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Finite Element Analysis of Cold Formed Steel Screwed Connections

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Abstract : Steel Structures are commonly used for rapid erections and multistory constructions due to its inherent advantages. However, the high accuracy required in detailing and heavier sections, make it difficult to erect in place and transport. Cold Formed steel which are specially made by reducing carbon and other alloys are used nowadays to make thin-walled structures. Various types of connections are being reported as well as practiced for the thin-walled members such as bolting, riveting, welding and other mechanical connections. Commonly self-drilling screw connections are used for cold-formed purlin sheeting connection. In this paper an attempt is made to develop a moment resting frame which can be rapidly and remotely constructed with thin walled sections and self-drilling screws. Semi-rigid Moment connections are developed with Rectangular thin-walled tubes and the screws. The Finite Element Analysis programme ABAQUS is used for modelling the screwed connections. The various modelling procedures for simulating the connection behavior such as tie-constraint model, oriented spring model and solid interaction modelling are compared and are critically reviewed. From the experimental validations the solid-interaction modelling identified to be the most accurate one and are used for predicting the connection behaviors. From the finite element analysis, hysteresis curves and the modes of failure were identified. Parametric studies were done on the connection model to optimize the connection configurations to get desired connection characteristics.

Keywords : buckling, cold formed steel, finite element analysis, screwed connections
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