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## DESIGN OF TOP-HAT PURLINS FOR COLD-FORMED STEEL PORTAL FRAMES

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### Abstract

This paper considers the use of cold-formed steel top-hat sections for purlins in the UK, as an alternative to conventional zed-sections. The use of such top-hat sections could be viable for cold-formed steel portal framing systems, where both the frame spacing and purlin span may be smaller than that of conventional hot-rolled steel portal frames. Furthermore, such sections are torsionally stiffer than zed-sections, and so have a greater resistance to lateral-torsional buckling. They also do not require the installation of anti-sag rods. The paper describes a combination of full-scale laboratory tests and non-linear elasto plastic finite element analyses. The results of twenty-seven tests on four different top-hat sections are presented. In terms of stiffness, good agreement between the experimental and finite element results is shown. The finite element model is then used for a parametric study to investigate the effect of different thicknesses and steel grades. Design recommendations are provided in the form of charts. The use of the finite element method in this way exploits modern computational techniques for an otherwise difficult structural design problem and reduces the need for an expensive and time consuming full laboratory study, whilst maintaining realistic and safe coverage of the important structural design issues.

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