Ain Shams University
Faculty Of Engneering

EFFECT OF STEEL FIBERS ON THE BEHAVIOUR OF R.C. JOINTS

"WITH PARTICULAR REFERENCE TO RIGHT ANGLED OPEN CORNER JOINTS "

BY

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A Thesis

Submitted in partial fulfillment for the requirements of

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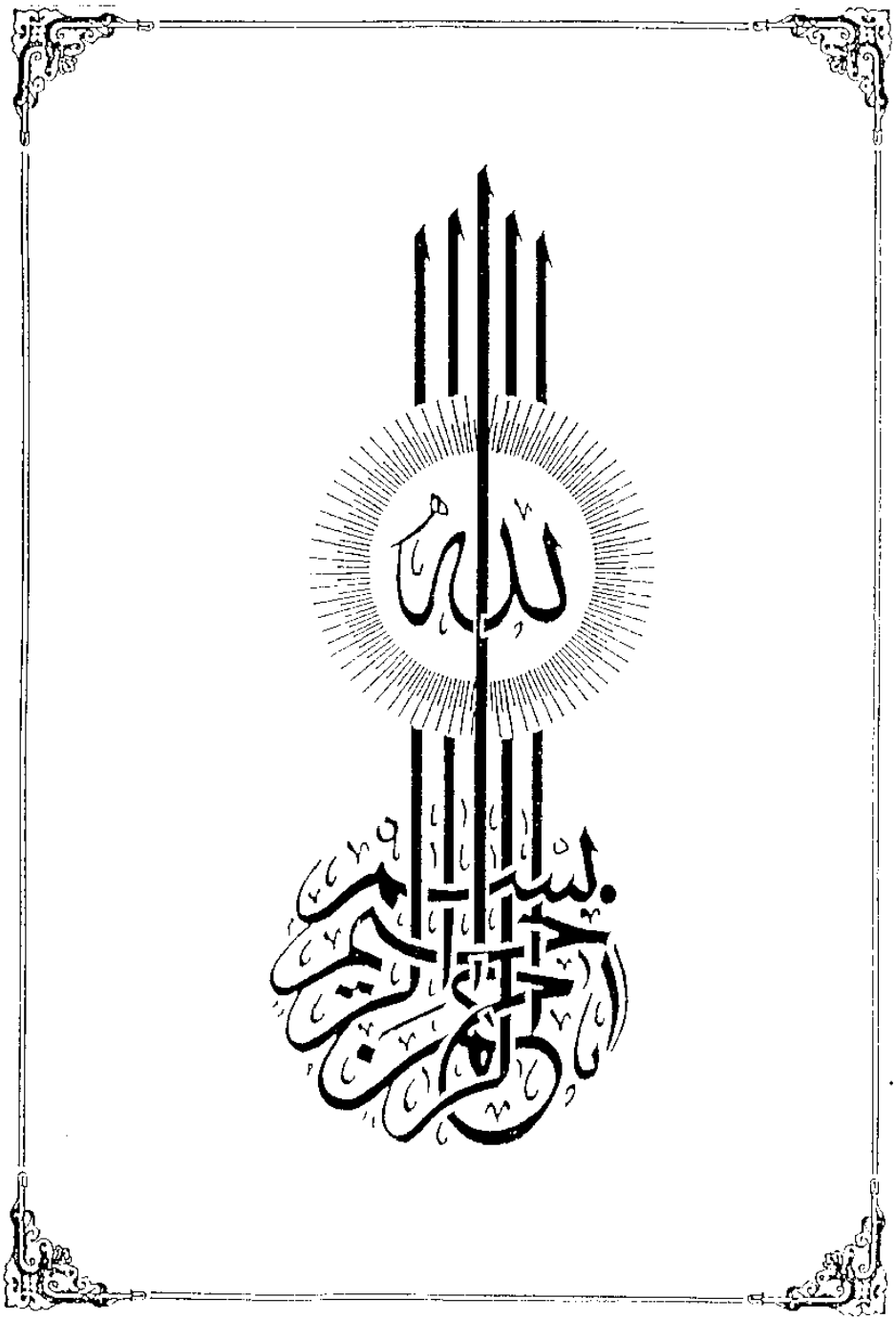

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STATEMENT

This thesis is submitted to Ain Shams University for the Master of Science degree in Civil Engineering (Structural) .

The work included in this thesis was carried by the author in R.C laboratory of Faculty of Engineering of Ain Shams University

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

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NOTATIONS

S.F.	Steel fiber
S.F.C.	Steel fiber concrete
l/d	Fiber aspect ratio
V_f	Fiber volume as a fraction of the volume of the composite
W_f	Weight of fibers as percentage of the concrete matrix
A_g	Weight of aggregate
M	Modular ratio which equals E_f/E_m
L_c	Critical fiber length
L	Fiber length
η_1,η_2	Efficient factors of fiber orientation and fiber length respectively
V_f(crit)	Critical fiber volume
$\sigma_{mu},\epsilon_{mu}$	Ultimate stress and strain of the matrix
M_{cr}	First cracking moment
$M_{ult.}$	Ultimate moment
h	Height of rectangular section
b	Width of rectangular section
z	Distance from the neutral axis to the compression face of the section
E_{ci}	Initial tangent modulus of the composite
E_{cs}	Secant tangent modulus of the composite
a,b,k_c	Constants of the equation for modulizing the stress-strain relationship of the composite
$\sigma_{c1},\epsilon_{c1}$	Maximum compression stress of the composite and the corresponding strain
W/c	Water-cement ratio
[B]	Strain matrix
[K]	Element stiffness matrix
[D]	Elasticity matrix

K_h	Bond pullout spring stiffness
K_v	Dowel spring stiffness
ν	Possion's ratio
G	Modulus of rigidity
U	Nominal bond stress at bar reinforcement matrix interface
S.G	Specific gravity
E	Young's modulus

Other symbols not listed are defined where they are used.

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* CHAPTER (9) : SUMMARY AND CONCLUSIONS

INTRODUCTION

GENERAL :

Most of the research in fibrous concrete has been concentrated on the material behaviour . however , the investigation of the actual behaviour of the fibrous concrete in the actual structural members is still rare .

The principle concern in this study is to investigate the behaviour and the ultimate flexural strength of the right angled open corner joints which are made of the fiber concrete in addition to steel bars , in the elastic and the cracked stages .

This investigation is carried out through changing : the percentage of the fiber by volume , the percentage of the main steel bars reinforcement , and the percentage of the cross reinforcement .

From exploratory research of the right angled open corner joints it has been shown that these kind of joints reflect its weakness in ultimate flexural strength as well as tendency to early cracking when subjected to bending moments. This phenomenon is due to the concentration of the tensile

stresses at the knee of the corner by about 2 - 2.5 times the tensile stresses of the corresponding beam section .
In many researches the draft recommendation results in having at least 50 % of main steel bars as cross reinforcement to counteract the tensile stress concentration at the knee of the open corner joints cast with conventional concrete .

The direct tensile strength and ductility of steel fiber concrete (S.F.C) are the characteristic that most clearly distinguish it from conventional concrete without fiber . Therefore, it is predicted to improve strength and deformation properties of these joints by using (S.F.C) leading to a higher allowable design load , also minimize the percentage of the cross reinforcement , Which recommended by many researches for conventional concrete or eliminate it to avoid the congestion of the steel bars to have more simple detailing of the reinforcement at the knee of the corner leading to an easier casting and compacting processes .

OBJECTIVES :

The main objectives of this research are :

1- Studying the effect of adding three different percentages of steel fibers,(0.5 % , 1.0 % , and 1.5 % by volume), on the behaviour of the right angled open corner joints