

4. SEISMIC STRUCTURAL ASSESSMENT OF EXISTING BUILDING AT URBAN LEVEL

R. Vicente¹, C. Oliveira², T. M. Ferreira¹, H. Rodrigues³, A. A. Costa⁴

¹ romvic@ua.pt, Department of Civil Engineering, University of Aveiro, Portugal

² cristina.oliveira@estbarreiro.ips.pt, Department of Civil Engineering, Barreiro School of Technology, Polytechnic Institute of Setúbal, Portugal

³ hugo.frodrigues@ipleiria.pt, Department of Civil Engineering, Polytechnic Institute of Leiria, Portugal

⁴ alic@isep.lpp.pt, Department of Civil Engineering, School of Engineering, Polytechnic of Porto, Portugal



1. GENERAL FRAMEWORK AND OBJECTIVES

In the last decades the evaluation of the seismic risk are of rising concern, considered essential in the activity and definition of strategy planning and urban management. The evaluation of the seismic vulnerability of the existent building stock in the perspective of the seismic risk mitigation should not be placed only in relation to the isolated buildings of relevant historical and cultural importance, but also, in relation to the agglomerate of buildings in urban centres. The chronological construction process frequently results in characteristic heterogeneity of masonry and wall connection quality. In addition, buildings do not constitute independent units given that they share the mid-walls with adjacent buildings and the façade walls are aligned. This way, as post-seismic observations proved, buildings do not have an independent structural behaviour but they interact amongst themselves, mainly for horizontal actions and so the structural performance should be studied at the level of the aggregate and not only for each isolated building. In most cases, for masonry structures there is no need for sophisticated dynamic analyses for seismic resistance verification or vulnerability assessment. This is even more relevant when an assessment at the level of a city centre is pursued [Ferreira et al; 2012].

The LiMo working groups were challenged to deepen their knowledge on vulnerability assessment tools for the case study of the *Pombaline* downtown building stock. The participants are incited to select in advance their preferred approach(es) of analysis, and apply them to a *Pombalino* building which is used as a case study. It is believed that this way the discussion of the results obtained by the different groups, to be carried out in the last day of the workshop, will be enriching. Moreover, the use of different approaches; scoring methods, mechanical methods and non-linear macro element modelling allowed to acknowledge potentialities and limitations of such methods, opening ideas for more sophisticated and hybrid approaches.

A considerable number of publications with examples of applicable vulnerability methodologies and documents that can prove useful in the calibration of mechanical and/or geometric input for the latter methodologies were provided to the participants. As guideline, a general review on the principal vulnerability assessment methods is presented in the following section.

2. CASE STUDIES: THE POMBALINO BUILDING

2.1 Introduction

The Great Lisbon Earthquake in November 1st, 1755, triggered the beginning of seismic engineering in Lisbon and in Europe. After the severe devastation caused, Lisbon downtown was completely and utterly destroyed. A new city should arise. For the first time in history, a city plan was conceived with seismic considerations, either in urban planning or in construction time.