Abstract

Monitoring of the “Twin Towers” of Bologna in Italy [†]

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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 Italian Architectural Heritage. The Asinelli Tower was built during the period 1109–1119. It rises to a height of 97.30 m above the ground, and shows 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 were 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 correlation 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

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