CERIS Civil Engineering Research and Innovation for Sustainability

# GBT-based analysis of steel-concrete composite bridges under serviceability conditions


## Summary

The aim of the research work is to develop a finite element model based on the Generalized Beam Theory (GBT), catered towards the serviceability analysis of steel-concrete composite bridge decks. Although GBT is well-established as a very efficient and structurally enlightening framework for analysis of thin-walled members, its application to steel-concrete composite bridge decks is recent and undergoing.

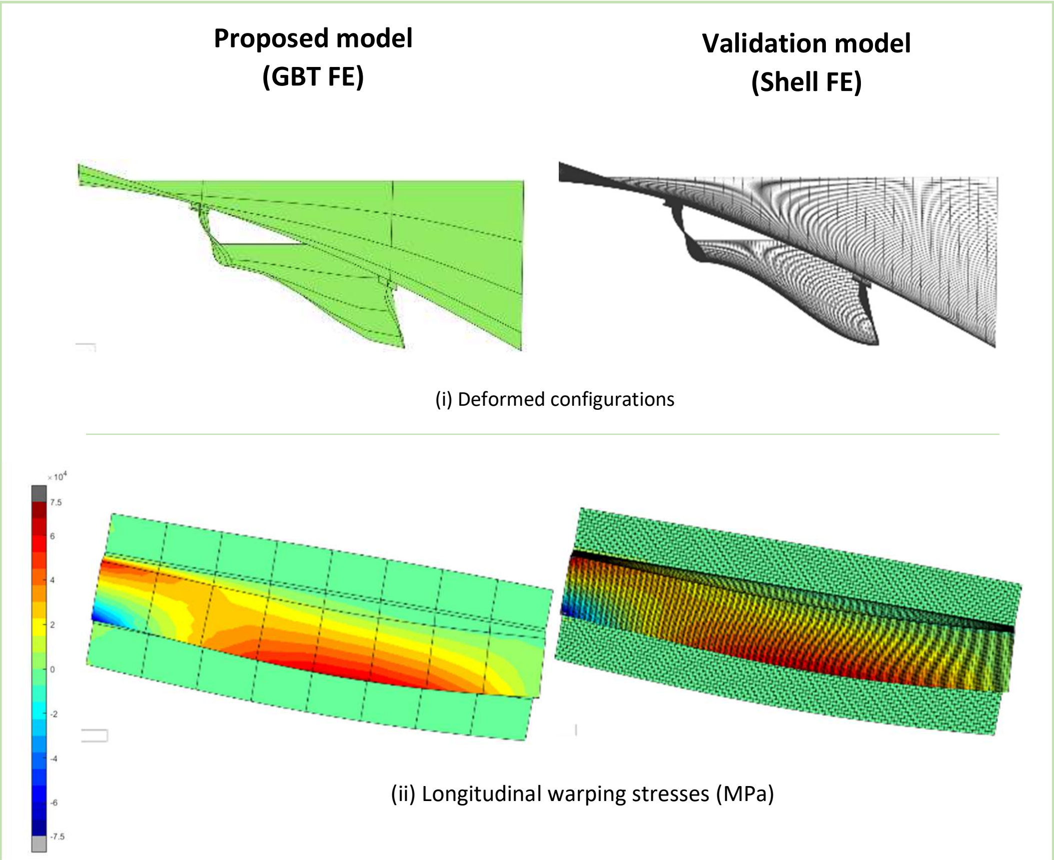
These scientific works focus on the development and/adaptation of GBT to the specific context at hand, including aspects such as the determination of the GBT deformation modes accounting for slip at the connection between steel and concrete, the incorporation of flexible diaphragms of cross-bracings along the span, cracking of the concrete slab near intermediate supports and time-dependent effects.

The model validity and merits are discussed by exploring pertinent case studies involving existing steel-concrete bridge decks. The obtained results are compared against those from equivalent shell finite element models, exhibiting excellent agreement. The modal features of GBT are then explored to highlight the added value provided by the model in better understanding the bridge deck mechanics, in particular the distortional behavior.



## Keywords

Steel-concrete bridges, flexible cross-section bracing, distortion, Generalized Beam Theory (GBT), serviceability conditions


*Comparison between (i) deformed configurations and (ii) longitudinal warping stresses, obtained with GBT and equivalent FE models for an eccentrically loaded steel-concrete box-girder bridge deck exhibiting significant distortion.*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