Cairo University

NONLINEAR NUMERICAL SIMULATION FOR THE BEHAVIOR OF REINFORCED CONCRETE LOADED BEAMS SUBJECTED TO FIRE

By

Mohamed Ayman Mosaad El-Shourbagy

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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Prof. Dr. Adel Yahya Akl
Professor of Structural Analysis and Mechanics
Faculty of Engineering
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Thesis Title:

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Keywords: Nonlinear simulation, finite element, fire test, concrete beams, coupled thermal-structural response

Summary:

Structural deterioration and collapse during major fire is evident and recorded in many incidents. Such events lead to severe injuries and deaths in addition to major economic loss of property. In this thesis the main objective is reaching a reliable algorithm to simulate a reinforced concrete beams under both mechanical and fire loads. The proposed algorithm is performed based on connecting thermal analysis and structural analysis using a sequential coupling technique. These analyses involves non-linearity of both thermal and structural.

The proposed algorithm is achieved through detailed numerical finite element models utilizing ANSYS program. The numerical results of the proposed methodology is verified against that of published experimental work, and the results shows good correlation with the experimental results ,indicating the efficiency of the numerical model. This algorithm of creating the coupled numerical model, is then used to execute parametric study, for establishing the effect of some parameters on beam thermal and structural responses to fire loads.

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