STRUCTURAL BUILDING COMPONENTS MAGAZINE (FORMERLY WOODWORDS)

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From Our Readers:

Good day,

I just finished Al Schuler's Economic Environment in the November 2000 issue of *WOODWORDS*. Could you please explain how to interpret the graph shown in Figure 1, page 17 of the article? I understand the concept of limited variability versus solid sawn material, but I am looking for an explanation/interpretation of the charts. Any insight would be appreciated.

Also, can you provide any information about the work of the Forest Sciences Lab as it relates to the wood products and construction industry? Do you have a web site?

Thank you for your time.

Don Simon, Merchandise Manager, Engineered Wood Prod.
Wickes Lumber, Vernon Hills, IL

Mr. Simon,

Thanks for the note and for taking the time to read the article. Here is my "non-technical" explanation. (I'm not an engineer, but an economist, so I want to avoid jargon such as standard deviations, coefficient of variation and design formulas, etc. in this explanation).

Figure 1 is an illustration depicting the relative performance of wood I-joists compared with beams manufactured from No.1 Douglas Fir dimension lumber. The horizontal axis gives the relative strength values (could be MOR, MOE or any other strength value) that would be obtained from testing a large number of joists and beams; the vertical axis indicates the proportions (percent) of joists and beams that have these corresponding strength values. The peakedness of the I-joist curve shows that most strength values are very close to the average (mean) strength, an indication of low variability. The gently sloping curve of the dimension lumber curve shows that many strength values are considerably lower or higher than the mean strength, an indication of high variability. This graph is only meant to show the relative spread of strength values within a "grade," not the relative strengths as the relative strengths may actually be the same depending on the grade of I-joists and lumber compared.

The implications of the high variability in beam strength are twofold. In order to insure that failures do not occur in the weaker beams, which are those represented by the left hand tail of the strength/frequency curves, beams must include an adequate safety factor and this is based on a divisor of the strength value at the lower fifth percentile. For instance, the divisor for bending is 2.1. Since I-joists have a narrow distribution the lower fifth percentile is closer to the mean strength. Conversely lumber has a wider distribution which means that the average strength is farther away from the lower fifth percentile. In simple terms, this means that there are sticks of lumber that have much greater strength than the design values one uses and therefore this is less efficient utilization of wood fiber strength on a dollar per stress actually employed.

Here are a few examples of the advantages of designing with products that have less strength variability: We can build identical roof trusses (strength properties, load bearing performance, etc.) with MSR (machine stress rated lumber) and plain old visually graded lumber. The truss built with MSR chords uses the wood fiber strengths much more efficiently than the truss built with conventional visually graded lumber. For example if one tests a truss with MSR lumber one might see a range of ultimate strengths that vary by about 10 percent. The trusses that use visually graded lumber may have ultimate strengths that vary by about 25 percent. This means there are more trusses that have greater excess capacity or in essence wasted capacity in a visually graded truss than there would be in a truss that uses MSR graded lumber all else being equal. As to your question regarding how work at Forestry Sciences Lab as it relates to wood products and the construction industry, we have three work units at Princeton. Their missions, etc. are listed on the web site (www.fs.fed.us/ne/princeton). Two units conduct research related to the wood products and construction industry: RWU-4803 is essentially an economics unit that looks at the demand/supply situation (including international trade) for wood products (hardwoods and softwoods) and analyzes the impact on the forest base; RWU - 4805 looks at the competitiveness of the hardwood industry specifically—problems, opportunities, etc.

I would suggest you also visit at the Forest Products Lab web site at www.fpl.fs.fed.us/program.htm. They have several research units looking at issues related to the wood products and construction industries (e.g., Engineered Wood Products and Structures [FPL-4716], Timber Demand and Technology Assessment [FPL-4851], Engineering Properties of Wood [FPL-4714]).

Finally, take a look at the entire Research Branch of the Forest Service (www.fs.fed.us/links/research.shtml).This site will identify each of the six FS Experiment stations (plus Forest Products Lab) scattered throughout the USA. Some of these research stations have work units doing research related to various aspects of the forest products and construction industry in their regions.

I hope this explanation helps. If you have any ideas regarding topics of interest that you would like to see addressed in the column (of an economic or marketing nature), please let me know.

Al Schuler,
Forestry Sciences Lab, Princeton, WV

WOODWORDS encourages feedback and dialogue on the issues that face our industry. If you are interested in sharing your thoughts or opinions on an issue raised in this or any issue of *WOODWORDS*, simply send a letter to the editor via fax at 608/274-3329 or email at editor@sbcmag.info. The staff does reserve the right to edit submissions for length, grammar and clarity.

SBC HOME PAGE

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