

## **Civil Engineering Journal**

Vol. 3, No. 10, October, 2017



## Construction of N-M Interaction Diagram for Reinforced Concrete Columns Strengthened with Steel Jackets Using Plastic Stress Distribution Method

Mohannad H. Al-Sherrawi<sup>a\*</sup>, Hamza M. Salman<sup>a</sup>

<sup>a</sup> University of Baghdad, Department of Civil Engineering, 10071, Baghdad, Iraq.

Received 4 September 2017; Accepted 25 October 2017

## Abstract

No attempts have been made in developing the N-M interaction diagram for reinforced concrete columns strengthened with steel jackets using the plastic stress distribution method. Therefore, this paper presents an analytical model to construct the N-M interaction diagram for reinforced concrete columns strengthened with steel jackets using the plastic stress distribution method after assuming the behavior of strengthened column to be like composite column and including the effects of confinement on concrete compressive strength. The proposed model was compared with experimental results. The comparisons showed that the model is conservative and it reveals the ultimate strength of the strengthened column. A parametric study has been also carried out to investigate the influence of various parameters on the N-M interaction diagram of the strengthened column. These parameters were: dimensions of steel angle, yield stress of the steel angles, concrete compressive strength and the size of the reinforcement bars used in RC columns. The results made clear the effects of these parameters on the N-M interaction diagram, and encouraged the use of the model in preliminary strengthening studies.

Keywords: Interaction Diagram; Reinforced Concrete Columns; Steel Jacket; Plastic Stress Distribution; Composite Column.

## 1. Introduction

There are a number of design proposals that can be used to construct N-M interaction diagram for a composite steelreinforced concrete column which are: the Wakabayashi's method, the American Structural Specifications Liaison Committee method, the Roik-Bergmann method, the Eurocode No.4 method and others [1]. All these methods did not construct the N-M interaction diagram for reinforced concrete column strengthened with steel jacket.

This paper presents an analytical model for the construction of interaction diagram for RC column strengthened with steel angles and strips using the plastic stress distribution method. In this work and due to placing of steel cage, the effects of confinement on concrete compressive strength, stress-strain response of confined concrete will be taken into consideration by assuming the column is acting like concrete filled tube section. The angles were assumed to be bonded to the concrete by filling the gaps between the concrete and steel jacket with injection plaster or a concrete mortar forming a layer of binding material between the concrete and steel jacket. At first, the proposed model is verified with experimental results, and then a parametric study is carried out to investigate the influence of some parameters.

<sup>\*</sup> Corresponding author: Dr.Mohannad.Al-Sherrawi@coeng.uobaghdad.edu.iq

doi http://dx.doi.org/10.28991/cej-030926

<sup>&</sup>gt; This is an open access article under the CC-BY license (https://creativecommons.org/licenses/by/4.0/).

<sup>©</sup> Authors retain all copyrights.