Università Politecnica delle Marche

PhD Program in "Civil, Environmental and Building Engineering, and Architecture"

SEMINAR ANNOUNCEMENT

Shear force in the beam-column connection and its analytical calculation

Prof. Albena Doicheva

University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria

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Abstract: The beam-to-column connection is a particularly vulnerable element in frame structures under seismic action and is often responsible for building damages. Experimental investigations carried out over the past six decades on shear strength in frame joints have not led to the establishment of a uniform procedure in the design codes of different countries. The reason lies probably in the varied nature of the investigated parameters and in the varied configurations of beam–column connections. A good knowledge of the forces passing through the frame joints in the beam–beam and column–column direction would allow both their adequate computation in new buildings and the verification of existing ones without requiring experimental studies. In the design codes of the leading countries in seismic engineering, the shear force is determined by the capacitive method, considering only the area of the longitudinal reinforcement of the beam passing through the column. This method shows us how much shear force the beam reinforcement can take, but not what the magnitude of the resulting forces actually is as a result of the acting loads. In addition, the method of the codes does not indicate the contribution of the concrete to the total magnitude of the shear force in the beam–column connection. In the proposed mathematical model for calculating the forces that leave the beam, the full dimensions of the cross-section of the beam were taken into account. The material properties and cross-sectional shape were also taken into account. A determining factor for the magnitude of forces entering the beam–column joint is the acting load on the beam. The calculations are based on Menabrea's theorem to determine the hyperstatic unknowns. The results of the proposed method show that the magnitude of the shear force differs from that accepted in the literature and the norms by 2% to 27%, depending on the stage of development of the crack. In comparison, the Eurocode-recommended method shows differences in the order of 2% to 40% for the beam with different loads.

All interested people, particularly PhD students, are invited to attend the seminar

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For further information, please contact: Stefano Lenci, DICEA, s.lenci@univpm.it.