Ain Shams University
Faculty of Engineering
Structural Department

MOMENT REDISTRIBUTION IN HIGH-STRENGTH CONCRETE BEAMS

By

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A Thesis Submitted to the Structural Engineering Department, Faculty of Engineering, Ain Shams University

For the Partial Fullfilment of the Requirements of the Degree of Doctor of Philosophy in Civil Engineering (Structural Engineering)

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APPROVAL SHEET

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ABSTRACT

The evaluation of ductility of reinforced concrete beams is very important, since it is essential to avoid a fragile collapse of the structure by ensuring adequate deformation at the ultimate limit state. One of the procedures used to quantify ductility is based on deformations, namely, the plastic rotation capacity. Knowledge of the plastic rotation capacity of certain regions of the structure is important for a plastic analysis or a linear analysis with moment redistribution. An experimental program is described in this article. It is composed of 10 tests designed to study the moment redistribution and ductility of continuous T-section high-strength concrete (HSC) beams. Particular care was given to analyzing how the tensile reinforcement ratio, concrete compressive strength, slenderness ratio and loading pattern influence the ductility and moment redistribution of the beams. A comparative study was carried out on several codes related to the moment redistribution permitted and the experimental findings. It was found that the code recommendations for normal strength concrete (NSC) can be safely applied to high strength concrete. A new equation is proposed to determine the degree of moment redistribution as a function in the value (x/d) for high strength concrete elements. This equation is only valid for concrete strength between 60 MPa and 90 MPa and for values of x/d between 0.1 and 0.2 only. A finite element model is being designed to verify the experimental results. A strong agreement was found between the experimental results and the analytical predictions regarding load deflection relationship. The Analytical model has been applied to various cases other than that studied in the experimental program.

STATEMENT

This Thesis is submitted to Ain Shams University for the degree of Doctorate of Philosophy in Civil Engineering, (Structural Engineering).

The work included in this thesis was carried out by the author at the Structural Engineering Department, Ain Shams University, from September 2006 to March 2010.

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

Date: / /2010

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