Research Journal of Engineering Sciences ISSN 2278 – 9472
Vol. **7(6),** 1-3, June **(2018)** *Res. J. Engineering Sci.*

Short Review Paper

Review of non-linear analysis of reinforced concrete column using ansys

Vivek Kumar Mishra* **and Rakesh Patel**
Department of Civil Engineering, SIRTS, Bhopal, MP, India
Vivekmishra637@gmail.com

Available online at: www.isca.in, www.isca.me
Received 7th March 2018, revised 28th May 2018, accepted 20th June 2018

Abstract

RC columns are fundamental load bearing individuals in a structure, which contribute lateral stiffness moreover. When we talk about reinforcements in a column we have a two types i.e. Longitudinal and transverse reinforcements. Longitudinal reinforcements are given parallel to the longitudinal pivot of column and transverse reinforcements might be band, ties or spirals. Stress-strain behaviour of section is essential keeping in mind the end goal to discover the accessible malleability from a column by moment curvature analysis. This paper reviews the investigation on stress strain behaviour of RC column by modelling concrete and steel part independently utilizing ANSYS programming.

Keywords: Non-linear, analysis, reinforced, concrete column.

Introduction

RC columns are very important load bearing member in a structure. It is important to plan and design the section part sufficiently since it support bars and slabs and exchange the load to the foundation. There are two kinds of reinforcements in a column component. First is longitudinal and second one is transverse type. First one is for moments and forces in a column and second one is for strength and ductility of section member[1].

RCC Column

A RC column is a structural member which takes complete load of beams, slabs and the entire structure and always designed according to the compressive loads. It is consist of concrete with a steel bars to provide reinforcement. For design determinations, we have two types of column one is short columns and other one is slender columns[2].

Short columns: Material quality and geometry of cross-section are the main property to control the bearing strength of short columns. According to application for providing extra stiffness reinforcing rebar is set pivotally in the column. For loading limit Pn for a particular column and having greatest compressive strength of concrete fc', the yield strength of the steel fy, the cross sectional area of the column Ac, and the total area of the steel rebar Ast the first term speaks to the load conveyed by the concrete and the second term speaks to the load capacity of the steel. Since the yield strength of steel is greater than that of concrete so by addition of steel will definitely build the strength of the column[3].

Slender columns: For a slender column the area is very small in comparison to their. In this column buckling failure is critical so we say that slender column will buckle before the concrete or steel reinforcement bar than in short columns[3].

Buckling of column

Buckling of columns is a type of phenomena and it comes to role when the column is subjected to axial- compressive load. This axial-compressive load causes the bending of the column and instability arises due to failure mechanism of the column. The buckling failure is quick, and it would be dangerous too if not properly controlled. From the parameters such as Length, strength and others will determine how or if a column will buckle or not. When we talk about long columns and compare their thickness it will experience elastic buckling someone like to bending[4].

Figure-1: Buckling of column[5].

When we compare short columns in relation to its thickness, one can predict from the same equation stated above that the allowable stress on a column increases before buckling increases due to length decreases. The different type of boundary conditions for the column is another important factor in determining buckling stress[6].

Eigen value buckling analysis: Every elastic structure has some material non-linearity and its different buckling behaviour so we can say that the theoretical buckling strength of an elastic structure can be anticipated by this analysis. It computes the load at which buckling takes place for the body according to loads and constraints. However, in real life, structural inadequacies and nonlinearities always present and it prevent to reaching their eigen value in order to predict buckling strength[7].

Slenderness Ratio

The ratio of the effective length of the column to the least radius of gyration of its cross section is called Slenderness ratio. More the slenderness ratio, low will be the strength of the column. Hence we can say that capacity decreases as the slenderness ratio increases. However, when we talk about lower peak stresses we have higher slenderness ratio it means lower critical stress will cause buckling. It is observed that when the slenderness ratio is low it will results in a higher critical stress[8].

Literature Survey

Investigated on the non-linear behaviours of RC column. From the results it can be concluded that for the different slenderness ratios of the RC-SIFCON columns, the deflection was maximum for the column having minimum slenderness ratio and minimum for maximum slenderness ratio as the buckling takes places in the slender column. The load carrying capacity was maximum for the column having minimum slenderness ratio[9].

Presented nonlinear FEM analysis of RC steel column subjected to reverse cyclic and monotonic loading condition in order to analyse buckling behaviour and to understand maximum deformation, load it can withstand, and stress distribution[10].

Studied RC columns subjected with axial symmetric and eccentric loading. Nonlinear finite element analysis is used to analyze reinforced concrete columns up to failure with FEM software ANSYS. Reinforced concrete column subjected to the axial symmetric loading, are modeled considering the frequent use in the laboratory[11].

Provided an importance about the ductility and shear strength of the steel and also give the variation in shear strength and deformations with the different percentage of reinforcement. Using FEM on ANSYS it was used to investigate the linear elastic analysis[12].

Predict the buckling behaviour of RC column to analyse the stress-strain behaviour by modelling concrete and steel part separately due to complexity. An experiment was performed to validate the FEM model[13].

Reviewed and discussed about the performance of the composite column. It also emphases on the research activities done by various researchers on the composite column over the last ten years, which have impacted the use of composite column[14].

Focused area is beam- column joints, its behaviour and support conditions are of interest. Various authors analysed beam-column joints of RC frames with weak columns, poor anchorage of longitudinal beam bars and with inadequate transverse reinforcement. They come to final conclusion that the behaviour of exterior beam column joint is different than the corner beam column joint[15].

For the propagation of crack patterns in RC beams a FEM beam model is analysed using ANSYS software instead of doing numerical simulation and experimental tests. Using FEM model they studied from initial cracking to failure of the beam[16].

Conclusion

We concluded that a lot of works have been done by various authors on FEM modelling of RCC column under non-linear analysis. But the work has not been done on eccentric loading on column. So it is important to work on it and considered as vast area for research.

Various researchers reported that lack of data and reliable FEM model of column effect the prediction of buckling behaviour of column. At the last we also conclude that additional work is needed by considering the parameters like loading pattern etc. which affect the buckling response of steel bars in RCcolumn[17].

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