



Rehabilitation of the Roof Timber Trusses of a Multiuse Pavilion

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Abstract

This paper describes the rehabilitation procedure of the roof timber structure of a multiuse pavilion in Viseu, Portugal. The roof structure consists of a series of parallel double timber trusses, partially concealed above a polyhedral wooden plank-made ceiling. Recently, the support of one of the trusses failed and another one has been assessed as in a pre-failure condition. Some load-redistribution and the prompt shore of the structure prevented the generalized collapse. The subsequent inspection and assessment led to the conclusion that the primary cause of the collapse was the failure perpendicular to the grain of the solid timber elements inserted between the double rafters and tie-beams. The replacement of the existing with a steel structure, and the repair and reinforcement of the existing wooden trusses, were considered as intervention possibilities. The latter revealed much cheaper, less time-consuming and in line with the international recommendations on rehabilitation works, and was therefore adopted. An innovative solution, consisting of the replacement of the central timber elements in all the supports, resulted in minimum visual impact and improved the load bearing capability beyond its original value.

Keywords: Timber Structures; Rehabilitation; Strengthening; Construction Process; Prosthesis.

1. Introduction

In the last decades, a strong shift occurred on the philosophy underneath the rehabilitation/refurbishment works in ancient structures (timber structures included). The ICOMOS (International Council on Monuments and Sites) Recommendations [1] set the path for new approaches focused on the safeguard of patrimonial and heritage values, and much of these guidelines are generally accepted today even when constructions other than monuments, such as private buildings, industrial facilities, etc., are concerned. The heritage issues have been a concern and topic of research and reflection ever since, and some countries with large and sensitive historical and architectural heritage issued standards on rehabilitation of wood structures [2-4] and others, based on those recommendations, as a way to force them into practical application. From among the provisions in those standards, the following particularly conditioned the definition of the rehabilitation solution described further ahead. The exact terms of the provisions were freely adapted to improve clearness of this text:

- The intervention provisions should harmonize with the existing structural context, rather than being concealed in it;
- The rehabilitation solutions shall be reversible, whenever possible;
- The original structural scheme (statics) should be kept;
- The stiffness of the rehabilitated connections should be close to the original values;
- Prosthesis of the same species as the original timber may be used to restore the integrity of an element;
- The durability of the wood shall be ensured with either constructive provisions or application of preservative products;

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