



Fundamental period of Italian reinforced concrete buildings: comparison between numerical, experimental and Italian code simplified values

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Aim of this study is a comparison among the fundamental period of reinforced concrete buildings evaluated using the simplified approach proposed by the Italian Seismic code (NTC 2008), numerical models and real values retrieved from an experimental campaign performed on several buildings located in Basilicata region (Italy). With the intention of proposing simplified relationships to evaluate the fundamental period of reinforced concrete buildings, scientists and engineers performed several numerical and experimental campaigns, on different structures all around the world, to calibrate different kind of formulas. Most of formulas retrieved from both numerical and experimental analyses provides vibration periods smaller than those suggested by the Italian seismic code. However, it is well known that the fundamental period of a structure play a key role in the correct evaluation of the spectral acceleration for seismic static analyses.

Generally, simplified approaches impose the use of safety factors greater than those related to in depth nonlinear analyses with the aim to cover possible unexpected uncertainties. Using the simplified formula proposed by the Italian seismic code the fundamental period is quite higher than fundamental periods experimentally evaluated on real structures, with the consequence that the spectral acceleration adopted in the seismic static analysis may be significantly different than real spectral acceleration. This approach could produces a decreasing in safety factors obtained using linear and nonlinear seismic static analyses.

Finally, the authors suggest a possible update of the Italian seismic code formula for the simplified estimation of the fundamental period of vibration of existing RC buildings, taking into account both elastic and inelastic structural behaviour and the interaction between structural and non-structural elements.

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References

R. Ditommaso, M. Vona, M. R. Gallipoli and M. Mucciarelli (2013). Evaluation and considerations about fundamental periods of damaged reinforced concrete buildings. *Nat. Hazards Earth Syst. Sci.*, 13, 1903–1912, 2013. www.nat-hazards-earth-syst-sci.net/13/1903/2013. doi:10.5194/nhess-13-1903-2013