



Structural vulnerability of two traditional Portuguese timber structural systems

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ABSTRACT

In general, the traditional Portuguese buildings show an undesirable deterioration level and, consequently, urgent rehabilitation processes are required. These buildings need maintenance and preservation because they are a valuable Portuguese heritage. Knowing and understanding these buildings is the first step for adequate rehabilitation processes. Usually, these buildings show the same pattern of pathologies and failure sequence. This research work is focused on the study of the roof timber structural systems of these buildings and intends to highlight these aspects. An expedite methodology of structural vulnerability assessment of the traditional Portuguese timber roof structures based on the structural vulnerability theory is presented. Real cases of traditional Portuguese timber roof structures are used. It was concluded that the trussed timber roof system seems less robust than the beamed system.

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1. Introduction

Most of the traditional Portuguese buildings are dwellings. The main vertical structural elements of these buildings are stone or earth based materials masonries. The horizontal ones are timber structural elements such as beams and trusses. Usually, these building materials are local and natural. This aspect indicates that these buildings, besides being a Portuguese heritage, also have an additional value because they are sustainable reference models for the modern building industry.

It is a fact that an impressive amount of this heritage shows an advanced stage of deterioration and urgent repair processes are required. Murta et al. [1] has underlined that the main cause for this scenario is the inexistence or deficient maintenance processes of these constructions through their lives. In this work, it is also mentioned that the deterioration process takes on a similar pattern in most of the cases and that it starts from the roof of the building [1].

In order to start a conservation process it is required that one has an understanding and knowledge of the building itself. It is in this context that this research work was developed. It intends to study the structural behaviour of the most relevant traditional Portuguese timber roof systems of dwellings. Real timber roof systems were used as reference. The failure of these structures guided the development of an expedite structural vulnerability assessment approach which is presented and proposed in this paper. This approach was inspired in the structural vulnerability theory [2,3].

Identifying the vulnerable parts of a structure and mitigating that vulnerability contributes to increase the robustness of a structure. In this case, a contribution for increasing the robustness of the traditional Portuguese timber roof systems of dwellings is given. Other authors have developed analysis with similar objectives, but in the context of steel roof structures [4].

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