

Applicability of linear analysis in fire design of tubular steel trusses

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Abstract

Welded tubular steel trusses are widely used in the applications of structural engineering due to their light weight, good mechanical performance and appearance. Moreover, a large amount of research has been done to ensure the safety of the design codes of tubular members and their joints. However, this research has mainly focused on the structural behaviour at ambient temperature and only a little research has been carried out at elevated temperatures.

At elevated temperatures, geometrical and material non-linearities are the two significant factors that affect the behaviour of structures. Moreover, thermal expansion may have a significant effect on the structure even under a moderate temperature rise. However, analysis which take the above mentioned factors into account are much more challenging task compared to linear analysis.

In this study, the applicability of linear analysis is studied by comparing its results to those obtained by advanced analysis which take the geometrical and material non-linearities and thermal expansion into account. Different kinds of trusses are analysed using commercial finite element software ABAQUS.