Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 79 (1998)

Artikel: New system for aerodynamic stability of suspension bridge
Autor: Yoshimura, Toshihiro
DOI: https://doi.org/10.5169/seals-59929

Nutzungsbedingungen
Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Mehr erfahren

Conditions d'utilisation
L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. En savoir plus

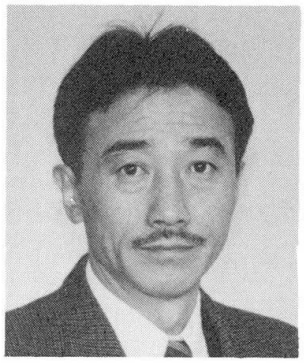
Terms of use
The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. Find out more

Download PDF: 07.02.2026

ETH-Bibliothek Zürich, E-Periodica, https://www.e-periodica.ch

New System for Aerodynamic Stability of Suspension Bridge

Toshihiro YOSHIMURA
Civil Eng.
Chodai Co. Ltd
Tsukuba, Japan



Toshihiro Yoshimura has experience in design and construction of major bridges at Honshu-Shikoku in Japan. He is currently a resident engineer for construction management of Yongjon Grand Bridge in Korea.

Summary

Aerodynamic stability is one of major issues to be considered in designing long span bridge with more than 3,000 meter of cable span length.

In this paper an attempt is made to discuss the use of cable formers for the system with four main cables, each of which is located at certain distance from others cables. The effectiveness of the new system for 3 span suspension bridge as well as 5 spans suspention bridge was examined by means of dynamic analysis.

It was found that the new system shall improve the torsional rigity of suspension bridge and also increase the frequency of the torsional vibration.

1. Concept of the New System

Strait-crossing bridges with more than 3,000 meter of span length are now being planned all over the world. Among them include Messina Crossing (Italy),Gibraltar Strait (Spain-Morocco) and Tugaru Strait (Japan). These longer span bridges, if implemented, will encounter the difficulty in maintaining the stability against drag forces.

The Key to solve this problem is to use main cables and let the torsional strength have an effect on the drag resistance, in order to improve the torsional rigidity of the suspension bridge. The feature of torsional vibration is explained by the forces which drag the right and left cables in the opposite direction. Therefore keeping the constant distance of cables was estimated to increase the frequency of torsional vibration (See Fig.1).

2. Result of the Vibration Analysis

In this paper cable formers were set up to keep the constant distance of cables and height of the cables. The initial finding is that cable formers were effective to increase the aerodynamic stability. After the vibration analysis, the effects of the new system are summarized as follows;

1) Installation of cable formers increased the freqency of torsional vibration(See Fig.2)
2) Difference of the height improved the efficiency
3) New system increased the torsional rigidy, up to the same level as that of the stiffenning girder(See Fig.3)

Applying the Selberg's equation, it was found that the critical wind velocity for flutter can be increased more than 20% by using this system, without increasing additional weights of stiffenning girder.

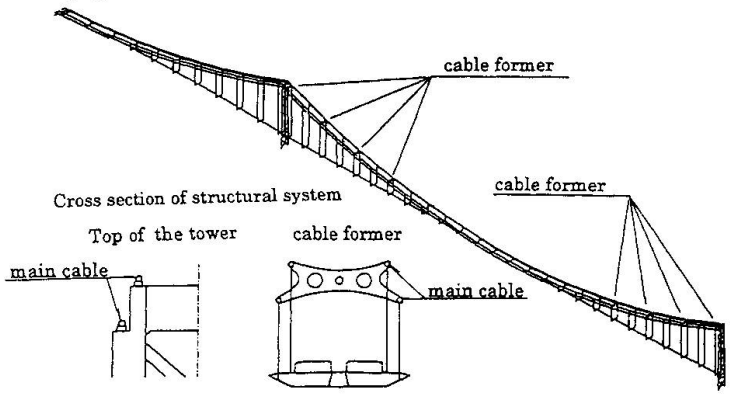


Fig.1 Illustration of the New System

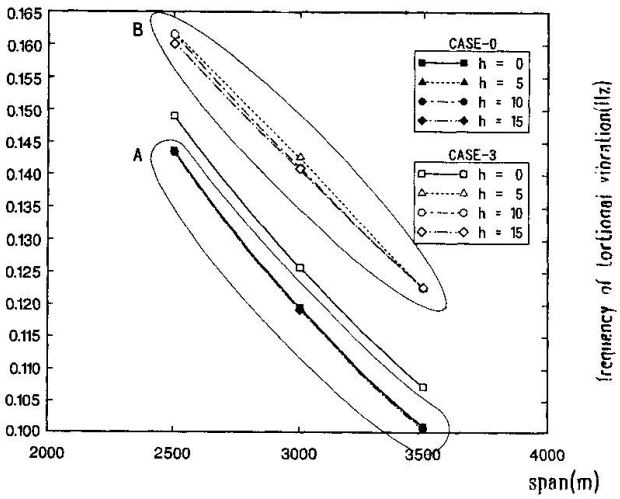


Fig.2 Influence of span-length on torsional vibration

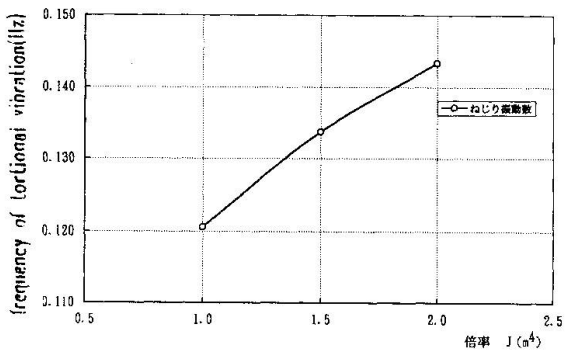


Fig.3 Magnification of torsional rigidy to stiffenning girder