

High strength steel stiffened plate girders: shear buckling behaviour and transverse stiffeners internal forces

Summary

Transverse stiffeners are used in slender steel plate girders along the span to give web lateral support and increase plate girder shear resistance. According to several studies, transverse stiffeners are primarily engaged in out-of-plane bending to laterally limit the edges of the panel as it buckles, rather than axial compression to anchor the tension field. As a result, the axial loading defined in EN 1993-1-5 for the design of transverse stiffeners, based on tension field action, is usually deemed to be substantially larger than that observed in laboratory testing and numerical simulations.

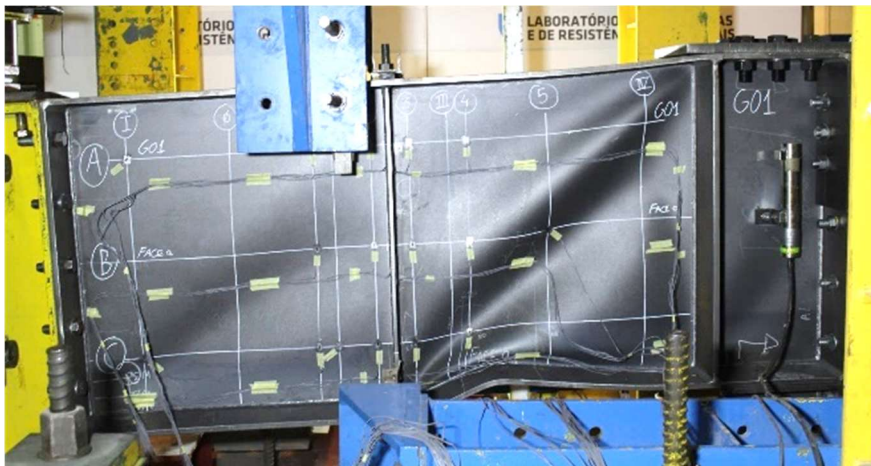
The aim of the research is to determine the internal forces acting on intermediate transverse stiffeners, as well as the buckling behaviour of high-strength steel stiffened plated girders under shear loads.

With slender webs and two transverse stiffener geometries, eight plate girders are loaded to failure in large scale experimental tests. FE-models that accurately reflect the tests offer a comprehensive understanding of the plate girder behaviour. During plate girder loading up to failure, the stiffeners' internal forces are measured.

The results of an extensive fully non-linear numerical parametric analysis of plate girders with a wide range of shapes shows that both the axial compression and the bending moment in the intermediate transverse stiffeners are much lower than the values defined by the EN 1993-1-5. The ultimate objective is to provide a design rule that can enhance EN 1993-1-5 design rules for use in high strength steel plate girder's applications.

Keywords

Plate girders, High strength steel, Transverse stiffeners, Shear buckling, Experimental testing, Nonlinear numerical analysis.



Large scale experimental test of a plate girder loaded in shear up to buckling failure with intermediate transverse stiffener forces monitoring.



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Period

2019-2024

Funding

FCT scholarship
(SFRH/BD/146561/2019)