

THE BEHAVIOUR & DESIGN OF BATTENED STRUCTURAL MEMBERS

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Abstract

The dissertation gives a short account of previous work on battened columns and of present-day specifications regarding their use.

The testing apparatus included fittings that gave perfectly free end conditions. Tests were made on sixty-eight welded strut specimens built up of channel sections, which were subjected to both concentric and eccentric loadings. The number of battens varied from five to nine, but the specimens were of one length giving a slenderness ratio for the whole strut of approximately eighty-five.

A full description is given of the test procedure and the observations made. The results of one of the test are shown fully worked out. Curves of deflection and rotation of centres of battens plotted against axial load are given.

Experimentally determined collapse loads are shown plotted against resultant eccentricities and smooth curves are drawn through the scattered points. Approximate formulae for collapse loads show reasonable agreement with these curves.

The theoretical work shows that below the yield stress the elastic theory gives satisfactory agreement between the observed and calculated values of deflection and rotation. After the yield stress is passed a similar analysis is used, but the results are approximate only. A curve of full plastic resistance moment of the channel section is used to evaluate the approximate collapse load of the strut specimen. The calculation agrees well with the experimental result. The forces and bending moments acting at the joints when the strut is on the point of collapse are calculated. It is shown that the welding in the battens can be reduced considerably.

The dissertation includes recommendations about the design of eccentrically loaded pin-ended struts of normal proportions, and draws general conclusions from the experimental and theoretical work.