

Operational Modal Analysis of the Atlantic Pavilion Wood Roof

Maíra Ledesma and Jorge Rodrigues

National Laboratory for Civil Engineering, Structures Department, Lisbon, Portugal

ABSTRACT: The roof of the Atlantic Pavilion in Lisbon is a large span glue laminated wood structure with a characteristic shape inspired on the shell of a horseshoe crab. It was one of the first large wood constructions to be designed according with Eurocode 5.

This paper presents the operational modal analysis studies of the Atlantic Pavilion roof, that were developed within the implementation of a permanent dynamic monitoring system of that structure, as part of a research project on “Dynamic Monitoring for Structural Safety Assessment”.

A permanent dynamic monitoring system consisting of 15 accelerometers, temperature and humidity sensors and one anemometer was installed in the roof.

A complete tridimensional finite element model of the roof structure was also developed.

The paper also briefly refers the strategies that are being implemented for the continuous analysis of the data recorded with the permanent dynamic monitoring system.

1 INTRODUCTION

To maintain Civil Engineering constructions with an adequate level of structural safety it is important to have systems to monitor or keep track of their structural condition throughout their lifetime, so that it is possible to establish, in due time, the appropriate rehabilitation or strengthening interventions, preventing undesired accident situations. This is precisely the main purpose of structural health monitoring, which can be accomplished using different methodologies, whether based on inspections and measurements performed periodically or involving the permanent installation of equipments, including the automatic data acquisition and processing.

The development and application of dynamic monitoring systems for Civil Engineering structures is the main purpose of the research project “Dynamic Monitoring for Structural Safety Assessment” supported trough the National Program for Scientific Equipment Renewal promoted by FCT. The work presented in this paper, was developed within the framework of that research project.

This paper presents the operational modal analysis performed for identification of the dynamic characteristics of the Atlantic Pavilion Wood Roof, considering the data obtained in ambient vibration tests. It also describes the development of a tridimensional numerical finite element model of the roof and the consideration of the experimental modal properties in the calibration of the finite element model, adjusting the computed values to the identified ones. The presented work constitutes, therefore, the initial phase of the development of the Dynamic Monitoring System of the Atlantic Pavilion Roof, that is being carried out within the framework of the above mentioned research project.