

An experimental approach to the treatment and consolidation of degraded timber elements from a XIX century building

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EXTENDED ABSTRACT

This paper presents the in situ experimental conservation work performed on three timber structural elements from a XIX century building: two floor beams and one roof beam. This palace was built in 1877 in the centre of Lisbon initially with residential purposes. It has four floors, with timber structural horizontal elements, stairs and roof beams (generally of *Pinus sylvestris*). The exterior walls are made of irregular stone masonry bedded on mortar, rendered and painted.

The building under study (figure 1) has been vacant since 2003 but remains in a reasonable conservation state. In terms of the timber elements condition some disperse and superficial degradation by wood-worm can be found as well as some fungal degradation in specific areas. This particular degradation results mainly from water leakage points in the roof and façades and also from the rupture of a pipe from the domestic water system.



Figure 1 – Palace Ribeiro da Cunha, Lisbon, Portugal

Three sections of timber structural elements moderately degraded by fungi and thought to be recovery-prone were subjected to consolidation by impregnation with an epoxy-based product, combined with the previous application of a biocide. In every case the degradation was located in a small part of the element with an extent generally lower than 80 cm.

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Indeed when timber elements are moderately degraded by fungi, assuming underlying moisture problems are solved and the wood is treated with adequate preservatives, the degraded elements need to be consolidated so that the timber keeps on fulfilling its structural and decorative functions.

As a preservative a boron water-based commercially available biocide product was used. The consolidation product was also a commercially available epoxy-based bi-component with low viscosity, specific for impregnation of rotten timber. The compatibility between these products when applied sequentially in timber had previously been evaluated by the authors, both for new and artificially aged timber. In that study it was found that the performance of the epoxy product as consolidants remains practically unchanged in timber previously treated with boron.

The evaluation of the performance of the consolidant was made in situ, given the fact that it is neither possible nor desirable to move the elements to laboratory premises. The consolidation efficacy was checked using non-destructive tests performed with the Pilodyn® and Resistograph® apparatus (figure 2), before and after the application of the products F. The ability of these equipments for the estimation of timber properties was previously checked.



a. *Pilodyn* test in roof beam



b. *Resistograph* in Pavement2 beam

Figure 2 – *In situ* testing of elements

The performance of the biocide itself was not evaluated since the efficacy of boron as a wood preservative is well established. Through non-destructive tests an increase of the consolidation effect on the degraded timber elements, promoted by the consolidation product used, was detected.

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