Mathematical Problems in Engineering

Hindawi

Special Issue on

# Modelling, Design, and Analysis of Existing Buildings with Advanced Seismic Strengthening Strategies

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In this volume, we discuss the recent advances in construction technologies and materials for the seismic retrofitting of existing structures, with a special focus on the mathematical modeling strategies and computational methods. In particular, buildings designed for vertical loads only, or with inadequate seismic classifications and code provisions, represent a serious source of concern, due to the possible economic and human losses in case of strong earthquakes, and require urgent action. Traditional methods, involving conventional materials and construction techniques, are based on increasing strength and stiffness (e.g., by adding new structural elements to the system and/or enlarging the existing members), which could even make the retrofitted structure less safe than it was originally. Modern methods, based on new materials and construction techniques, propose strategies of seismic strengthening based on the following: modification of damage and collapse modes, to eliminate possible sources of brittle failures by wrapping all or part of a structural element with composite materials; increasing deformability at the base or at a certain height of the building, with a considerable reduction of the seismic loads transmitted to the superstructure (i.e., seismic isolation); adding damping to reduce the seismic demand rather than increasing the structural capacity. While there is no doubt that these advanced retrofitting strategies can be successfully used for the seismic protection of new buildings, their application to existing buildings may give rise to a number of design issues.

The compatibility of the added structural elements and/or materials with the primary structure must be carefully assessed. The structural modifications will change the internal forces in the primary structure, which must be capable of withstanding the new stress distribution. Additionally, when considering the trade-off between the cost of intervention and performance levels, it is important to take into account the fact that, for existing buildings, seismic rehabilitation objectives lower than the target performance generally adopted for new buildings should be assumed. Finally, for a widespread application of these advanced strategies, practical design procedures based on reliable mathematical models and computational methods are needed, and this is the main focus of this volume.

We are pleased to invite researchers to submit original research and review articles that will provide valuable input to our understanding of various issues related to the mathematical modelling, design, and analysis of existing buildings retrofitted with advanced seismic strengthening strategies based on new technologies and construction materials.

Authors can submit their manuscripts via the Manuscript Tracking System at http://mts.hindawi.com/submit/journals/mpe/mdae/.

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