, some allowable stresses have increased (like modulus of elasticity [accounts for the stiffness of the wood]), some have decreased (like allowable bending stresses which will reduce maximum allowable spans [and you thought it was your imagination that the framing lumber had more knots in it]), and some didn't change. The purpose of the modifiers is to permit designers to "engineer" the wood to a greater degree and reflect the actual conditions of use (which couldn't be done under the old design specification).

Design formulas have changed, partially as a result of the new design values, but mostly as an early step in the change of wood design theory. The change follows the lead of concrete design and its Ultimate Strength Design and steel design with its recent switch towards Load and Resistance Factor Design.³

New lumber grades and groups have been created. There is now a Hem-Fir (U.S.) grade of "1 and Better", and a Spruce-Pine-Fir ("SPF-South") group for U.S. lumber has been added. Also, allowable stresses have been added for some hardwood lumbers [just for all of you who wanted to design using oak and maple for framing].

Design and construction conditions, long in use, have been recognized by the new design specification. The design specification addresses design of columns built-up from wood studs (with nailed and bolted fabrication methods).

The new design specification recognizes only two moisture service conditions, wet (more than 19-percent moisture content) and dry (19-percent and less). The 15-percent moisture content grouping has been deleted [it was used with Southern Pine].

The 1991 National Design Specification, and design value supplement, is available at \$25.00 plus \$3.00 handling charge, from the National Forest Products Association, Publications Department, 1250 Connecticut Avenue NW, Suite 200, Washington, DC 20036.

Sources:

The Construction Specifier. New Empirical Design Values will Change Lumber Use. March 1991, p. 19.

National Forest Products Association, 1991 National Design Specification for Wood Construction.

Progressive Architecture, Reassessing Lumber Strengths. December 1991, pp. 37 to 38.

Renganathan Govindarajoo. Reliability-Based Design for Wood, A More Exact Science. The Construction Specifier. April 1991. pp. 126 to 133.

Notes:

1. Actually, ASTM Committee D-7, is considering the use of the term *wood member* to replace the terms *lumber* and *timbers* in its update of ASTM D198 so the standard is acceptable in Europe. From ASTM Standardization News, June 1992, p. 18.
2. The Construction Specifier. New Empirical Design Values will Change Lumber Use. March 1991, p. 19.
3. Renganathan Govindarajoo. Reliability-Based Design for Wood, A More Exact Science. The Construction Specifier. April 1991. pp. 126 to 133.

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