DETERMINATION OF CHARACTERISTIC VALUES IN NBR 7190/1997 FOR DESIGN AND FIRE SAFETY IN WOOD MATERIALS: HITS AND MISSES

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ABSTRACT
Annex B of the Brazilian standard for timber frame projects (NBR 7190:1997) have normative status and determines that the characteristic values of wood properties must be estimated by an expression that produces conservative estimates. In most situations, this strategy is suitable for design and fire safety in wooden materials due to the high variability of these materials. Unfortunately, the use of this criterion penalizes materials where great efforts were made to achieve a high level of quality control.

Keywords: Fire safety, wood materials.

INTRODUCTION
Standardization is an activity that determines repetitive and common use requirements, in order to obtain effectiveness and efficiency in actual or potential contexts. The protection of human life and health is one of its main objectives although its greatest use is to achieve a reduction of cost of production and the final product with maintenance or improvement of the quality.

The Brazilian Association of Technical Standards (ABNT) is the agency responsible for technical standardization in Brazil since its foundation in 1940 and is the official representative in Brazil of the following international organizations: ISO (International Organization for Standardization), IEC (International Electrotechnical Commission); and regional standardization bodies COPANT (Pan American Standards Commission) and the AMN (Mercosur Association for Standardization).

"According to the standard" is a phrase that appears 29, 72 and 66 times in the last three meetings in Brazilian Wood and Wooden Structures (2008, 2010, 2012) and is significant of a practice that, although experimentally and statistically inadequate, is recurrent in scientific works with wooden materials (Matos, 2013).

Values characteristic \(X_{wk}\) and average values taken from an experiment that followed the determinations of NBR 7190: 1997 on the performance of compression parallel to the fibers and the bending of the species *Erisma uncinatum* (*Vochysiaceae*) exposed to low risk fire conditions were simulated through simulation of pseudo random variables using Monte Carlo methods (Oliveira, 2012). The study simulated six variability conditions (coefficients of variation = 0.05, 0.10, 0.15, 0.20, 0.25, 0.30). Ten samples with normal distribution were generated 20000 times resulting from combinations of average values and levels of variability.
RESULTS AND CONCLUSIONS

The results from the simulations are shown in Fig. 1. An approximately quadratic relationship is shown by the characteristic values $X_{wk}$ that are within the average confidence interval with maximum point for coefficient of variation equal to 0.20. The characteristic values $X_{wk}$ that are outside the average confidence interval have an inverse pattern (Fig. 1A). The frequency of the largest characteristic values $X_{wk}$ than the upper limit of the confidence interval is almost nil from variation coefficient values equal to 0.10. The estimate of the characteristic values $X_{wk}$ is a conservative estimate and produces with a large frequency values below the confidence interval for the mean (Fig 1B).

Considering the high variability of wood and wooden materials, this strategy is suitable for the design and fire protection.

An anomalous and dangerous behavior is observed when the coefficient of variation is the smallest of all: about a quarter of the estimates of the characteristic values are greater than the upper limit of the confidence interval (Fig 1B). This study needs further development but shows another problem with the use of the standard as experimental protocol. The use of improper procedures may invalidate the very large investment that is made by some timber industries in quality control.

REFERENCES