

Wooden Cable-Stayed Footbridge with Curved Carriageway in Urbanised Area

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Summary

Today, all over the world, large scale urbanization is forcing more and more the importance of developing new technologies related to the rational use of wood, contributing to solving the problems of urban traffic. There is also an aesthetical need of showing the melting of up-to-date high technology with beauty. The cable-stayed stress-laminated timber footbridge, with curved modules meets all these needs. The building of a prototype, enabled static and dynamic tests to be carried out. The experimental results revealed the technical and economical feasibility of the following items: cable stayed footbridges with timber from reforestation; decks only made of stress laminated timber; curved plates of stress laminated timber. It also revealed that the human induced vibrations leads to the most critical design condition. The loss of deck curvature study indicated the need of further research considering the time effect, to confirm the initial success achieved. Based on results of these testing, the numerical model calibration was done. In order to investigate which variables are responsible for the footbridge response, several simulations were performed with the calibrated model.

Keywords: footbridge, cable-stayed footbridge, stress-laminated timber footbridge, timber, serviceability, loss of curvature, design of stress-laminated deck plates.

1. Introduction



Fig. 1: Pedestrian walkway Miguel Reale, on the Avenue Cidade Jardim in Sao Paulo-SP, Brazil.

The suspension bridges are used for a long time ago. The idea of suspending the boards with cables date of mid-century III, and has been used by various civilizations.

Cable-stayed and suspension bridges are among the most developed structures.

According to Almeida [1], stays proportionate high stiffness to structures; in tension, generate compression stresses in main longitudinal beams and reduce displacements in transversal elements, don't requiring high torsional stiffness decks.

By basic definition, the walkways, or footbridges (figure 1), are bridges for pedestrians, ie, transposition of obstacles, like rivers, inlets, deep valleys, other roads, etc., as an extension of the runway in a normal way.