

Monitoring of the “Twin Towers” of Bologna in Italy

†

Giuseppe Lacidogna *, **Gianni Niccolini** and **Oscar Borla**

Department of Structural, Geotechnical and Building Engineering, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy; gianni.niccolini@polito.it (G.N.); oscar.borla@polito.it (O.B.)

* Correspondence: giuseppe.lacidogna@polito.it

† Presented at the 1st International Electronic Conference on Applied Sciences, 10–30 November 2020;

Available online: <https://asec2020.sciforum.net/>.

Published: 10 November 2020

Abstract: In this contribution, in which the preliminary outcomes on the monitoring of the “Garisenda” Tower are discussed, there are also briefly presented the results already obtained from the monitoring of the “Asinelli” Tower, carried out a few years ago by the Authors. The two medieval Towers, recognized as the “twin towers” of Bologna, represent a remarkable symbol of the City and of the Italian Architectural Heritage. The Asinelli Tower was built in 1109–1119. It rises to a height of 97.30 m above the ground, and show a deviation from verticality of 2.38 m. The Garisenda Tower, built around the same time, is much smaller (48 m) but with a steeper leaning (3.22 m) due to an early and more marked subsidence of soil and foundation. The data collected during the AE monitoring period of the Asinelli Tower were analyzed to evaluate the damage progress in a certain region of the masonry structure and correlate it with other considered phenomena, such as the influence of vehicle traffic, seismic activity, and wind action. To arrive at a comprehensive and objective evaluation of the structural conditions of the Garisenda Tower, whose monitoring is still ongoing, the results obtained by the AE technique are supplemented with data obtained from other zones of the structure subject to different stress-strain conditions or by means of other techniques. Thanks to this arrangement, the AE signals distribution is related to the data measured by optical cables and a seismometer to obtain an objective correlations between the actions generated by the environment and the Tower damage.

Keywords: acoustic emission; damage evolution; seismic effects; wind effects; masonry structures; non-destructive monitoring

Funding: This research received no external funding.

Publisher’s Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



© 2020 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).