Cairo University

NON-LINEAR ANALYSIS OF COMPOSITE STEEL BATTENED COLUMNS USING FOAM CONCRETE

By

Eng. Yasser Salah Ibrahim Abdel-Majeed

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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Title of Thesis:

Non-linear Analysis of Composite Steel Battened Columns Using Foam Concrete

Key Words:
Composite columns buckling, Critical load, Battened steel columns, Foam concrete; Non-linear analysis.

Summary:

Filling battened steel columns with light-weight concrete (EPS) provides a composite action that adds to column axial-capacity, prevents inward local-buckling and allows for quick and simple construction of low-rise buildings. Instead of gravel, foam is mixed with sand and cement to form the light-weight concrete with F_{cu} about one MPa (10 kg/cm^2) and E about 100 MPa (1000 kg/cm^2).

In all considered cases, overall-buckling controlled failure. Verification analysis was performed against 12 Full-scale columns tested in BHRC by the same research team; half of the tests were for bare columns and the other 6 were composite. ANSYS was used for the nonlinear finite element analysis.

Using the verified FEM, a parametric study was prepared for the aim of deriving a new set of column-curves for "Composite Steel Battened Columns Using Foam Concrete" that are not permitted in the design codes.

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At last; but not least; I am fully indented to my parents for bringing me up and supporting me ever since.

Hoping this thesis would be a step towards a better understanding of our current needs and a better development of our country.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Yasser Salah Ibrahim Abdel-Majeed Date: 25-9-2018

Signature:

Dedication

To my Family,
The reason for what I have become today.
Thank you for your love, support, advice and care.

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