

Finnish Fins: a novel approach to short-span, timber-only bridges by the use of stiffening fins

Juan Manuel GARCÍA-GUERRERO*, Gerhard FINK^a, Günther H. FILZ^b

* Department of Civil Engineering, Universidad Politécnica de Cartagena (UPCT)
Paseo Alfonso XIII 52, 30203, Cartagena, Spain
jm.guerrero@upct.es

^a Department of Civil Engineering, Aalto University, Finland

^b Aalto University, ENG | Department of Civil Engineering ° ARTS | Department of Architecture, Finland

Abstract

Using wood as building material has long tradition in many countries, and it is deeply rooted in Finnish culture. The Finnish tradition of wooden building comprises from the primordial sauna and small houses, to the development of wooden churches and towns, and nowadays to large span structures and multi-story building (see Norris [1] or Keskişalo [2]). Today the presence of a highly developed Finnish timber industry paired with a strong commitment to sustainability provide the basis for advanced solutions, both structurally and architecturally.

The city of Kouvola is about to realize a high quality, recreational route for pedestrians and cyclists. In order to improve the functional connections and the recreational activities on the Kymi riverfront approximately a dozen of wooden bridges in a variety of spans, most of them in the range of 6 to 10 m will be built. Even though they will have different structural configurations, they will create a “family” of bridges, sharing common design aspects.

This paper presents a novel approach for one of the above-mentioned, bridges: 6 m span and approximately 1 m in width, where fin-like stiffeners are utilized for three different purposes. Firstly, a set of non-continuous, vertical timber fins is stiffening the deck of a bridge. Secondly, the fins are form-defining elements for the planar or elastically bent and therefore arched deck. Thirdly, the fins will function as railings, seats, etc.

Numerical and experimental investigations are carried out in order to analyze the influence of several parameter on the structural behavior of the bridge. Among others (a) the position and orientation of the fins, (b) the overlapping distance between fins, and (c) the geometric characteristics of the fins and the deck are investigated.

Based on the results of the investigations an alternative design concept is introduced that combines aesthetics, sustainability and ease of construction.

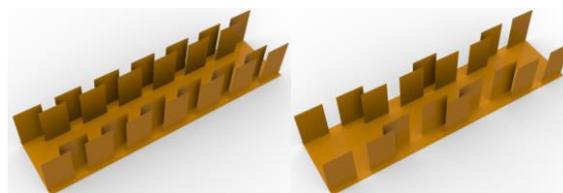


Figure 1. Example of timber bridge with fins (left, regular pattern, right, irregular pattern).

References

- [1] M.-R. Norri, *Timber Construction in Finland*, Museum of Finnish Architecture and Finnish Timber Council, 1996.
- [2] M. Keskişalo, “Use of tension rods in wood construction – 14 storeys with laminated veneer lumber as shear walls: Lighthouse Joensuu” in *Internationales Holzbau-Forum IHF 2018*, Garmisch-Partenkirchen, Germany, December 6-7, 2018