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Effect of Reinforced Concrete Jacketing on Axial Load Capacity of Reinforced Concrete Column

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Abstract

Whenever a member of a structure becomes structurally deficient, it becomes vulnerable to the existing load and for the additional loads that it may be subjected to in the coming future. Since columns are the most important structural element, the structural retrofit of columns, relative to other structural elements is of prime importance. This study intends to investigate the performance and behaviour of an RC column jacketed with Reinforced Concrete columns under axial loads. The objective of this paper is to find out the efficiency of RC jacket in enhancing the strength of an existing RC column. A mathematical design based upon Indian Standards codes has been designed to identify the behaviour of jacketed RC columns. This has been followed by a finite element based numerical simulation using the same material properties as used in the process of designing. The simulation has been done in ABAQUS software with appropriate contact modelling. The analytical model considers that there is no bond slippage between the existing and new concrete surface i.e. the bond between the existing and new concrete is assumed to be perfect. This perfect bond between the surfaces has been modelled by using appropriate constraints in ABAQUS software. The finite element models show fair agreement with the designed values in terms of ultimate capacity and failure mode. The load bearing capacity enhancement of the RC jacketed column has been found to increase substantially. The enhancement capacity results obtained from the finite element software differs about 16-25% from the design values.

Keywords: Retrofitting; Strengthening; Jacketing, Reinforced Concrete (RC) Column; ABAQUS.

1. Introduction

In order to prevent the disaster associated with the buildings due to additional floor loads or due to inadequate designs, the existing buildings sometimes need to be retrofitted. Retrofitting means repair, renovation and strengthening of the existing structures to make them more resilient or fit for the desired purpose. Nowadays retrofitting, repairing and restoring have become one of the most important aspects for structural engineering community and over the year's engineers have used different methods and techniques to retrofit existing structures. Several researches and studies on enhancing the strength and usability of the existing Reinforced Concrete Column have been done. The studies performed on Strengthening and Rehabilitation by Reinforced Concrete Jacketing technique considered different practical aspects like surface interface preparation, adding longitudinal reinforcements and shear stirrups spacing [1]. In order to study the main purpose of Jacketing and making some technical considerations into it several provisions and detail were made for Concrete and steel jacketing as well for both column and beam member.

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