

The Building Rehabilitation case: Protection against Seismic Risk

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Nisrine Makhoul, born 1977, received her civil engineering degree from the Lebanese University, Lebanon. Six years experience in Highways & Infrastructure projects. Then earned a Research Master degree & finishing a PhD degree from ENSAM – Paris. Area of research; seismic risk in buildings (decision analysis & strengthening of structures).

Summary

As it is clearly known, the extra cost of the measures taken to protect a building against seismic risk is higher concerning old buildings than new designed ones. But since more than 80% of buildings were designed before the new seismic codes, it is a huge heritage waiting to manage, with great priority. The need to solve this situation became urgent with regards to many levels: the society level, the government level, budget level, etc... We witness the development of several new sophisticated methodologies that are emerging in the Civil Engineering field and Seismic Engineering field to deal with seismic risk, as one among many methods let us note the «Performance Based Earthquake Engineering – PEER PBEE Assessment method»; which is not a code – based method, and which is being developed mainly at Stanford University and University of Berkeley among others. This new method is innovative with respect to earthquake engineering (geotechnical and structural), decision analysis and management. We improved greatly the decision analysis model based on sophisticated methods. Finally as a result to all the precedent we propose a new multidisciplinary approach dealing with public and private building cases, allowing to share properly the responsibility by all (engineers, owners, authorities...), in order to convince people to rehabilitate their structures by including them in the decision analysis process. The study deals with high and small probability seismic regions. An application without restriction to the particular case of France is presented.

Keywords: performance based design; decision analysis; incremental seismic rehabilitation; France.

1. Introduction

Since late sixties probabilistic methods have been introduced to seismic engineering, also performance assessment methodologies have emerged in the last decades (as Performance Based Earthquake Engineering, PEER PBEE). Lately decision analysis is witnessing enormous improvement using sophisticated decision analysis model. Management science is following this progress as well, through more specific strategies in order to implement them in the real world. The presented science progress may obviously give result to a multidisciplinary approach that helps us deal better with every specific case.

The cost of extra measures taken to protect buildings against seismic risk is higher concerning old buildings than new designed ones; an almost 20 % of the building cost is needed to rehabilitate an old building while around 2% of the building cost is needed for extra measures to implement seismic codes for the new designed one. Since more than 80% of buildings were designed before the new seismic codes, it is a huge heritage waiting to manage, with great priority. This article will present a new methodology allowing to achieve this goal. The paper is structured as follows: section 2 presents the problem and refers to the particular case of France without restriction, section 3 presents the innovative Performance Based Earthquake Engineering methodology, section 4