

RECENT ADVANCEMENTS IN THE SEISMIC PROTECTION OF RC PRECAST INDUSTRIAL BUILDINGS

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Forum topics	<input type="checkbox"/> Energy in 21st Century	<input type="checkbox"/> Cultural Heritage in Digital World
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Abstract: (250 to 500 words: for each heading use the bullet points or narrative - the submission including graphics should not exceed one page)

Problems - Issues / Challenges-Needs	<ul style="list-style-type: none"> Reinforced concrete (RC) precast buildings represent a considerable part of the industrial and commercial infrastructure in Europe. The potential losses in the case of strong earthquakes are therefore large. This was explicitly demonstrated by recent earthquakes in Italy (in Emilia-Romagna, 2012). The economic losses due to the damaged industrial infrastructure and due to production interruption were amounted to more than 13 billion euros. In spite of the broad use of RC precast buildings, the knowledge about their very complex seismic response is still limited and the design practice and the design codes need to be improved.
Solutions - Methods / Results - Findings	<ul style="list-style-type: none"> The seismic response and seismic safety of RC precast buildings clearly depends on the performance of the specific connections between different structural and nonstructural elements. So far, knowledge about the highly complex inelastic seismic behaviour of such connections has been very limited. It was, intensively investigated within two European projects SAFECAST and SAFECLADDING where full-scale experiments were performed on specific connections as well as on prototype structures, and the behaviour of different types of precast structures was studied. University of Ljubljana was actively involved in these projects with the main goal to obtain a better insight into the seismic response of existing systems of RC precast structures, which are broadly used all over the Europe. The extensive and detailed experimental and analytical studies of dowel connections, which are crucial for the stability of these buildings, were performed. The seismic response of the façade cladding panels and their role to the overall response of precast buildings was systematically evaluated for the first time. These studies, performed within the SAFECLADDING project, have been recently completed with unique full-scale shake table experiments, performed within the project funded by Slovenian National Research Agency.
Novelty - Value / Relevance to ...	<ul style="list-style-type: none"> The complete insight into the main mechanisms of the dowel connections was obtained for the first time. The important parameters of the cladding panels' response were identified, and the improvements of the design practice have been proposed. The innovative system for the seismic protection of the existing cladding panels was developed. These research activates had important impact to the improvements of the design codes. Considering the UL research results, several new requirements were included into the recently proposed draft of the new version of Eurocode 8 standard. The new design procedure that has been proposed by UL, is included into this standard as the normative procedure for the design of dowel connections.
Forum statement	...

Keywords: RC precast buildings; Seismic response; Dowel connections, Cladding panels, Eurocodes



Fig. 1 Typical RC precast building system

Graphics: (please use the gray area below for representative graphics or graphical summary: select the gray area below and paste your graphics)