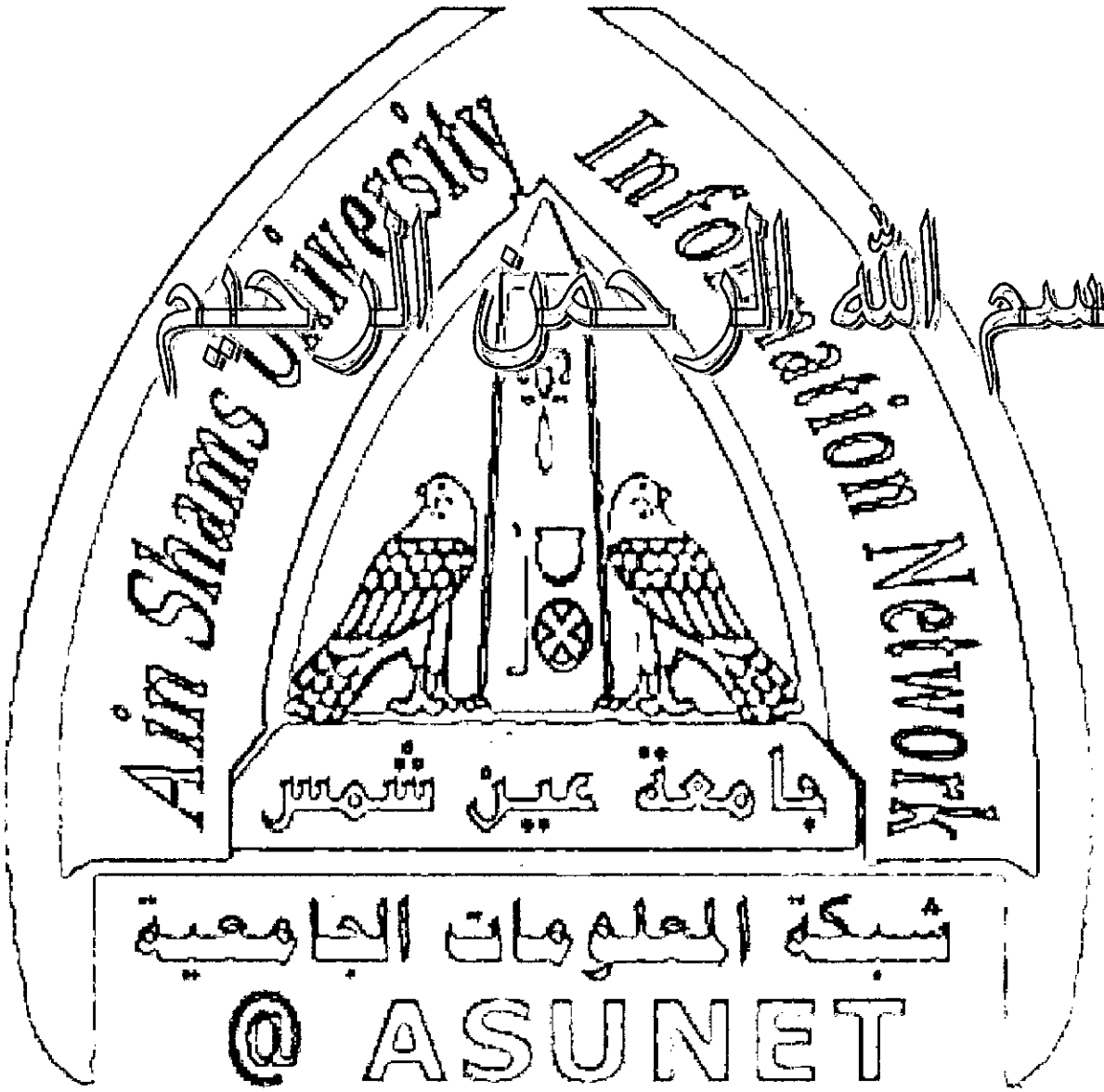
شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

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

يجب أن

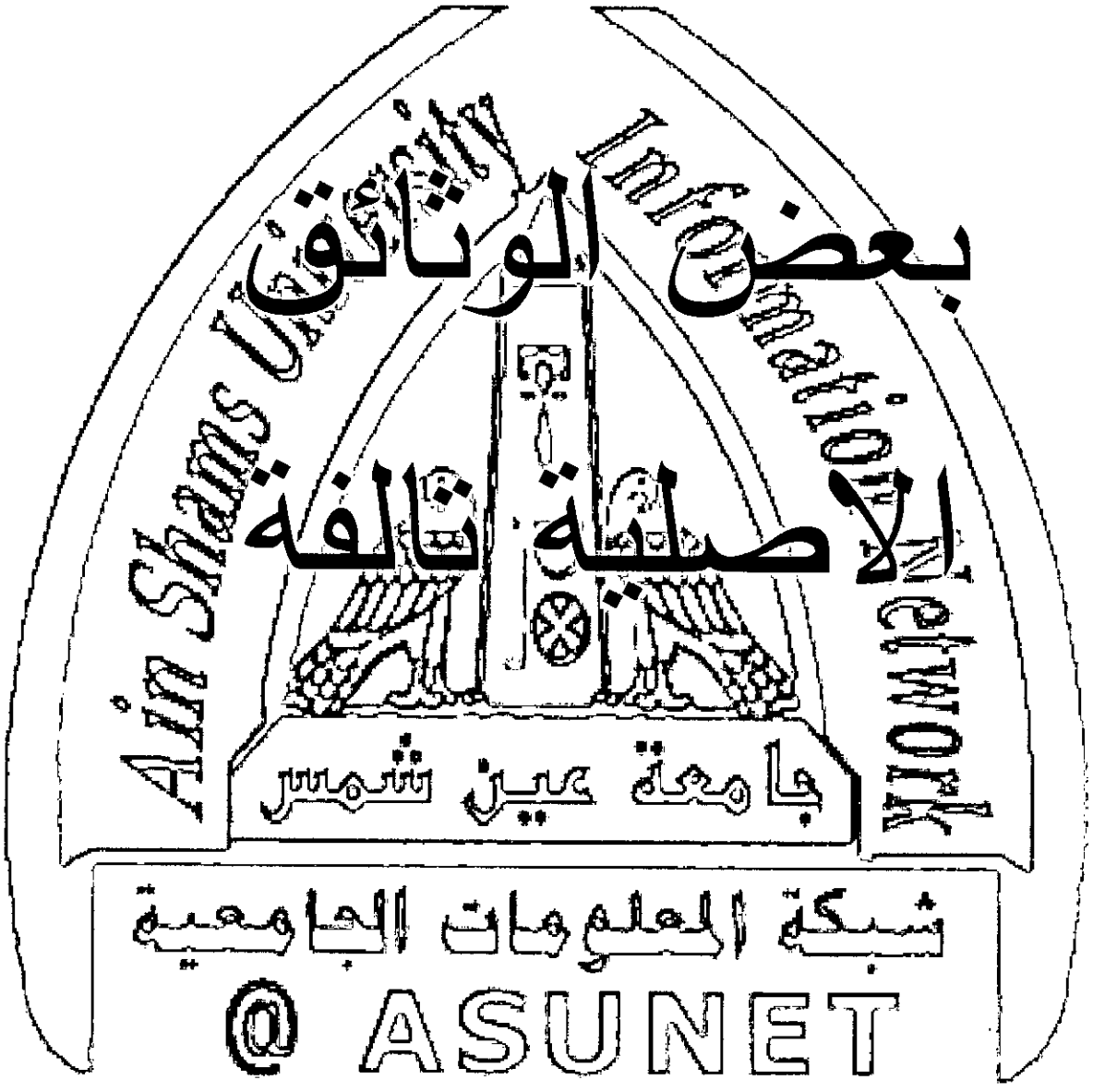
تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم



بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالأصل

ZAGAZIG UNIVERSITY BANHA BRANCH
FACULTY OF ENGINEERING - SHOUBRA

Strengthening Of Concrete Members

BY

KHALED MAHMOUD AHMED MAHMOUD

M. Sc. – Structural Engineering 1997- Ain Shams University
High diploma - Geotechnical Engineering 1990- Ain Shams University
B. Sc. Civil Engineering 1987 - Ain Shams University

A Thesis

Submitted To Faculty Of Engineering - Shoubra,
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Cairo - Egypt

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Name : Khaled Mahmoud Ahmed Mahmoud
Thesis Title : Strengthening Of Concrete Members (Square Columns)

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Abstract of the Ph.D. Thesis Submitted by

Eng./ Khaled Mahmoud Ahmed Mahmoud

Title of the Thesis:

STRENGTHENING OF CONCRETE MEMBERS

Supervisors :

Prof. Dr. Assem Mostafa Kamal Abd-Elalim
Dr. Mohamed O. R. El-Hariri
Dr. Ehab Foad Ibrahim

ABSTRACT

Confinement of concrete is an effective way for strengthening of concrete members, especially columns. The behaviour of strengthened concrete columns wrapped by Fibre Reinforced Polymer composite (FRP) sheets opens the way to new powerful strengthening technique. Square and rectangular-section columns were found to experience less increase in strength and ductility than their circular counterparts when wrapped with FRP because the distribution of lateral confining pressure varies from a maximum at the corners to a minimum in between. Most of the recent researches on non-circular concrete columns concluded that increasing the stiffness of the FRP wrapping is a promising way to increase the wrapping efficiency. To improve the effectiveness of wrapping, a sandwich-wrapping method is used in this research. Sandwich wrapping consisted of wrapping the column with two layers of FRP, inner and outer, separated by an incompressible material as filling material. Acrylic plates were used as filling material between FRP sheets. Twelve square RC columns with dimensions 200X200X1500 mm were tested. Two columns were considered as control specimens while the remaining ten columns were strengthened with different wrapping schemes. The effectiveness of the sandwich wrapping system was investigated either in straps or full wrapping. The variables of the study were: the method of wrapping; percentage of wrapping; thickness of acrylic plates and type of wraps (Glass FRP or Carbon FRP). The number of layers was kept constant as two layers, except for one column where another layer was added to examine its effect on the column performance. The use of sandwich wrapping greatly enhanced the maximum axial load capacity of the columns. The ductility of the sandwich wrapped specimens also was higher than regular wrapped specimens; thus proves that using sandwich technique improves the behaviour of rectangular RC columns under axial loads. A model was proposed to describe the stress-strain behaviour of confined square or rectangular RC columns. The proposed model is suitable for different wrapping configurations including regular and sandwich wrapping. The results of the model showed good agreement with experimental tests results. The model also showed good agreement with several other available test results considering different columns aspect ratios, straps or full wrapping, different types of FRP types (Carbon, Aramid and Glass)

Keywords: Concrete, Confinement, Column, FRP, Strengthening, Jacket

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It is a pleasure to express my deepest gratitude and appreciation to ***Prof. Dr. Assem Mostafa Kamal Abd-Elaleem*** Professor of Material Properties Department of Civil Engineering Faculty of Engineering – Shoubra - Zagazig University - Banha Branch for his valuable advice and encouragement throughout this thesis.

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I shall be always grateful to ***My wife*** for her support and patience throughout this study. My education would never have been possible without the continued encouragement and support of my ***Parents***, I shall be always thankful to them.

STATEMENT

This thesis submitted to Zagazig university - Banha branch for the degree of Doctor of Philosophy in Civil Engineering.

The analytical work included in this work was carried out by the author in the Department of Civil Engineering Faculty of Engineering – Shoubra - Zagazig University Banha branch, from January 2001 to August 2004.

The experimental work included in this work was carried out by the author in the Reinforced Concrete Laboratory of Housing & Building Research Center (H.B.R.C.), from January 2001 to August 2004.

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

Date : 31/8/2004

Signature :

Name : Khaled Mahmoud A.

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