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Modeling of eccentrically patch loaded steel I-girders

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Patch loading acts locally, over a small area or length of a structural element. It is a common situation in structural engineering that local compressive load affects the flange of steel I-profile causing local instability of the web in the region below applied load. Numerous examples are present in different structures, including crane and bridge girders. Although some eccentricity of load relative to the web plane is unavoidable in engineering practice, rather modest amount of worldwide research work has treated this issue in comparison with the case of centric patch loading. It has been shown that most eccentrically patch loaded steel I-girders behave rather unlike centrically loaded girders, having quite different collapse mode, characterized by reduced ultimate load. Several modeling techniques were applied within the investigations of eccentric patch loading: (1) Experimental analysis (started at the same time, in late 1980s, at the University of Maine and at the Czech Academy of Sciences; continued ten years later with a series of experiments at the University of Montenegro, from 1998, 2001 and 2007; finalized by few tests at the University of Navarra, in 2009); (2) finite element method (FEM) modeling, by means of various computer software (from specifically created software at the University of Maine, to the commercial software used at the University of Montenegro and University of Granada); (3) artificial neural networks (ANN) modeling (ANN forecast models for collapse mode and ultimate load have been developed at the University of Montenegro); (4) formulation of empirical expression that relates ultimate load of eccentrically patch loaded I-girder to the ultimate load of geometrically identical girder with centric patch load.

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