

A Comparison Investigation into Analysis Methods to Determine the Buckling Capacity of South African Cold-Formed Steel Lipped Channel Sections

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Abstract - This paper presents a comparison investigation into analysis methods to determine the buckling capacity of South African cold-formed steel lipped channel sections. The research considers the evaluation of buckling capacities of five different column lengths using five different methods: 1. experimental tests; 2. the Direct Strength Method (DSM) as prescribed in *SANS 10162-2*; 3. *Eurocode 3*; 4. simplified Finite Element Analysis (FEA), i.e. only beam modelling elements; and 5. finely refined FEA, i.e. plate modelling elements. All columns have a 75 x 50 x 20 x 2.0 (h x b x c x t mm) cold-formed lipped channel cross-section. A comparison of the experimental buckling results to the aforementioned methods shows that the *Eurocode 3* and DSM buckling resistance values overestimate the buckling loads by 23.8% and 12.7%, respectively. For the two Finite Element Model (FEM) buckling analyses; the simplified FEA method yields an overestimation of 76.9% and the finely refined FEA yields an overestimation of 74.8%. It is recommended that the DSM is used to calculate the buckling resistance of cold-formed lipped channels.

Keywords: Buckling, thin-walled, cold-formed, Direct Strength Method, Finite Element Analysis.