

Definition of mitigation strategies for the seismic risk reduction of old RC residential buildings

Summary

The main goal is to develop an efficient retrofitting plan to be employed in the specific seismic vulnerable Reinforced Concrete building typology that characterize the building stock of the city of Lisbon, in Portugal. The buildings under consideration include those realized before the 1980s, i.e. before the introduction of modern seismically oriented codes.

The seismic behavior of existing RC buildings will be assessed by mean of nonlinear 3D models developed. Non-linear static analyses will be performed to assess the seismic behavior of the structures. Sensitivity analysis will be carried out to account the variation of properties inside the typology of buildings and the effect of certain parameters to the seismic vulnerability of RC buildings. This task is going to approach geometric parameters (directly related with the case studies) and mechanical parameters (stiffness and strength of the materials and structural elements). With the results of this sensitivity analysis, fragility curves of the buildings, before the implementation of strengthening solutions, will be defined.

To reduce the seismic vulnerability, appropriate strengthening techniques will be selected and adopted, by focusing on cost-benefit analyses. Moreover, several fragility curves will be obtained to deeply characterize the seismic performance of RC buildings (before and after strengthening). This is particularly important to allow explicit consideration of the reduced structural safety of RC buildings in future interventions.

The ultimate aim of this Ph.D. research work is to develop a methodology for the vulnerability assessment of RC buildings and an efficient retrofitting plan to be employed at the city level using GIS mapping application. This retrofitting plan would be of great interest to design practitioners and eventually, may be incorporated in the future generation of seismic safety assessment and retrofitting codes, such as Part 3 of Eurocode 8, that still provide very scarce information on retrofitting solutions.

Keywords

Vulnerability and risk assessment, reinforced concrete constructions, numerical modelling.



PhD student

Claudia Caruso

PhD program

Civil Engineering (IST, University of Lisbon)

Supervisor

Rita Bento (CERIS, IST, University of Lisbon)

Co-supervisor

José Miguel Castro (FEUP, University of Porto)

Period

2015-2019

Funding

FCT scholarship
(PD/BD/127923/2016)



Example of case study building.