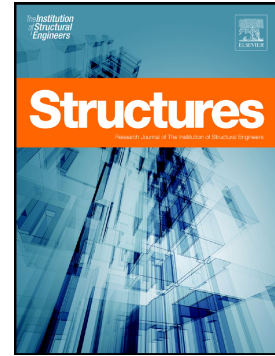


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### Lateral Torsional Buckling Behaviour of Steel Beams – On the Influence of the Structural System

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**Lateral torsional buckling behaviour of steel beams – On the influence of the structural system**

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**Highlights**

- Lateral torsional buckling behaviour of cantilever and two-span beams
- Effect of yielding on the failure modes (cross section failure, eigenvalue failure of the partially plastic system and elastic system and limitation of the rotation around the longitudinal axis)
- Influence of structural system, member slenderness and cross section on decisive failure mode and LTB behaviour

**Abstract**

This paper analyses the lateral torsional buckling (LTB) behaviour of cantilever and two-span steel beams. The structural behaviour in terms of load-deflection curves, plasticisation of the cross section, ultimate capacities and failure modes of these beams is compared to the corresponding behaviour of simple beams, which are often considered as a basis for developing simplified models for design purposes. The results of the numerical study show that the ultimate capacity of steel beams is strongly affected by the yield-zone development and limited by four different failure criteria, namely the cross section failure, the eigenvalue-failure of the partially plastic system, the rotation limit and the eigenvalue-failure of the elastic system. Different ranges of slenderness are crucial for each failure criteria and these ranges vary for the different structural systems.

**Keywords**

Lateral-torsional buckling, failure criteria, eigenvalue-failure of the partially plastic system

**1 Introduction**

Simplified analytical models used for the prediction of member buckling resistances of steel beams are commonly based on the results of experimental and numerical studies on simple beams, e. g. [1-4]. For lateral-torsional buckling the models often use reduction factors originally developed for flexural buckling. However, the lateral torsional buckling behaviour of a cantilever beam or a multi-span beam may be different from the behaviour of a simple beam or even the flexural buckling behaviour of a hinged column. The simple relative

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