بسم اللّه الرحمن الرحيم

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية
التوثيق الالكتروني 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

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B.Sc. in Civil Engineering
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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

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Abstract of the M.Sc. Thesis Submitted by
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Supervisors:

Prof. Dr. / Ayman Hussein Hosny
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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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