

Seismic response of a reinforced concrete building: comparison between earthquakes, induced vibrations, and numerical modelling

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The seismic response of an R.C. building in north-eastern Italy is proposed, considering earthquake recordings, natural and induced vibrations, and numerical modelling. The structure belongs to the Italian structural seismic monitoring network managed by the Italian Department of Civil Protection (DPC).

The vibration modes of the structure have been identified by considering the transfer function calculated by spectral ratio of the earthquakes and ambient noise recorded inside the building. These values are compared with the fundamental modes estimated with active vibrations and numerical modelling performed by DPC prior to the installation of the permanent monitoring network. The results show the complicated seismic behaviour of the structure, both for low-magnitude events, and the later towers interaction to the main block.

The contribution of the lateral towers is confirmed by ambient noise measurements. The amplification peak observed does not increase with storey level and can be interpreted as the interaction between the tower and the main block and not as a mode of vibration of the tower itself. This interaction is transmitted to the main block of the building and is clearly recognisable in earthquake recordings in the main block seismic array.