

A NEW APPROACH FOR DESIGN OF CONFINED HIGH STRENGTH CONCRETE COLUMNS USING THE GENERAL METHOD

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ABSTRACT

With the continued increase in the use of High-Strength Concretes (HSC) in buildings and other structures, accurate and detailed mathematical modeling is becoming essential for the design of structural and load-bearing elements. In this work slender columns subject to combined bending and axial loads are analyzed using geometric and material nonlinear algorithms. Geometric nonlinearity is associated with curvature caused by second order effects. Material nonlinearity is analyzed according to the axial load-moment-curvature diagrams obtained from the equilibrium conditions and the strain compatibility and constitutive relations applied to the General Method (GM) procedure. The GM proposed by [1], known to be the most accurate method of analyzing reinforced concrete, can predict the material failure or instability of a structural element occur. This research presents axial load-moment interaction curves for hinged HSC columns with symmetrical single curvature for different slenderness ratios. It can be applied to simple or reverse column curvature bending design. Through the use of these design charts, the GM procedure moves beyond being a verification method to being a design tool. Because of the inherent fragility of HSC, the confinement action produced by transversal stirrups is included in the mechanical properties of the materials. More accurate stress-strain curves are integrated numerically to obtain the compressed concrete resulting force. The results show that when the confinement effect is taken into account material costs are lowered, especially for non-slender columns.

Keywords: Columns, High Strength Concrete, General Method, Confinement, Design Charts