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DYNAMIC INVESTIGATIONS ON THE HEALTH STATE AND SEISMIC VULNERABILITY OF MORANDI'S PAVILION V OF TURIN EXHIBITION CENTER

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SUMMARY

Modern architectural heritage raises issues connected to its preservation or rehabilitation and require in-depth analysis and appropriate protections. Just recently, the collapse of the Polcevera Bridge in Genoa cast a shadow on the durability itself of established materials and technologies, in particular prestressed concrete. Another aspect deserving special attention in this heritage is seismic provision. The underground Pavilion V is an iconic structure designed by Morandi, conceived in 1958 as an expansion of the exhibition space hosting the industrial vehicle section of the Turin Automobile Show. The pavilion consists of a single wide space, 69 m in width and 151 m in length, and is located 8 m below ground level. The present contribution illustrates the recent experimental investigations conducted on this stunning building, with emphasis on the dynamic characterization tests. The tests were deemed necessary for the interpretation of the structural system in view of a possible reuse as part of the university campus of architecture. The interpretation of the experimental campaign stimulated a broader range discussion on the structural and seismic reliability of this type of scheme, as well as its possible seismic improvement and rehabilitation.

Keywords: *Structural health monitoring, System identification, 20th century concrete architecture, Architectural heritage, Preservation, Riccardo Morandi, Turin Exhibition Center.*

1. INTRODUCTION

The preservation of 20th century architecture has now fully entered the wider disciplinary culture of conservation. However, in practice, this cultural awareness clashes with the difficulties involved in adapting recent buildings to current building regulations.

From the point of view of their seismic improvement, 20th century buildings present specific issues, connected to the materials and techniques used for the construction, as well as to the complex and innovative spatialities; the continuous experimentations in all these areas have been among the characteristic features of architectural and engineering research of the past century. For these reasons, in view of a restoration and re-functionalization of these buildings, it is a priority to carry out a careful evaluation of the structural performances, both as regards the level of safety in static conditions and from the point of view of seismic behavior. Experimental activities, including dynamic tests, are part of those operations aimed at identifying the structural characteristics, determining the state of health of the structure and predicting the response to seismic actions.

The complexity of the dynamic behavior of Pavilion V, realized in accordance with Morandi's scheme of the balanced beam, regards firstly its great rigidity and secondly the uncertainties related to behavior of the joints as well as its interaction with soil and with non-structural elements. In these conditions, appropriate design of the dynamic tests play a decisive role in the process of characterization. As for the modal parameter identification techniques, in recent years, time domain techniques have been pursued rather successfully, also thanks to the great spectral resolution offered in the analysis of complex systems, and thanks to their modal uncoupling capability [1]. Contrary to classical methods, subspace algorithms do not suffer from the problems

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