

# Understanding the strengths and weaknesses of Qajar architecture towards earthquake

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## ABSTRACT

Understanding traditional seismic strategies is necessary to conduct appropriate rehabilitation of historic buildings and city centers. But the fast post-earthquake disappearance of vernacular built heritage and of the associated popular knowledge and know-how along with the spread of inappropriate maintenance work make it very difficult. How can we overcome these difficulties? It is suggested to broaden the scope of observations by including both larger geographical areas and elements that do not appear as aseismic features at first glance. This paper illustrates the relevance and the limits of this approach by applying it to the case study of Yazd historic city center.

Yazd is located in a moderate seismic area and is famous for its well preserved historic city center, with a high number of Qajar adobe buildings in various states of maintenance. Earthquakes in Yazd are frequent but probably of too low intensities for a local seismic culture to develop (Ferrigni, 2005), which is not the case in the surrounding areas. And local building cultures often spread into broader territories, facing more or less distortions (Hofmann, 2015) that must be understood.

The authors combined literature review, direct observations of numerous buildings and a deeper study of four Qajar houses to conduct their research. The data collected mainly relates to the geometrical features, the materials used and the interconnections between elements, on three different scales: The largest one relates to the house and its block; the second one to the walls; and the smallest one to the materials used and their layouts. Geometrical considerations and a global understanding of the stiffness of the different elements and their connections allowed for a first understanding of the probable seismic behaviour of the studied adobe buildings and vaults. During this research, they were complemented with some post-earthquake observations in Bam, which is a rather close city that suffered from an earthquake in 2003, and on collapsing houses in Yazd.

This work allowed for the identification of several aseismic features presented in this paper along with hypotheses regarding their functions and the distortions that occurred; some of them being easier to identify and understand than others. These hypotheses are to be deepened and checked by experimental works. In this paper, it is illustrated by tests conducted on the shear strengths of masonry made with mud mortars and adobes or baked bricks to better understand how builders benefited from mixing these materials in an adobe vault.

## REFERENCES

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