



EFEITO DO ATRASO DE MEDIÇÃO PARA DETERMINAÇÃO DO TEOR DE UMIDADE NA MADEIRA

¹Souza CO (cassianos@ipt.br), ¹Macena SMF (sumacena@ipt.br), ¹Silva AS (amandasousa@ipt.br), ¹Miranda MJC (mmiranda@ipt.br), ¹Yojo T (yojos@ipt.br),

¹Instituto de Pesquisas Tecnológicas do Estado de São Paulo

Centro de Tecnologia de Recursos Florestais / Laboratório de Árvores Madeiras e Móveis

RESUMO: A madeira é um material higroscópico que interage com o meio ambiente até atingir o teor de umidade de equilíbrio. Os procedimentos de teste definidos pelas Normas Brasileiras, Americanas e Europeias são similares considerando-se os métodos de secagem. Contudo, os parâmetros como tamanho da amostra, forma e peso são diferentes. Este trabalho analisa o efeito do atraso de tempo decorrido na obtenção do resultado do teor de umidade. Foi utilizada a madeira nativa brasileira “Cambuí-sucupira” (*Enterolobium schomburgkii*, Leguminosae) e a madeira nativa americana “Pinus” (*Pinus* sp., Pinaceae). Cada amostra foi separada em dois grupos. O grupo definido como “sem dessecador” (pesado imediatamente após a retirada da estufa, e em intervalos regulares até 30 minutos) e o grupo “com dessecador” (após 60 minutos em temperatura ambiente). Os resultados mostraram que estatisticamente o teor de umidade do grupo “sem dessecador” medido no tempo 0,0 é equivalente ao grupo “com dessecador”. O teor de umidade é afetado pela densidade: amostras com baixa densidade são mais sensíveis à absorção de umidade. A quantidade de amostras e a densidade do material afetam os níveis de confiabilidade dos resultados.

Palavras Chave: madeira, teor de umidade, efeito do tempo, análise estatística.

MEASUREMENT OF TIME DELAY EFFECT ON WOOD MOISTURE CONTENT DETERMINATION

SUMMARY: Wood is a hygroscopic material, which interacts with environment until reach the equilibrium moisture content. The testing procedure defined by Brazilian, American and European Standard is similar if oven-dry method is considered. However, the sample parameters like size, shape and weight are different. This paper analyzes the effect of elapsed time delay in the moisture content result. It was used Brazilian native wood “Cambuí-sucupira” (*Enterolobium schomburgkii*, Leguminosae) and North America Native wood “Pinus” (*Pinus* sp., Pinaceae). Each sample was separated in two groups. The group defined as “without desiccator” group (weighted immediately after removing from drying oven, and in regular intervals until 30.0 minutes) and “with desiccator” group (after 60 minutes in room temperature). The results showed that statistically the moisture content from “without desiccator” group at time 0.0 is equivalent to “with desiccator” group. The moisture content is affected by the wood density: low density samples are more sensible to moisture absorption. Sampling quantity and the material density affects the results confidence level.

Key Words: wood, moisture content, time effect, statistical analysis.

1. INTRODUCTION

Moisture content is a significant characteristic of wood, since it can affect the material behavior in relation to its dimensional stability (KOLLMANN and COTÉ JUNIOR (1968)), mechanical strength and stiffness (LONGSDON and CALIL JUNIOR (2002)), workability and natural durability (BRANCO *et al.* (2014)). Thereby, it is important to determine the moisture content as close as to the true value.

The method utilized by Brazilian, American and European Standard Organizations to determine the moisture content is similar. However, the sample parameters like size and weight are different. Even for the same organization, it is possible to find different criteria for determinate the sample. Table 1 present this information for organizations listed above.

Table 1. Sample dimensions for moisture content determination for different standard organizations.

Standard Organization	Sample Dimensions (cm)	Sample Weight (g)
ABNT NBR 7190	2.0 x 3.0 x 5.0	–
ASTM D4442	–	–
EN 322	–	20
EN 13183-1	Minimum 2.0 in grain direction	–

Note: the symbol – represents any convenient size or weight for sample dimensions and sample weight respectively.

Once defined the sample, initial and oven-dry weight data determine moisture content. For oven-dry weight, samples are heated in oven at $103 \pm 2^{\circ}\text{C}$ until heat constant weight. The interval between two successive measurements of sample to be considered as constant weight is not uniform between the standards organizations. The number of decimal places is also another not uniform point, as presented in Table 2.

Table 2. Moisture content criteria for different standard organizations.

Standard	Verifying the sample constant mass on oven		Moisture content determination	
	Interval between two successive measurements	Acceptable difference (%)	Condition of measurement of final weight (after oven drying)	Expression of results
ABNT NBR 7190	6 hours	≤ 0.5	Hot(*) (without desiccator)	Not informed
ASTM D4442 – Method A	3 hours	$\leq 2 \cdot \text{BS}^{(**)}$	Room temperature (with desiccator)	One decimal
ASTM D4442 – Method B	4 hours	No appreciable	Hot(*) (without desiccator)	Integer value
EN 322	6 hours	≤ 0.1	Room temperature (with desiccator)	One decimal
EN 13183-1	2 hours	≤ 0.1	Hot(*) (without desiccator)	One decimal

Note: (*) For measurement condition indicated as 'Hot', the standard considers to be done as soon as possible.

(**) BS: selected balance sensitivity.