AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL ENGINEERING DEPARTMENT

ENHANCEMENT OF FIRE RESISTANCE OF REINFORCED CONCRETE BEAMS USING DIFFERENT TECHNIQUES

By
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Thesis submitted for partial fulfillment of the Degree of Doctor of Philosophy in Civil Structural Engineering

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STATEMENT

This thesis is submitted to Ain Shams University for the Degree of Doctor of Philosophy in Civil Structural Engineering.
No part of this thesis has been previously submitted for obtaining a degree or a qualification.

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ABSTRACT

In terms of the importance of modifying the concrete properties to perform efficiently under severe fire conditions, this study was initiated with the objective of enhancing the fire resistance of reinforced concrete beams. In order to achieve the above objective, the researcher designed a methodology that encompassed five investigation phases (i.e. theoretical, experimental, numerical modeling, analytical and inferential phases). During the ***Theoretical Phase***, literature was reviewed in the field of concrete fire resistance in order to assess the previously implemented experimental and analytical procedures. All through ***Experimental Phase***, the researcher carried out an experimental study to evaluate the enhancement of the mechanical and thermal properties of concrete with steel fibers. Throughout ***Numerical Modelling Phase***, the researchers established a finite element model to simulate a reinforced beam with steel fibers under high-temperature conditions, where assumptions and simplifications were put forward. In addition, verification was carried out to the model results versus the experimental results. In the course of ***Analytical phase***, a parametric study was achieved to verify the enhancement of steel fibers using a full-scale reinforced concrete beam. During ***Inferential Phase***, conclusions were provided and recommendations were suggested for future work and engineering practice.

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

FIGURE PAGE

CHAPTER 2