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Sustainability of Vernacular Architecture in Zegalli Houses in Northern Iran with Emphasis on Their Seismic Behavior

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Abstract : Zegalli houses in Guilan province, northern Iran, are a type of vernacular houses which their foundation, skeleton and walls all have been made of wood. The only houses which could survive the major Manjil-Rudbar earthquake of 1990 with a magnitude of 7.2 were these houses. Regarding this fact, some researchers started thinking of this type of foundations used in these houses to benefit from rocking-wise behavior. On the one hand, the relatively light weight of the houses, have helped these houses to withstand well against seismic excitations. In this paper at first a brief description of Zegalli houses and their architectural features, with emphasis on their foundation is presented. in the next stage foundation of one of these houses is modeled as a sample by a using a computer program, which has been developed in MATLAB environment, and by using the horizontal and vertical accelerograms of a set of selected site compatible earthquakes, a series of time history analysis (THA) are carried out to investigate the behavior of this type of houses against earthquake. Based on numerical results of THA it can be said that even without no sliding at the foundation timbers, only due to the rocking which occurs in various levels of the foundation the seismic response of the house is significantly reduced., which results in their stability subjected to earthquakes with peak ground acceleration of around 0.35g. Therefore, it can be recommended the Zegalli houses are considered as sustainable Iranian vernacular architecture, and it can be recommended that the use of these houses and their architecture and their structural merits are reconsidered by architects as well as civil and structural engineers.

Keywords : MATLAB software, rocking behavior, time history analysis, Zegalli houses
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