

Selected solutions for ancient timber structures: some Portuguese case studies

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Abstract

Timber is one of the most used materials in the roofs and floors of monumental constructions in Portugal. These timber elements are often visible, which allows easier identification of the timber species, characterization of details, evaluation of deterioration and conservation.

Complex timber structures, such as those belonging to the roofs of large monuments, are often not easy to understand in a expedite way. This complexity makes the field of conservation of historical timber structures not only a challenge but also a field much in need of modern research.

Load bearing timber structures are exposed during their life to some degradation factors which lead, in the absence of appropriate maintenance interventions, to the loss of their structural integrity and serviceability.

Often the intervention's strategy is decided on the basis of costs, time available or expertise in a particular material or technique; the lack of knowledge on timber properties, timber structural systems, biological degradation, safety assessment procedures, suitable treatment and strengthening techniques are key factors that may determine their integral replacement even if their conservation would not pose special problems. Sometimes the intervention takes such a long time to start that the whole original fabric is already lost. In other cases, partial replacement of the existing structure is required for the sustainability of the building's use, despite fulfilling the safety requirements.

The objective of this paper is to present some of the Portuguese experience in this field, regarding the case studies of Portuguese timber structures in three different situations: Santa Cruz Monastery, Capuchos Monastery and the Church of Salesianos in Estoril.

These case studies will be presented to illustrate common conservation problems and typical interventions aiming at non-invasive strengthening solutions or replacement of the timber structure.

1. INTRODUCTION

Timber, frequently associated with masonry and stone, is the material most uninterruptedly used by mankind. Thus, the heritage of timber structures is immense and several and wideranging structural typologies and functions are assigned to these structures, see Figure 1. Roof and floor timber elements are often visible, which allows easy identification of the timber species, characterization of details, evaluation of deterioration and conservation.

Complex timber structures, such as roofs of large monuments, are often not easy to understand in a expedite way. As the coverings of monuments as cathedrals, public buildings, mansions or villas show very complicate features, not easy to be understood during the first inspection. This is not only due to the fact that the system is very elaborate and to the large number of members but also due to continuous changes and past repair works, mostly with additional stiffening or propping, resulting in heterogeneity of the members, a multiplicity of connections and diversity of supports. This means that the original must be distinguished from the additions and replacements. This complexity makes the field of conservation of historical timber structures not only a challenge but also a field much in need of modern research.