Non-Linear Static Analysis of Screwed Moment Connections in Cold-Formed Steel Frames

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Abstract : Cold-formed steel frames are preferable for framed constructions due to its low seismic weights and results into low seismic forces, but on the contrary, significant lateral deflections are expected under seismic/wind loading. The various factors affecting the lateral stiffness of steel frames are the stiffness of connections, beams and columns. So, by increasing the stiffness of beam, column and making the connections rigid will enhance the lateral stiffness. The present study focused on Structural elements made of rectangular hollow sections and fastened with screwed in-plane moment connections for the building frames. The self-drilling screws can be easily drilled on either side of the connection area with the help of gusset plates. The strength of screwed connections can be made 1.2 times the connecting elements. However, achieving high stiffness in connections is also a challenging job. Hence in addition to beam and column stiffness's the connection stiffness are also going to be a governing parameter in the lateral deflections of the frames. SAP 2000 Non-linear static analysis has been planned to study the seismic behavior of steel frames. The SAP model will be consisting of nonlinear spring model for the connection to account the semi-rigid connections and the nonlinear hinges will be assigned for beam and column sections according to FEMA 273 guidelines. The reliable spring and hinge parameters will be assigned based on an experimental and analytical database. The non-linear static analysis is mainly focused on the identification of various hinge formations and the estimation of lateral deflection and these will contribute as an inputs for the direct displacement-based Seismic design. The research output from this study are the modelling techniques and suitable design guidelines for the performance-based seismic design of cold-formed steel frames.

Keywords : buckling, cold formed steel, nonlinear static analysis, screwed connections

Conference Title: ICSSC 2018: International Conference on Steel Structures and Constructions

Conference Location : Amsterdam, Netherlands

Conference Dates : May 10-11, 2018

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