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MODELLING THE BEHAVIOUR OF A LARGE SPAN GLULAM ARCH OF ATLÂNTICO PAVILLION

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Abstract: Atlântico Pavilion, designed for the world fair Expo'98 in Lisbon, is a multi-purpose hall created to receive an audience up to 16,500 people. It is a remarkable structure. From the outside it resembles a futuristic spaceship. But it is the inner timber roof structure which turns it in one of the most emblematic buildings of its kind. The Pavilion has one of the largest glued laminated timber (glulam) structures in the world, with a maximum of 114 m span. This structure supports the arched roof and it is fixed to the concrete foundations by means of pinned joints.

Since 2000 the National Laboratory for Civil Engineering is responsible for following up the glulam structure. The monitoring includes: periodic visual inspections and measurements of wood moisture content, continuous measurements of standard environmental conditions relevant to the structure, and the determination of horizontal and vertical displacements by geodetic surveying methods. Vertical displacements of one of the arches, function of the influence of several parameters, are modelled. The model is calibrated using data from previous measurement campaigns.

The paper describes the Pavilion glulam structure and the monitoring system and presents the results, as well as the numerical models for describing environmental conditions and vertical displacements. These models fit well the historical behaviour of the studied arch. Measured displacements closely follow a pattern that can be described as a function of environmental conditions (temperature and relative humidity) and age of the structure, thus suggesting the strong influence of these variables and the absence of materials degradation or structural instability phenomena so far.

1. INTRODUCTION

The Atlântico Pavilion was built to fill the need of a multipurpose arena for large scale shows, sport events, conferences and concerts in Lisbon area. It was erected to accommodate several cultural and leisure attractions created for Expo'98, the world fair held in Lisbon in 1998. As many of the buildings constructed for this event, it was meant to remain after the closure of Expo'98.

The Atlântico Pavilion encloses one large volume defined by being, at its construction, the largest laminated timber structure in Europe. The innovative design of this structure created the need to closely follow its behaviour, reason for the setting of a monitoring system. This paper describes the studies undergone to establish a simple mathematical model that describes the historic behaviour of this structure. This model doesn't intend, by no means, to replace a structural model of the arch. It only intends to check if the displacements follow a pattern that can be related to a response to atmospheric conditions and age.