عنوان مقاله:

Validation of Fiber-Based Distributed Plasticity Approach for Steel Bracing Models

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خلاصه مقاله:

Nonlinear analysis approach is not anymore limited only to research purposes, but becoming more popular as a tool that can be used during design, thanks to the increased efficiency of computer software and hardware. An accurately calibrated numerical model may simulate the behaviour of buildings in a quite realistic way, which helps designers understand better the performance of their structures. However, the feasibility of the nonlinear analysis approach is limited by the complexity of the numerical model, and the aim of any researcher or engineer is to obtain the most useful information in a reasonable amount of time. This study focuses on the validation of a simplified numerical modelling approach to simulate the nonlinear behaviour of steel bracings. The paper presents a comparison between two different modelling approaches; a refined finite element model using volumetric elements, and fiber-based model using beam elements with distributed plasticity. The numerical models calibrated with the experimental result from existing literature, reproduce the behaviour of cold formed square, and hot rolled open section steel elements under inelastic cyclic loading. The hysteresis loops obtained from two models show that the accuracy obtained by simpler fiber-element formulation is quite close to the more refined volumetric model. Finally, in order to assess the accuracy of the fiber-based modelling approach to estimate the nonlinear cyclic response of full-scale braced frame configurations, two real scale frames are analysed, and the results are compared with the results of the experiments performed on the test frames. In terms of computation time and accuracy, distributed plasticity model is much more efficient, and can be a good option to perform nonlinear analysis of multi-level buildings, which would be quite cumbersome with volumetric modelling approach. This study has been realized thanks to the research fund received .from European commission with the contract MEAKADO RFSR-CT-2013-00022

کلمات کلیدی:

Distributed Plasticity; Inelastic Cyclic Modelling; Fiber Based Beam Elements