High strength steel application in bridges – webs of plate and box girder road bridges

Summary

The main objectives of this work are the analysis of the potentialities of the HSS application in bridges, the identification of the leading constraints in the exploration of those potentialities, the definition of design measures that can minimize the identified constraints and, finally, the optimisation of high strength steel application in bridges.

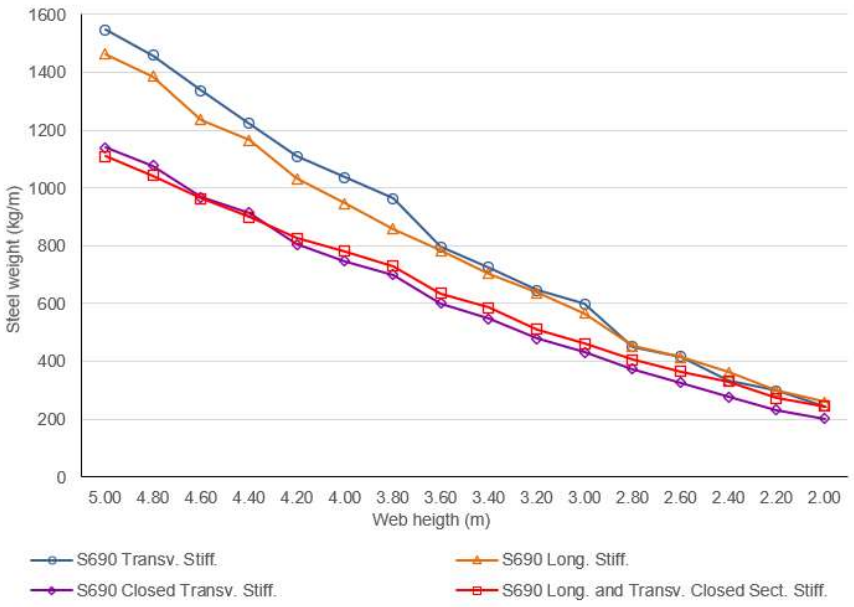
This work is focused on the application of steel with 690 MPa yield stress in the decks of the most common plate girder and box girder composite road bridges. Two distinct main fields are studied, the fatigue resistance and the structural stability, but the thesis is centred in this last subject, particularly in the stability of the girder bridge webs.

Two case studies were selected, a twin plate girder bridge with 80 m span and a box girder bridge with 120 m span. Both decks are designed with S355 and S690 steel grades. The Eurocode requirements is applied in the safety checking of these structures. The comparison between the obtained results allows the identification of the HSS potentialities and also the identification of the leading constraints in their application, which are the fatigue resistance, the local buckling of plates, the flange induced buckling of the webs and the transverse stiffeners design.

The results from experimental and numerical research in the referred main issues were collected, analysed and compared with the code requirements. A parametric study is performed concerning the web design and, finally, the measures to optimize the application of HSS in bridge design are proposed.

Keywords

High strength steel (HSS), bridges, girder webs, stiffeners, plate buckling, Eurocodes.



Parametric study: total web steel weight for the S690 solutions (kg/m).

PhD student
Carlos Alexandre Cintra Vieira

PhD program
Civil Engineering (IST, University of Lisbon)

Supervisor
Francisco Virtuoso (CERIS, IST, University of Lisbon)

Co-supervisor
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