

Finite Element Models for Stress-Laminated Solid Wood Decks

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1 Abstract

Stress laminated timber bridge decks consist of planks or glulam timber members that are put together side by side to form plates or solid volumes of wood to be used as bridge decks. The decks may also be used for other purposes than bridge decks. Load-carrying capacities of these decks are very high and friction alone carries load between individual members. Friction is achieved by using prestressed steel rods through the decks that give normal compressive forces between members, see Fig.1.

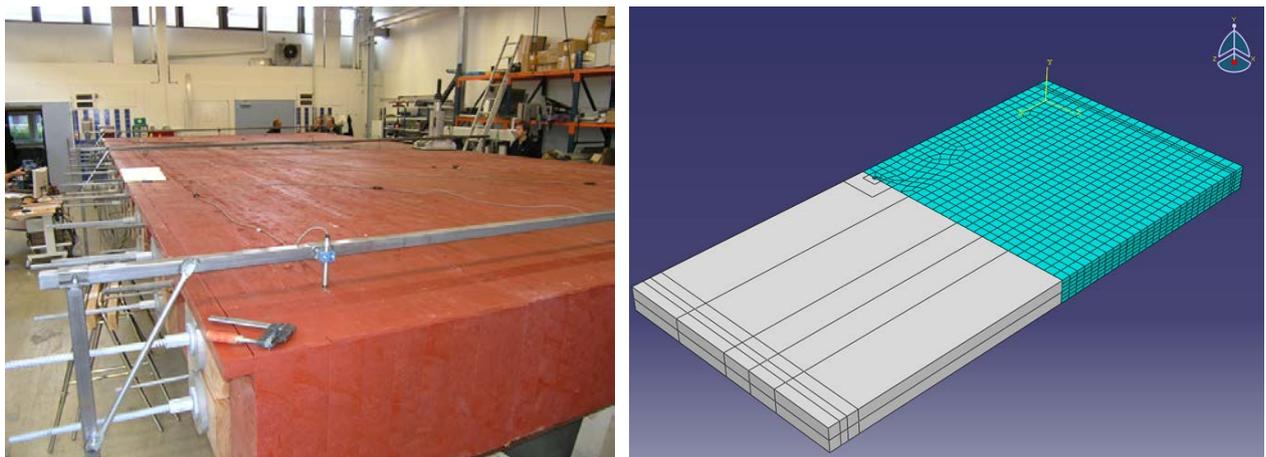


Fig.1. Left: bridge deck in laboratory test situation. Right: FE model

The load vs. displacement curve for a transversally loaded deck is normally nonlinear even for low load values but especially for high loads due to partial slip between members. FE simulations and laboratory tests for behaviour have been made earlier, see [1], [2], [3]. Two different approaches for FE-simulations have been used, one with an elastic-plastic material model without discrete member modeling and another with discrete member modeling and contact surfaces between members.

In the presentation a summary of earlier results are shown and also some recent results due to additional features in the FE models. The additions are possibilities too simulate gaps between members for the elastic-plastic model and results from butt-end modeling with the contact model. Fig. 2 shows an example of a non-linear load vs. displacement curve for a model with butt-end joints in the deck.

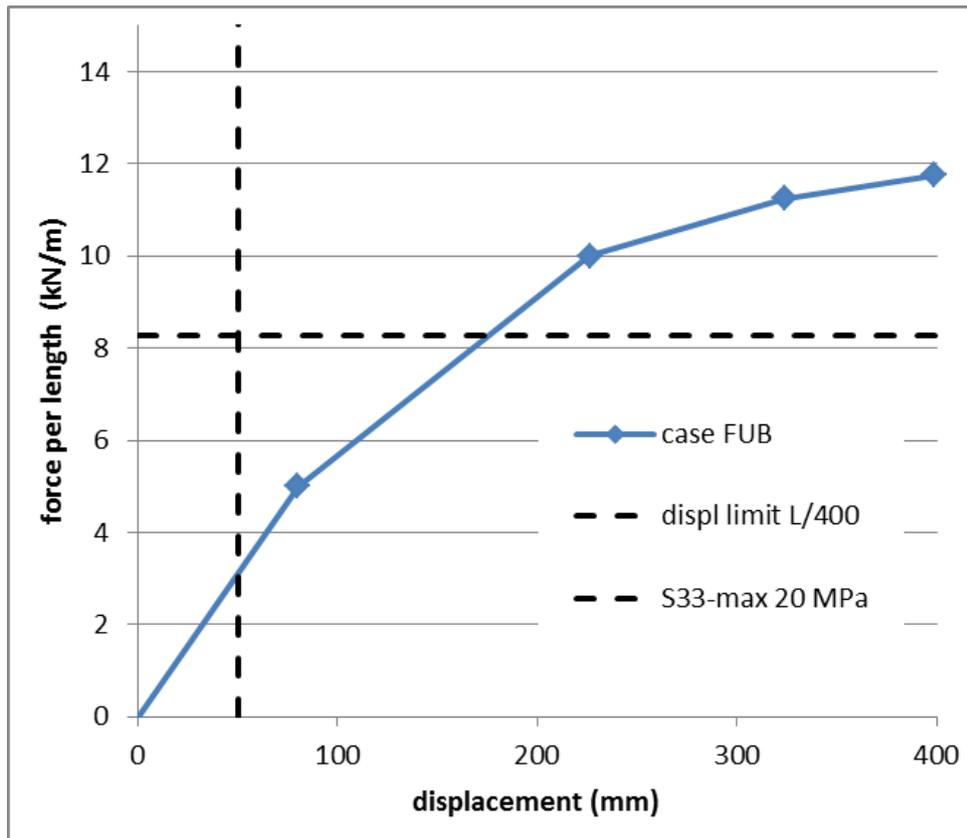


Fig.2. load vs. displacement curve for a model with butt-end joints in the deck.

References

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- [3] Ekevad M.; Jacobsson P.; Kliger R. (2013). Stress-Laminated Timber Bridge Decks: Non-linear Effects in Ultimate and Serviceability Limit States. International Conference on Timber Bridges 2013 (ICTB2013). Arranged by USDA Forest Products Laboratory. Las Vegas, USA, September 30-October 2, 2013.