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COMPARATIVE ANALYTICAL STUDY ON CRACK WIDTH OF REINFORCED CONCRETE STRUCTURES

By

Ahmed Abdel Fattah Abdel Kader Abu El Naas

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
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Flexural cracks, Crack width, Serviceability, Codes provisions, Non-linear FE-analyses

Summary:

This study investigates the cracking behavior of flexural reinforced concrete beams which was model analytically and numerically to link the results of the research with the equations of the famous codes in this field to reach the appropriate recommendations. The analytical program included twelve groups of reinforced concrete beams. The parameters studied analytically in this work include the parameters affecting on the crack width such as steel stress, concrete cover for longitudinal reinforcement at tension zone, surface geometry of reinforcement bar (smooth, deformed), area of longitudinal tension steel, spacing between bars in tension zone, diameter of bars in tension zone and compressive strength for concrete. The numerical program included a 3-D finite element analysis through the well-known program. Verification of the numerical model has been done to check the accuracy of results. The numerical models were compared with other experimentally tested beams found in literature review then compared with the analytical results of the suggested reinforced concrete beams models in the analytical program. It was concluded that some codes doesn't take into consideration the effect of some important variables and cases on the width of the crack. Also, it was found that that some codes are not clear in the region concerning the position of the crack width calculation and the values obtained for the crack width. JSCE (2007) equation for calculating crack width the most suitable for calculating value of crack width because it take into consideration the most important factor which effected on the crack width.

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.

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Dedication

To my parents, my sisters and the spirit of the late my uncle

Acknowledgments

First and foremost, praise and thanks to be to Almighty Allah for his limitless gifts and guidance and peace be upon his last messenger Mohamed.

I would like to express my deepest thanks and gratitude to **Prof. Dr. Hany Mohamed El-Hashimy**, Professor of Concrete Structures, Faculty of Engineering, Cairo University and **Dr. Khaled Farouk Omar EL-Kashif**, Associate Professor of Concrete structures, Cairo University, Faculty of Engineering, Cairo University for their encouragement during the preparation of this work, stimulating supervision, control advises and constructive criticisms which made the completion of this work possible.

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