



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

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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/cm²) and E about 100 MPa (1000 kg/cm²).

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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