

APPLICATIONS OF BASE ISOLATION TO HERITAGE BUILDINGS AFTER THE 2009 L'AQUILA EARTHQUAKE

Marco MEZZI

Professor, University of Perugia, Perugia, Italy

marco.mezzi@unipg.it

Riccardo VETTURINI

M.Sc. Civil Eng., INGENIUM Eng. Soc., Foligno, Italy

ing.vetturini@gmail.com

Keywords: Heritage Buildings, Seismic Retrofitting, Base Isolation, L'Aquila Earthquake

Problem and Significance: The meaning of “historical” building is a problem open to debate. From a general point of view, the “historical” buildings are characterized by the inherent worth they possess due to their architectural, aesthetic and cultural role, representative of their era in history: as such, their values must be preserved. Most historical buildings were built using stiff, heavy and low strength masonry structures. These characteristics make them particularly vulnerable to seismic attacks, leading to large damage and even failures; the earthquake resistance of these structures can result further reduced by the deterioration due to aging.

Proposed Approach: Seismic isolation is a relatively recent technique which has already been applied for the seismic protection of existing constructions. The work presented in this paper is developed within a research program aiming at improving the basic knowledge, the design procedures and the construction systems in order to promote the use of seismic isolation as a practical method to retrofit existing, in some cases “historical”, buildings. The investigations focus on structural typologies of existent historical buildings built in Italy in the last centuries, many of which result highly vulnerable to earthquakes. The application of an effective seismic protection policy, based on the use of suitable techniques and avoiding the devaluation of the architectural worth, is really a hard problem. Base isolation can represent the optimum system to solve the problem, indeed it allows for the reduction of both the structural deformations and floor accelerations, improving the protection of structure and contents. The high stiffness of masonry structures easily allows for the separation of the oscillating modes with a good efficiency of the isolation option, leading to the full protection against the maximum expected earthquake without works on walls in the elevation portion.

Results and Applications: Actual applications of the base-isolation technique for the retrofitting of historical buildings damaged by the 2009 L'Aquila Earthquake are presented and discussed. The performances of both a conventional and base-isolation retrofitting option are compared. Actual constructive methods for the cutting of masonry and for the insertion of a base isolation system at the base of the buildings are drawn up and the cost and consequence are also pointed out.

