شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

جامعة عين شمس
شبكة المعلومات الجامعية
@ ASUNET

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

MONA MAGHRABY

REPAIR OF RC BEAMS SUBJECTED TO TORSION USING STEEL PLATES

By

OSAMA AHMED MOSTAFA ALI

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
2020

REPAIR OF RC BEAMS SUBJECTED TO TORSION USING STEEL PLATES

By

OSAMA AHMED MOSTAFA ALI

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

Under the Supervision of

Prof. Dr. HANY AHMED ABDALLA

………………………………..

Professor of Concrete Structures
Structural Engineering Department
Faculty of Engineering, Cairo University

Prof. Dr. GHADA DIAA

………………………………..

Building Materials Research and Quality
Control Institute, Housing & Building
national research Center, Egypt

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

REPAIR OF RC BEAMS SUBJECTED TO TORSION USING STEEL PLATES

By

OSAMA AHMED MOSTAFA ALI

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

Approved by the
Examining Committee

Prof. Dr. **Hany Ahmed Abdalla**, (Thesis Main Advisor)
Professor of Concrete Structures, Cairo University

Prof. Dr. **GHADA DIAA Abd-Elhmeed** (Advisor)
Building Materials Research and Quality Control Institute, Housing & Building national research Center, Egypt

Prof. Dr. **Akram Mohamed Torkey** (Internal Examiner)
Professor of Concrete Structures, Cairo University

Prof. Dr. **Gouda M. Ghanem** (External Examiner)
Professor of Concrete Structures, Helwan University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

Engineer's Name: Osama Ahmed Mostafa Ali
Date of Birth: 05/03/1993
Nationality: Egyptian
E-mail: osamaahmed9295@gmail.com
Phone: 01015155815
Address: 01-Arafat street – Hadayek El-Koba - Egypt

Registration Date: 01/03/2016
Awarding Date: …./…./2020
Degree: Master of Science
Department: Structural Engineering

Supervisors:

Prof. Dr. Hany Ahmed Abdalla
Prof. Dr. GHADA DIAA Abd-Elhmmed

Examiners:

Prof. Dr. Hany Ahmed Abdalla (Thesis main advisor)
Prof. Dr. GHADA DIAA Abd-Elhmmed (Advisor)
Prof. Dr. Akram Mohamed Torkey (Internal examiner)
Prof. Dr. Gouda M. Ghanem (External examiner)
Professor of Concrete Structures, (Helwan University)

Title of Thesis:

" REPAIR OF RC BEAMS SUBJECTED TO TORSION USING STEEL PLATES "

Key Words:

RC beams; Steel Plates; Torsion; Repair; twisting angle

Summary:

An experimental program was carried out to investigate the behavior of rectangular reinforced concrete beams strengthened by using steel plates under torsion. Eight specimens were tested with different parameters, such as the effect of configurations, the orientation of steel plates, and the width of strips. The ultimate load capacity, the ultimate torque, and the twisting angle of the specimens were investigated after laboratory experiments. The results showed that the use of steel plates improves the ultimate load-bearing capacity of all repaired beams, where full wrapping is the most efficient configuration. Also, the U-jacket steel plate technique provides higher torsional strength than the 90-degree strips applied to the beam axis. The results show that the width of the strips plays a vital role in strengthening, where specimens of the largest width are directly used to increase the resistance of the RC beams and decrease the angle of twisting of the reinforced concrete beams subjected to torsion.

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: Osama Ahmed Mostafa Date:

Signature:

Acknowledgments

First and foremost, I thank ALLAH, the most gracious, the ever merciful for helping me finish this work.

My sincere appreciation and gratitude to my **father**, my **mother,** for their help and patience during the preparation of this work. I would not have to achieve this goal without their help and support.

I would like to offer my sincere thanks to my supervisors Prof. Dr. **Hany Abdalla** and Prof. Dr. **Ghada Diaa,** for their valuable supervision, continuous encouragement, useful suggestions, and active help during this work.

I would also like to thank all the people who have helped me in any way to accomplish my thesis as my friends, the members of the Cairo University laboratory, and CMB Company.

Table of Contents

List of Tables

List of Figures