Ain Shams University
Faculty of Engineering

BEHAVIOUR OF BOX GIRDERS WITH OPENINGS

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of MASTER OF SCIENCE in Structural Engineering .

The work included in this thesis was carried out by the author in the Department of Structural Engineering, Ain Shams University , from Sepatember 1985 to March 1993.

No part of this thesis has been submitted for a degree or a qualification at any other uUniversity or Institution .

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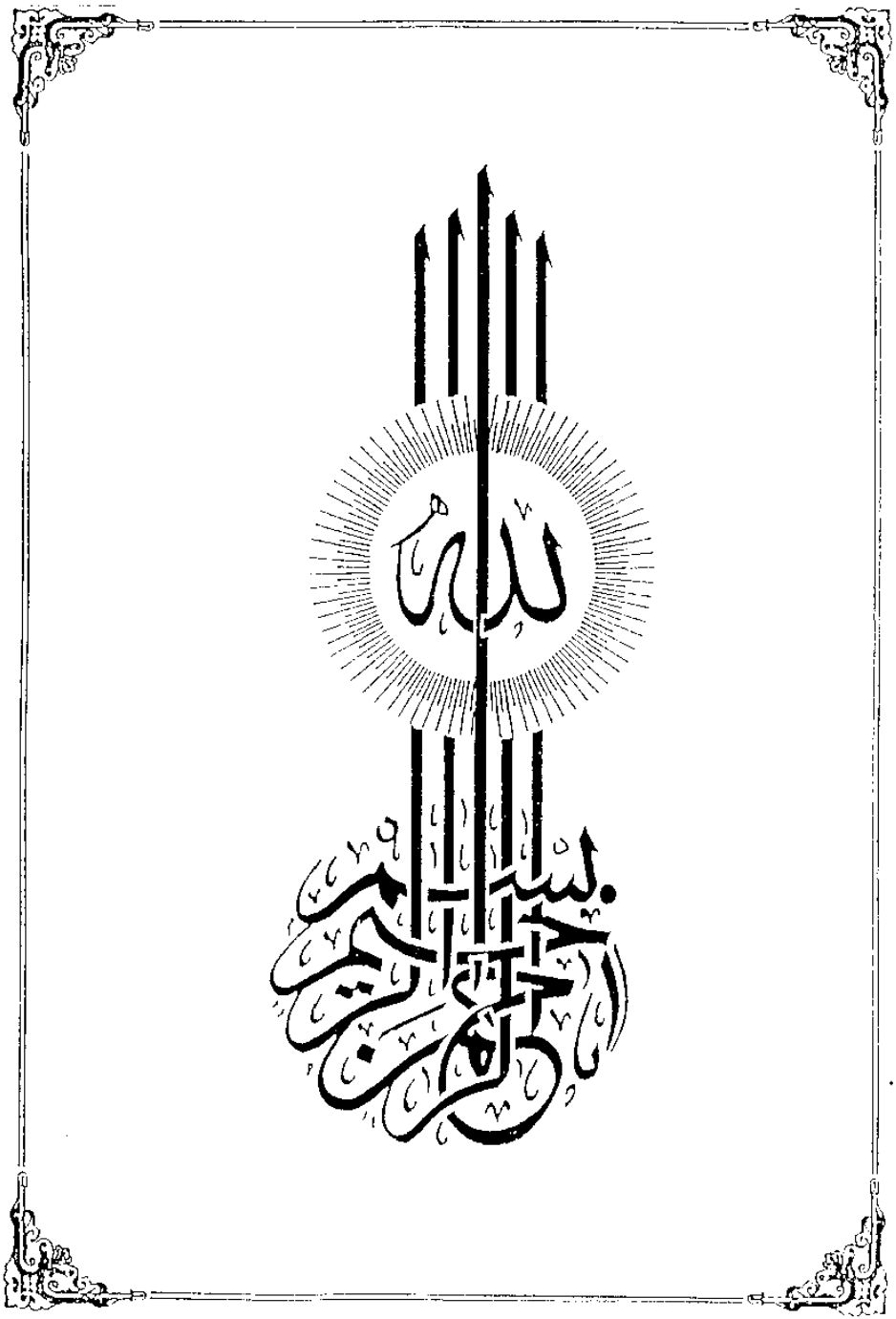

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ABSTRACT

The present research is concerned with the behaviour of box beams with openings in either the webs or in the lower flange . The effect of varying the opening location in the longitudinal or transversal directions on the box behaviour is studied . Also the effect of symmetrical and distortional loading is studied . The research objective is to find the best location of openings in webs or lower flange that has the least effect on deflections and stresses . It aims also to overcome the problem of concentrated stresses and excessive deformations arising from certain openings location . Openings located near the junction lines between webs and flanges , in unstiffened box beams , have shown a dangerous effect on deformations and stresses . Special treatment is needed for such openings .

Keywords :

Box girders , Finite element analysis , Openings , Symmetric loading , Distortional loading , Stiffeners Stresses , Deflections , Transversal moments .

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