Cairo University

STUDY ON DESIGN AND CONSTRUCION OF ULTRA-LONG SPAN CABLE STAYED BRIDGES DUE TO WIND LOAD

By

Hussein Ibraheim Hussein Nassar

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In
Structural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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under the Supervision of

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Professor of Structural Analysis and Mechanics
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Prof. Dr. FathyA. Saad
Professor of ConcreteStructures
Faculty of Engineering, Ain shams University

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Approved by the
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Title of Thesis:

Study on design and construction of ultra-long span cable stayed bridges due to wind load

Key Words:
Ultra-long span; Cable stayed;Bridges; Wind Loads; temporary cable; analysis; design; optimization; pylon; side span supports; cable arrangement; cross sections.

Summary:

The primary objective of this research effort is to present proposals for optimal design and construction of Ultra-Long Span Cable Stayed Bridges due to wind loads. Three dimensional Finite Element Models were performed using advanced specialized Software (SAP 2000 and SOFISTIK), to study the design and stability of theseBridges during construction and in the final stage. Cable sag and target force are considered. Moreover, several examples were performed in order to verify the accuracy of the used software. The effect of several parametersare considered:cables arrangement, different pylon shapes, side span length, side span supports, deck cross-section (single cell and double cell), with main span 1500 meters. Since wind loads could have significant effects on Ultra-Long Span Cable Stayed Bridges during construction, hence,the thesis focuses on studying different installation and systems to illustrate their effect on these bridges. The results could give an assessment of the behavior of the bridges and deck due to aerodynamic wind forces, which may be the cause of significant instability. Finally, several proposals arepresented to give a good illustration about the optimum sections for deck cross-sections and pylons; also the calculation of the quantity of the cables which is considered one the most important parameters in cable stayed bridge.

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So many people have contributed so much to this Thesis; it is difficult to know where to begin.

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Table of Contents

List of Figures