AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL DEPARTMENT

MOMENT REDISTRIBUTION OF CONTINUOUS PRESTRESSED CONCRETE BEAMS

BY
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A Thesis
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STATEMENT

This thesis is submitted to Ain Shams University, Cairo, Egypt, on 2018 for the degree of doctor of philosophy in Civil Engineering (Structural).

The experimental work included in this thesis was carried out by the researcher at the Housing and Building National Research Canter laboratories, Giza, Egypt.

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

Date :   /   / 2018

Signature :
Name : Eslam Mousa Ali Mousa

To

My father,

My mother,

My Wife, MY Daughters (SAMA & SALMA) and My Son (SAAMER)

And
My whole family

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Abstract of the PhD Thesis Submitted by
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Supervisors:
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ABSTRACT

In the current practices of structural design, the concept of moment redistribution in conjunction with linear analysis is well known and widely accepted. There are numerous studies and various references that deal with this issue and different codes propose various provisions for the amount of permissible redistribution.

To date, there is a debate on the extent of redistribution permitted by different codes of practice. The extent of moment redistribution in continuous prestressed concrete beams depends on number of factors including the amount of tension strain, compression reinforcement, cable profile as well as concrete strength.

In prestressed concrete members, there is a major difference between simple and continuous construction that is the effect of the secondary moment. At ultimate limit state of design, the consideration of secondary moments is important in the design analysis for statically indeterminate continuous prestressed concrete members. Codes give different recommendations for the consideration of secondary moments at ultimate limit state.

This thesis presents an experimental and analytical programs conducted to investigate the Behaviour of two-span continuous fully and partially prestressed concrete (PC) beams. The program consists of a total of eight continuous beams with overall dimensions equal to 150 x 300 x 8000-mm and clear spans equal to 3850-mm. The beams were tested using five-point loads up to failure to examine its Behaviour. Different cable profiles and concrete strength were used for fully and partially prestressed concrete specimens to predict the actual moment redistribution for each parameter. A comparison between the experimental results and the available international codes are presented.

An analytical study was carried out using strain compatibility approach to predict the actual Behaviour of the PC beams with different cable profile and different concrete strength. The analytical results showed good agreement with the experimental results. Finally, recommendations based on the conclusions of this study are given for better understanding of the behaviour of statically indeterminate continuous prestressed concrete beams.

Keywords: Continuous Beams, Ductility, Fully Prestressing, Moment Redistribution, Prestressed Concrete, Partially Prestressing, Secondary Moment, Stiffness.

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