Beam-column joints under seismic actions in RC buildings: experimental testing, modelling issues and retrofitting techniques

Seminar

Corso di Dottorato in Ingegneria Strutturale Geotecnica e Rischio Sismico

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Beam-column joints often represent a critical issue for the seismic performance of Reinforced Concrete (RC) buildings. In existing (low standard) RC buildings, capacity design is not accomplished, generally leading to sudden shear failures under seismic loading. Recent earthquakes and studies showed that, for these buildings - which represent most of the existing RC building stock in Mediterranean area -, shear failure of beam-column joints can significantly affect strength, ductility capacity, and seismic damage and relevant losses as well. Nevertheless, a shared approach for the numerical modelling of their response under seismic action still represents an open issue in the most updated literature, along with the selection of the most effective and less invasive strengthening techniques for these elements. Even the design approach of these critical elements in new buildings is very different worldwide and still evolving, as visible in recent advancements of the next generation of Eurocodes.

This seminar aims at providing an overview of the state of the art and of the new research outcomes and trends about experimental testing, modelling strategies and retrofitting techniques of unreinforced beam-column joints in existing RC buildings. Experimental outcomes will be first presented and analyzed to highlight the main vulnerabilities of unreinforced joints, focusing on the experimental results obtained at the lab of Department of Structures for Engineering and Architecture. A wide overview of the shear strength evaluation and joint modelling proposals will be carried out to show how beam-column joints seismic response can be numerically reproduced in nonlinear static or dynamic structural analyses and pro and cons of the main modelling strategies. Lastly, recent advancements in strengthening techniques aiming at limiting joint damage will be discussed, along with their (experimentally tested) effectiveness, providing practice-oriented design tools and a critical analysis of their effectiveness.