PROBABILISTIC DESIGN AND OPTIMIZATION OF REINFORCED CONCRETE FRAMES

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Pages 229-235 | Published online: 27 Apr 2007

- https://doi.org/10.1080/03052159108941072

Abstract

A structural optimization algorithm which includes global displacements as decision variables is presented. The formulation addresses the possibility of using a universal procedure for obtaining optimal solutions independently of local code restrictions. A comparison of current ACI code safety requirements and reliability constraints with examples of optimal limit design techniques is presented. The flexural performance of the elements was evaluated as a function of the actual stress-strain diagrams of the materials. For the non-linear case, formation of fictitious rotational hinges was allowed and the equilibrium constraints were updated accordingly. The adequacy of the frames was guaranteed by imposing constraints, representing the maximum probability of failure of the members and the global displacements allowed, combined with a prescribed limited system probability of failure.

KEY WORDS: Structural optimization, integrated analysis, frames, reinforced concrete, reliability