The Messina Strait Bridge: Major Problems Affecting the Design

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Summary

Some of the main challenges faced during the design stage of the Messina Strait Bridge are presented in this work. The first part of the paper is devoted to the description of the problems related to the overall organization of the work. The second part is related to the technical aspects, focusing the attention on the wind induced effects and on the train runnability. Wind structure interaction and train runnability represent the technical aspects conditioning the design choices of the whole work. The experience gained during the studies that lead to the definition of the technical specification for the construction tender will be summarised in this paper giving an overview to the methodologies adopted and the more restrictive requirements. A major details on the specific problem is demanded to the proposed references.

Keywords: aeroelasticity, train runnability.

1. Introduction

The bridge crossing the Messina Strait, that at the moment has reached the construction stage, will be the longer suspension bridge in the world in terms of main span length. It will overcome the longest main span that is represented, to the present, by the Akashi Kaikyo Bridge (1991 m of main span length) reaching the record length of 3300 m, with an increment of almost the 65 % (*Fig. 1*).

This consideration becomes more impressive if the comparison is performed taking into account only the suspension bridges carrying the railway traffic, being the Tsing Ma Bridge the bridge carrying both road and rail traffic with the longest main span of 1377m that is less than one half of the Messina main span. The slenderness of the structure and the requirements for a safe train runnability makes the wind-structure interaction and the train-structure interaction two of the most challenging tasks to be assessed during the design stage.

Earthquake loads are also important being the Messina strait a high risk seismic area. Anyway, it is worth considering that the increase in the span length corresponds to a decrease of the structure stiffness with positive effects for the seismic aspect. The longer is the suspension bridge span, the less critic is the seismic problem because of the large structural flexibility and low natural frequencies that make the structure behaviour more safe.

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