



Sustainable infrastructures: aeroelastic response of a pedestrian suspension bridge made of wood and hemp cables.

Fabio Rizzo, Giuseppe Brando

Gabriele D'Annunzio University, Department of Engineering and Geology, Chieti-Pescara, Italy

Federica Tamburrano, Paolo Fusero

Gabriele D'Annunzio University, Department of Architecture, Chieti-Pescara, Italy

Contact: fabio.rizzo@unich.it

Abstract

The paper discusses the structural behaviour and the aeroelastic response of a wooden bridge suspended with hemp cables. Recent developments now allow the use of natural and more sustainable materials for space structures, in place of traditional materials such as steel or concrete. In the case of infrastructures this can be very convenient because large infrastructure sizes can lead to a favourable cost/benefit ratio. Even though traditional materials such as wood or hemp were used for colossal engineering works in the past, currently they need to be tested more and more, in order to update existing standards and codes. The case study discussed in this paper is a single-span pedestrian suspension bridge, 250 m in length and with a deck chord equal to 12 m. It is located on a seafront in the centre of Italy. The two towers are approximately 32 m in height and are cable-stayed.

Keywords: Suspended bridge; hemp; wood structure; pedestrian bridge; flutter.

1 Introduction

In the past, many cities and towns in the world hosted industries producing hemp rope. Russia, was the largest producer of the world and best-quality manufacturer, supplying 80% of the hemp demanded by the Western world from 1740 until 1940. 70–90% of all rope, twine, and cordage was made from hemp up 1937 [1].

A new goal, since the late twentieth century and in the context of a sharpening increase of global environmental pollution, is to increase the use of non-polluting, recyclable, antibacterial resources.

Hemp, in this context, represents an important resource [2] compared to the traditional materials like steel [3].

Researchers have analyzed, through studies on hemp fiber, the material high temperature resistance, heat resistance and other properties [4–7], such as thermal conductivity, permeability, and other properties [8-9], that make hemp a very appealing material to be used for building and construction purpose. They explored, for example, hemp fiber insulation anti-radiation, anti-mildew and antibacterial performance.