Ambient vibration testing of buildings aimed to seismic assessment: experiences in Liguria

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Abstract

Ambient vibration tests (AVTs) provide valuable information about the dynamic behaviour of existing buildings [1]. Their use is well established in Structural Health Monitoring (SHM) applications to detect modifications in the structural behaviour after ageing, damage and retrofitting [2], and surely to formulate and update numerical models aimed to the seismic assessment. Moreover, vibration-based methodologies assume great relevance within seismic mitigation strategies to prioritize retrofitting actions at urban scale. In this context, the Italian Department of Civil Protection developed the Seismic Model from Ambient Vibrations (SMAV) [3], which relies on experimental modal parameters extracted by AVTs to evaluate the operational level of strategic buildings following a seismic event. Within the application of the SMAV procedure, this work presents an extensive measurement campaign carried out in Liguria Region (Italy) in collaboration with Geamb S.r.l. Full-scale AVTs have been performed on seven strategic buildings located in the provinces of Savona and Imperia. The structures under test, four made by reinforced concrete and three by unreinforced masonry (URM), differ greatly for dimensions, constraints and complexity. For each building, the dynamic identification is carried out using different output-only techniques [4] and comparing the results in terms of natural frequencies, damping ratios and mode shapes. Since the measurement chains have been planned assuming infinite in-plane rigidity for all the diaphragms [5], as required by SMAV, the paper investigates how this assumption can actually affect the accuracy of the identified modal parameters and discusses some verification tools [6].

Keywords: **Ambient vibration tests, structural identification, seismic assessment, existing buildings.**

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