NONLINEAR BUCKLING ANALYSIS OF LONGITUDINALLY AND TRANSVERSALLY STIFFENED I-GIRDERS SUBJECTED TO IN-PLANE BENDING

By

Eng. Ola Azmy Abd elfattah

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
GIZA, EGYPT
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Under the Supervision of

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ABSTRACT

Considerable attention has been devoted to understanding the nonlinear behavior of stiffened I-Girder. Although different elastic analysis and researches have been done, yet there are no enough nonlinear researches to find the exact behavior of the stiffened web panel subjected to pure bending. In this research, a general literature review of the previous studies in the field of elastic behavior of the stiffened I-Girder is presented. A nonlinear finite element model which accounts for geometric and material nonlinearities is developed. Verification of the proposed finite element model has been performed by comparing its results with the results of the work previously performed by others. A parametric study is carried out using the verified finite element model for different web panels. The influences of aspect ratio, slenderness ratios, the relative flexural rigidity of the longitudinal stiffener, and the relative flexural rigidity of the transversal stiffener are presented. Furthermore, the effect of the gap spacing between the longitudinal and transversal stiffeners on the linear and nonlinear critical buckling stress had been investigated. A comparative study between the finite element results and those using the design equations of AASHTOO LRFD and Eurocode-3 in the field of the longitudinally stiffened I-Girder is performed.