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The use of modified amplification factors in assessing in-plane instability of unbraced frame structures

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ABSTRACT

Kemp's (1999) amplification factor method is tested in its ability to model the nonlinear in-plane behaviour of several unbraced rectangular steel portal frames. The evaluation is by means of comparison to results obtained from physical tests and advanced finite element analyses of the portals. The failure load calculations are favourable, but the load-"amplification factor" (load-*X*) relationships differ substantially between test methods. These differences are ascribed to Kemp's bilinear representation of the load-*X* relationship, the tendency of his amplification factor to underestimate loss of elastic flexural rigidity, and the assumption of a single amplification factor for an entire structure. Modifications are proposed to the limits of the bilinear load-*X* graph, and to the failure criterion of Kemp's method. These modifications maintain the simplicity and accuracy of the failure load prediction, improve the modelling of the load-*X* relationship, and provide a means of recognising upper and lower bound collapse loads.