AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL ENGINEERING DEPARTMENT

DYNAMIC RESPONSE OF JOINTS OF FLOATING BRIDGES

BY

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A thesis
Submitted in partial fulfillment for
The requirements for the degree of the Master of Science
In civil engineering(Structural)

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STATEMENT

This thesis is submitted to Ain Shams University for the degree of Master of Science in Civil Engineering (Structural Engineering).

The work included in this thesis was carried out by the author in the Department of structural engineering, Faculty of engineering, Ain-Shams University.

No part of this thesis has been submitted for a degree or qualification at other university or institution.

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Title of thesis

Dynamic Response of Joints of Floating Bridges

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ABSTRACT

The objective of this research work is to study the behavior of joints of the ribbon-type floating bridges under the influence of transverse loading conditions. Practical problems related to the load-carrying capacity and overstressing of these bridges in the field use of these bridges have been addressed, and possible practical solutions proposed and evaluated. The effect of transverse current loads on the straining actions in the bridge body were studied. An analytical algorithm is developed for analyzing the bridge body under transverse loads, while incorporating a nonlinear element representing the behavior of the proposed connection joints.

An existing sophisticated software package (developed in previous research work by the senior authors) developed using the proposed analytical approach is extended, with emphasis placed on the automation of the parameter variation process taking into account different cases, where single or multiple boats are used to support the bridge laterally against the water current forces. The results of this parametric study are used to assess the advantages of using the proposed connection joints. A practical proposal for the modification of the shape of existing joints between the pontoons of floating bridges was made, with the objective of reducing the bridge's sensitivity to the movements of the supporting boats. The developed software was used to test the efficiency of the proposed modifications in the minimization and control of the transverse moments developed in the bridge body, and to assess the effect of using single or multiple boats to support the bridge laterally.

A practical proposal is developed which enables the site observers to control the bridge movements with a set of criteria easy to follow in the field. Practical recommendations are presented, which can be highly valuable in the field of design and operation of these floating bridges.

Key words: Floating bridges - Ribbon bridges – Fluid structure interaction – dynamic analysis

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