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Numerical Analysis of Cold-Formed Steel Shear Wall Panels Subjected to Cyclic Loading

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Abstract : Shear walls made of cold formed steel are used as lateral force resisting components in residential and low-rise commercial and industrial constructions. The seismic design analysis of such structures is often complex due to the slenderness of members and their instability prevalence. In this context, a simplified modeling technique across the panel is proposed by using the finite element method. The approach is based on idealizing the whole panel by a nonlinear shear link element which reflects its shear behavior connected to rigid body elements which transmit the forces to the end elements (studs) that resist the tension and the compression. The numerical model of the shear wall panel was subjected to cyclic loads in order to evaluate the seismic performance of the structure in terms of lateral displacement and energy dissipation capacity. In order to validate this model, the numerical results were compared with those from literature tests. This modeling technique is particularly useful for the design of cold formed steel structures where the shear forces in each panel and the axial forces in the studs can be obtained using spectrum analysis.

Keywords : cold-formed steel, cyclic loading, modeling technique, nonlinear analysis, shear wall panel
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