

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

**FLEXURAL BEHAVIOR OF PRESTRESSED
CONCRETE BEAMS STRENGTHENED BY NEAR
SURFACE MOUNTED FRP RODS**

A Thesis

Submitted in partial fulfillment for the requirements of the
Degree of Master of Science in Civil Engineering
(Structural Engineering)

BY

Belal Hesham Mokhtar EL-Harouney

B.Sc. in Civil Engineering
Faculty of Engineering, Helwan University, 2013

SUPERVISED BY

Prof. Dr. Ayman Hussein Hosny Khalil

Professor of Concrete Structures
Structural Engineering Department, Ain Shams University

Dr. Ezz EL-Deen Mostafa

Assistant Professor
Structural Engineering Department, Ain Shams University

Dr. Amr Maher Taha EL-Nemr

Assistant Professor
Structural Engineering Department, German University

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Examiners' Committee

Name and affiliation	Signature
Prof.Dr. Magdy El Sayed Ali Kassem Professor of Concrete Structures Faculty of Engineering – Cairo University	
Prof.Dr. Ahmed Hassan Ghallab Professor of Concrete Structures Structural Engineering Department Faculty of Engineering - AinShams University	
Prof.Dr. Ayman Hussein Hosny Khalil Professor of Concrete Structures Structural Engineering Department Faculty of Engineering – AinShams University	

Date: 19 /10 / 2019

AUTHOR

Name : Belal Hesham Mokhtar EL-Harouney
Date of birth : 22 March 1991
Place of birth : Cairo, Egypt
Academic Degree : B.Sc. in Structural Engineering
University : Helwan University
Date : 2013
Current job : Senior Structural Engineer – ASSENT

STATEMENT

This thesis is submitted to AinShams University, Cairo, Egypt, on for the degree of Master of Science in Civil Engineering (Structural).

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

Date : 19 / 10 /2019

Signature :

Name: Belal Hesham Mokhtar

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**AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL DEPARTMENT**

Abstract of the M.Sc. Thesis Submitted by
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CONCRETE BEAMS STRENGTHENED BY NEAR
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Supervisors:

Prof. Dr. / Ayman Hussein Hosny

Dr. / Ezz El-Deen Mostafa Salah

Dr. / Amr-Maher El-Nemr

ABSTRACT

The applications of post tensioned concrete have increased and have now been used in different regions of the world. There are only few studies which have studied the behavior of retrofitted prestressed concrete experimentally, with the major part of the studies focusing on retrofitted reinforced concrete. This research study is initiated by a desire to more fully investigate the response of it.

There is no clear information regarding the applicability of the provisions of the ACI 440.2R-17 Code to evaluate the capacity for posttensioned beam strengthened with NSM FRP under flexural loading. The code adopted the design procedure for prestressed beams strengthened with laminates of FRP. The codes adopted Strain compatibility method to determine the strain in the FRP reinforcement, the strain in the non prestressed reinforcement and the strain change in prestressing reinforcement.

Three finite element models were validated by literatures. The FEM results showed a reasonable agreement with the tested beam results. A parametric study was established on a T-sec beam with dimension of 700 mm web width, 1800mm overall height, thickness of flange 150 mm and 1500mm flange width. The super length was simulating real-life bridge beams with a value of 29.6m. The beam was simply supported and loaded uniformly. A total no. of 31 finite element 3D models was generated to accommodate all possible failure modes, FRP rupture, Concrete cover separation and concrete crushing. several parameters were accommodated such as percentage of prestressing steel (W_p), Concrete compressive strength (f'_c), the bond between strand and tendon and the effect of beam continuity. Theses parameters established to investigate all possible failure mode that can be occurred when strengthening/retrofitting of posttension beam with NSM FRP. Finally, a methodology was done between ACI 440.2R-08 code and the finite element results at predicted equations for the ultimate failure load and the predicted failure mode.

Key Words: Posttensioned beam, NSM FRP & Reinforced concrete

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