ABSTRACT

Plated columns hitherto considered as facade wall elements have been recognised as axial load carrying elements and theoretical analysis has been proposed to predict their elastic and post collapse behaviour. Torsional-flexural buckling and component plate local failure are identified as major buckling modes along with the Euler type of buckling. The theoretical findings are verified and substantiated by experiments. Columns with cross section like channel, trough, angle, circular arc and Z-section are considered for investigation.

These columns are analysed for their buckling strength through stability equations derived on the basis of a realistic stress-strain relation for concrete. Equations are derived for the critical buckling strains for axially loaded and eccentrically loaded columns. Analysis is limited to small eccentricity measured along the positive major principal axis.

The post collapse behaviour of the columns is studied by drawing the collapse curve which indicates the nature of failure. Criteria are proposed to determine the failure load from the draw down curve.
Local buckling of the plate elements of thin-walled reinforced concrete columns is considered and a basis is formulated for finding the minimum width-thickness ratio required to prevent local buckling.

Details of the experimental programme carried out to verify the theoretical findings are reported. (Thirty columns with hinged end supports were tested to failure. Load and deflection data were gathered).

Based on the results of the theoretical investigation and the experimental verification thereof, criteria for the design of thin-walled columns are proposed.