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**THE USE OF TAPERED SECTIONS IN STEEL PORTAL FRAMED STRUCTURES IN SRI LANKA**

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## ABSTRACT

With the rapid development of the industrial sector in Sri Lanka, there is a high demand for clear span buildings to cater for the factories. Plastic design for portal frame has become popular in these days. However in Sri Lanka, most Designers adopt elastic design due to the scarcity of analytical and design software dealing with plastic design. There is no proper way of plastic analysis unlike the elastic analysis. Reactions for the plastic analysis are calculated after analyzing a number of collapse mechanisms.

Clear guide lines for the portal frame with tapered sections are not given in BS 5950 except for some recommendation given in Appendix G. In this research, design of portal frames with tapered sections are done plastically and elastically but it was observed that plastic analysis is much difficult to detect the exact position of the plastic hinge. Then elastic design was done with tapered sections using CADD A3D Software package.

Variable section properties were taken into consideration by dividing the member into small elements with the guide line given in BS5950 and in particular appendix G, covering a span range of 20m to 50m for the spacing of 4.5 m, 6.0m and 9.0m with eave height of 4.5m and 6.0m using 355 N/mm<sup>2</sup> and 275 N/mm<sup>2</sup> strength steel plates.

Portal frame with uniform sections were designed for same spans spacing and eave height using 355 N/mm<sup>2</sup> and 275 N/mm<sup>2</sup> strength plates. Finally a comparison was done with tapered section and uniform sections. It has been found that portal frame with tapered section need less steel than uniform sections, but an economical range is identified for the tapered section portal frame, considering the welding cost. This economical range is identified considering the cost per frame basis.

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