Presenting Restoration and Retrofitting Process of Jame' Mosque after Doroud Earthquake

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ABSTRACT

In this paper, retrofitting process for Jame' mosque after Doroud earthquake (31st March, 2006) has been evaluated. The earthquake epicentre was in Darb-e-Astaneh a remote village about 40 kilometres west of the city of Doroud. The series of seismic shocks however affected a vast populated rural and urban area; some 25 villages and the city of Boroujerd were severely damaged. The earthquake tremors in Boroujerd city caused damages of various degrees in the historic and cultural property of the province. In the city of Boroujerd, the most significant damages include the damages of the minarets in the Jame' Mosque, the collapse of false ornamental stalactite ceiling in the Imam (Soltani) Mosque and partial collapse of the beehive dome in the Imamzadeh Ja'far holy Shrine In the Lorestan province. Reinforcing the historical structures have been a challenge for experts and authorities for years while, no basic and integrated measure has been taken in this regard and with Bam earthquake and destruction of historical Arg-e-Bam and Doroud earthquake and damages incurred by historical places and heritage, they are threatened to be destroyed and damaged yet. In addition to, modern knowledge of reinforcing, which is focused in civil engineering and structure, there is the native and classic knowledge for reinforcing historical structures and buildings, which may be a solution for us. Many factors were involved in destruction and damage of this tomb by earthquake, of which the effects of loosen joints, weak connection among different elements of structure, negligence about seismic problems in reconstruction works and characteristics of earthquake may be counted as some instance.

Key Words: Retrofitting, Jame-mosque, Restoration, Earthquake

1 INTRODUCTION

The assessment of the seismic capacity of historic masonry buildings presents objective difficulties deriving from the analytical treatment of the masonry material non-linearity, which displays nearly no-tension characteristics and requires proper experimental data for the calibration of the numerical models. In addition, the complexity of geometrical configuration of this building typology often requires the implementation of models characterized by a large number of degrees of freedom. Therefore a full nonlinear dynamic analysis of masonry buildings is not an immediate task. Retrofitting existing structures to resist seismic actions that they were not originally designed for is a common practice in structural engineering. Recently, recommendations for the analysis, conservation and structural restoration of architectural heritage have been approved by ICOMOS [1]. These Recommendations are intended to be useful to all those involved in conservation and restoration problems and not exclusively to the wide community of engineers. A key message, probably subliminal, is that those involved in historic preservation must recognize the contribution of the engineer. Often engineering advice seems to be regarded as something to be sought at the end of a project when all the decisions have been made, while it is clear that better solutions might have been available with an earlier engineering contribution.