Development of P-M Interaction Chart For Composite Column

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Abstract*- Encased are used as composite column in multistory building as well as bridge piers because as superior, toughness and ductile and high strain rate from traffic and railway decks. In the present work "Development of P-M Interaction chart for composite column " considering the time consuming of the p-m interaction chart and it is the simple excel program of the concrete and steel section of the composite column and the considering the various parameters of the composite column to the different cross section of the p-m interaction chart for the composite column. In the p-m interaction chart for composite column with axial load and uniaxial bending As well as biaxial bending.*

Keywords- Encased composite column, Moment capacity Curve.

I. INTRODUCTION

A steel concrete composite column consisting of steel section ,concrete and reinforcing steel is generally used as a load bearing member in a composite frame structure. Two type of composite columns,those with steel section encased in concrete and those with steel section in filled with concrete are commonly used in buildings.

A composite column is a structural member that uses a combination of structural steel shape,pipe or tubes with without reinforcing steel bars and reinforced concrete to provide adequate load carrying capacity to sustain either axial compressive loads alone or a combination of axial loads and bending moments.

The interactive and integral behviour of concrete and the structural steel elements makes the composite column a very cost effective and structural efficient member among the wide range of structural elements in building and bridge constructions.

General concept of composite column

Composite columns may be of two kinds :-

1) Concrete -filled pipe and tubural steel columns,
2) concrete - encased steel columns

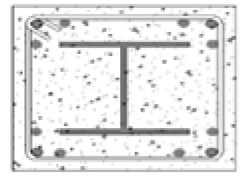

Figure 1.

II. LITERATURE SURVEY

Y.K.Gediya,.C.Koradia(SJIF - 2015) [1]:

From their Investigation Composite framing system consisting of steel girder acting monolithically with concrete has been as available alternative to the conventional steel or reinforced concrete system in the high -rise construction. The purpose of in his project is to develop a design aid for more simplified & effective design of column subjected to compressive force & uniaxial bending . The recommended programming is focused on solving the problem with the aid of the load vs moment diagram .Whose construction is time consuming .This makes economical design difficult. therefor a user friendly application (a simple excel program)is develop for the everyday used. Finally in his charts is developed for composite column is developed by varying reinforcement percentage to 1%,2%,3%,4%,5% and 6% for a steel section available in SP-16 which is used in our composite section design.

N.E. Shanmugam,B. Lakshmi (ELSEVIER-2001) [2]:

From developed steel-concrete composite columns are used extensively in modern buildings.Extensive research on composite columns in which structural steel section are encased in concrete have been In -filled composite columns his received limited compared to encased columns. In this a review of the research on composite columns is given with emphasis on experimental and analytical work. Experimental data has been collected and compiledin a comprehensive format listing parameters involved in the study .The review also includes research work that has been carried out to date accounting for the effects of local bucking ,bond strength, seismic loading ,confinement of concrete and secondary stresses on the behaviour of steel -concrete composite columns.

Ehab Ellobody & Ben Young (ELSEVIER-2011) [3]:

From developed non-linear 3-D finite element model for eccentrically loaded concrete steel composite columns. The columns were pin-ended subjected to an eccentric load acting along the major axis with eccentricity of the depth of the cross section. the model accounted for the in elastic behaviour of the steel, concrete reinforced bars as well as the effects of concrete confinement of the encased steel composite columns.The interface between the steel section and concrete the longitudinal and transverse reinforcement bars and the reinforcement bars and concrete considered allowing the bond behaviour to be modeled and the different components to retain its deformation of column the concrete strength varied from normal to high strength (30-110 mpa) the steel section yield stresses also (270-690) the eccentricities loaded composite column behviour and strength comprising different structural steel size ,different concrete strengths and different steel yield stresses were investigated ina parametric study.

P. A. S. ROCHA (ISMJ--2015) [4]:

This paper proposes a methodology for obtaining the interaction curve for composite steel - concrete sections subject to combined compression and bending based on the deformation domains of reinforced concrete structures defined by ABNT NBR 6118[1]. For this were developed expressions for the axial force ,the moment and the strains of concrete, longitudinal reinforcement and the elements comprising the metal profile in each deformation domain ,Based on these expressions a computer program called MDCOMP (2014) was created .In this study the same limit values of longitudinal reinforcement strain defined by ABNT NBR 6118 [1] were used for the steel profile strains.To verify the numeriacal implementations perfomed ,the interaction curves and the plastic resistance of the recommendations of Eurocode of ABNT NBR 8800[3]

Cristina Campian&Zsolt Nagy(ScienceDirect-2015) [5]:

From developed describes experimental aspects for composite steel- concrete columns with steel encased profile. On the other hand, from the graphics and parameters analysis we can conclude that the columns with HSC have a higher energy absorption capacity, which can recommended this solution to the construction in seismic areas, even the failure mode was brittle. In structural terms ,composite columns with concrete class C70/80 provide obvious better performances ro structures, having significant increase to almost all analyzed parameters. the solution of fully encased composite column is a competitive solution for seismic and non-seismic zones, due to the excellent seismic performances (resulted from the presented experimental tests) and also because of improved fire protection. The results obtained on the columns made with high strength concrete showed improved performances ,especially resistance . Due to the brittle fracture of the high strength concrete more experimental and numerical research must still be made.

Young Bong Kwon& SungWoongPark(CSCE-2015) [6]:

The development of the direct strength (DSM) for concrete filled tubular (CFT) sections A formula for strength interactions of CFT member under combined compression and flexure is proposed and is compared with test results The comparison confirmed that the formula for axial and flexural and that for strength interaction can conservatively predict the resistance of CFT columns to the axial load and combined compression and bending concrete -filled tubular (CFT) sections have advantages such as high strength, excellent ductility, and large energy dissipation capacity, they are used as structural members for high -rise buildings and long -span bridges. Since the steel skin confines the outward deformation of the steel skin, both steel and concrete enhance the strength of CFT sections. However , the buckling under compression and /or bending before overall buckling or material yielding.

Amjad Hameed Abd Al-Razaq (Jorden Journal of civil engineering-2014) [7]:

In this research paper Concrete Filled Steel Tubes (CFST) are extensively used in modern structures due to their static and vibrating strength specifications. In this research, a new design model is studied for steel-concrete composite columns under the title of steel tube-shaped columns filled with self-consolidating reinforced concrete with high strength. In this composite column, an I- or cruciform steel hollow-square section is placed inside a square steel tube and the self-consolidating concrete with high strength is poured inside the tube. The ABAQUS software was used to analyze by finite element method (FEM) thirteen composite columns exposed to compression and bending. The effects of the concrete strength, the ratio of width to thickness, the ratio of length to width, and the ratio of the steel cross-section on the strength of these composite columns were evaluated. The results showed that the steel hollow-square section paced inside limited the formation of the diametric shear cracks in the concrete core. Therefore, the failure mode and the post-yield behavior change the composite short columns. The load curves against the axial strain; the stress distribution of the composite columns; and also the interaction curves of the nominal axial load and the nominal bending moment are shown. The comparison of the results computed by the use of FEM modeling showed good compatibility with the laboratory results.

Xuanding Wang Jiepng Liu Xuhong Zhou (Journal of constructional steel research -2015) [8]:

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Example of Encased Composite Column Section Chart

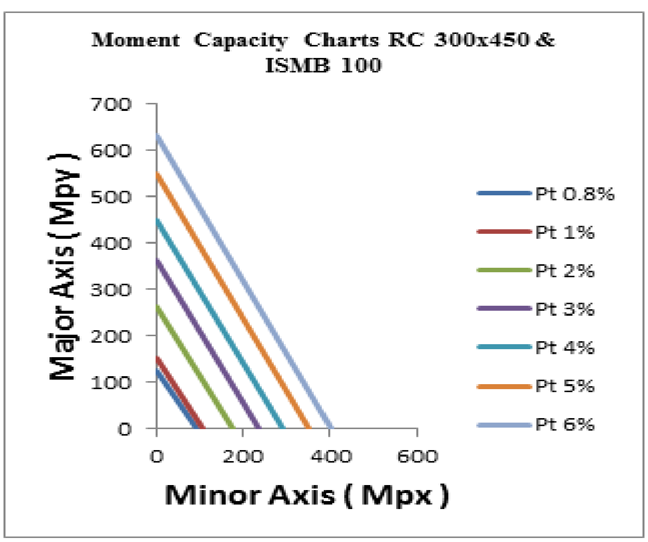

Figure 2.

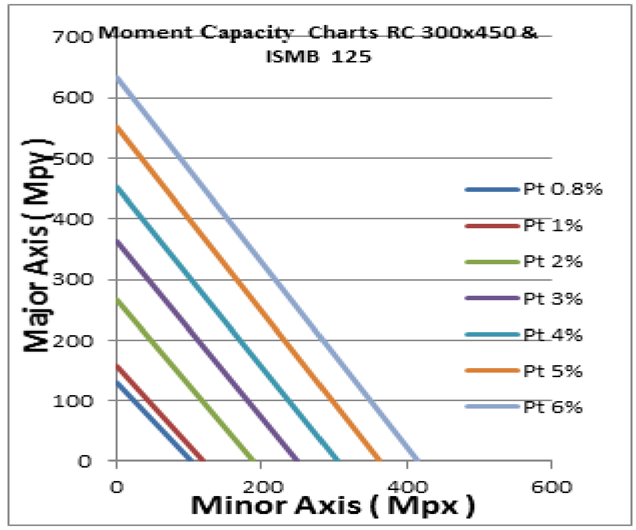

Figure 3.

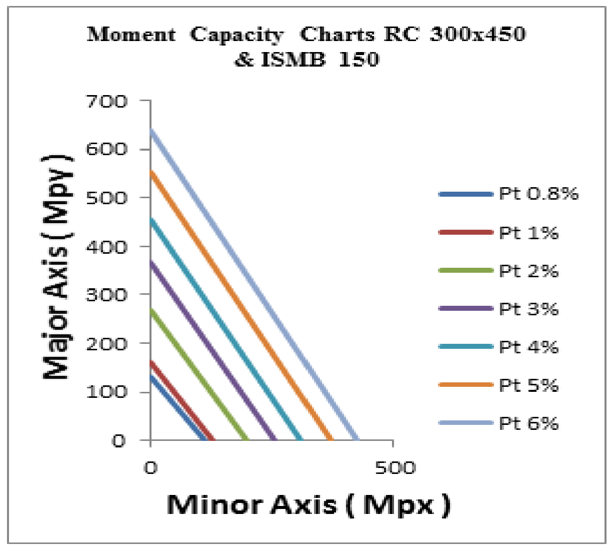

Figure 4.

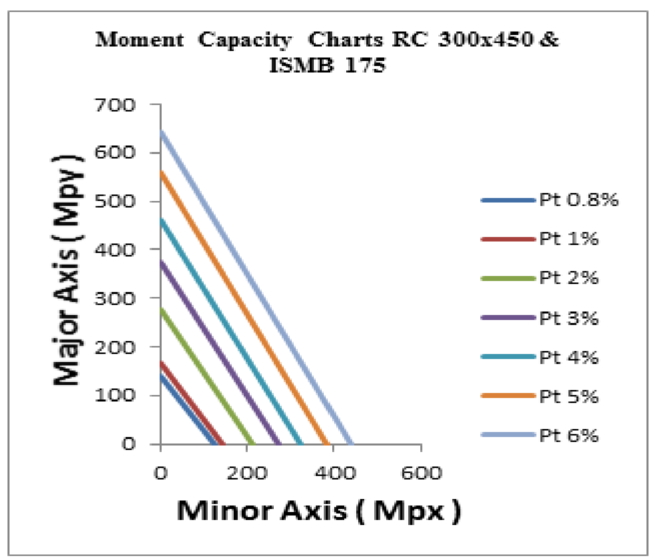

Figure 5.

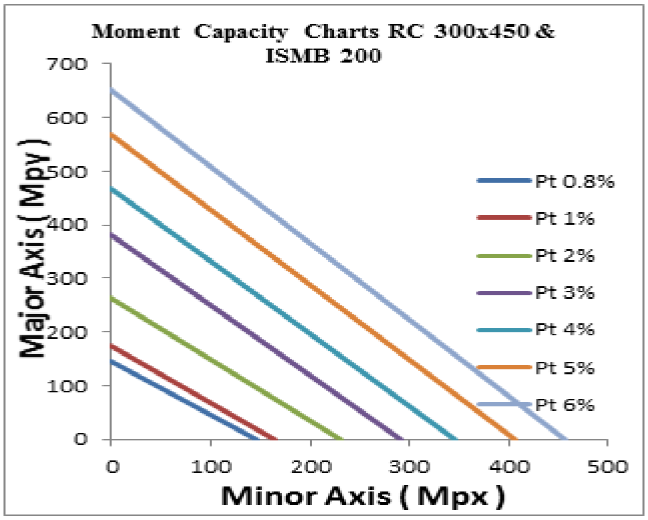

Figure 6.

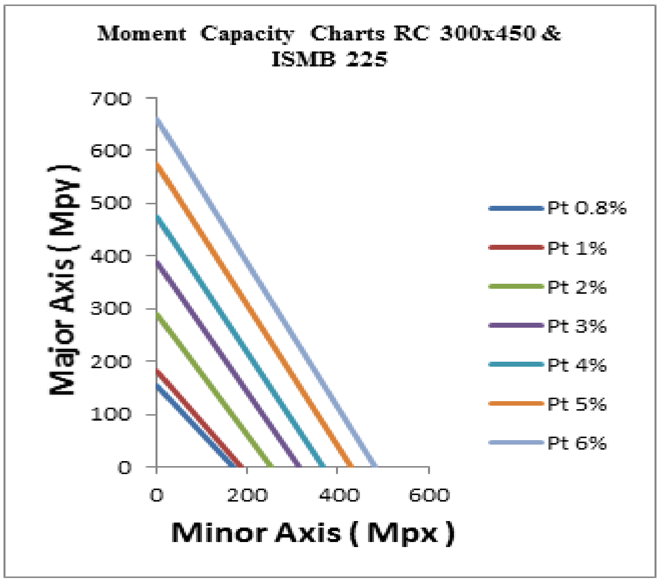

Figure 7.

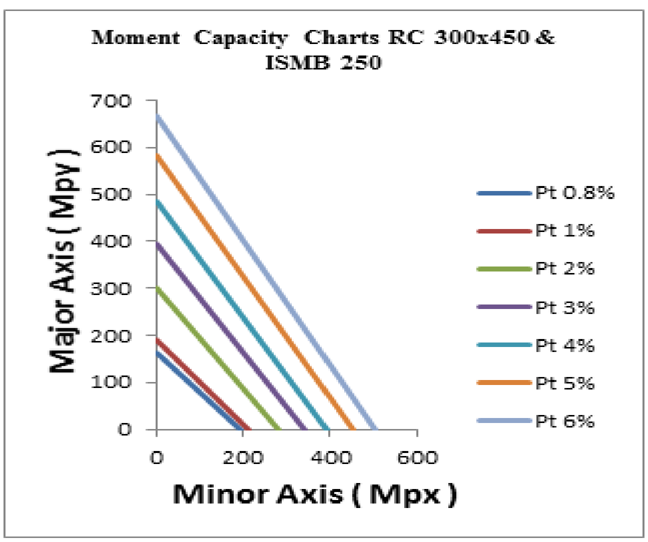

Figure 8.

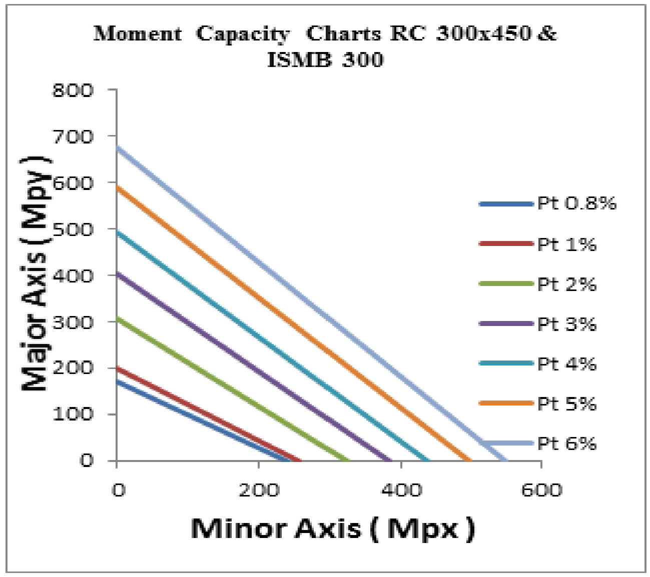

Figure 9.

III. CONCLUSION

From the value of plastic moment capacity in research paper and in software are more or less equal for concrete encased section.

From the validation in software the capacity of concrete encased column section work data are equal

From the P-M charts we can conclude that the axial compression capacity of composite column depending upon the percentage of steel But plastic moment capacity of the section about major and minor axis are increasing by putting the any I - section of the steel.

From the work data we can conclude that the moment capacity of concrete encased section will be slightly increase by increasing steel section size so we can provide smaller steel section for increasing moment capacity of composite section are compare to higher steel member section.

Hence ,From the above conclusion software gives nearly equal to same of data or manual data acceptable values.The value varies due to member property is not given work data.

From the comparison of data from excel programming we can conclude that the provided section should be smaller which can more effective for increasing moment capacity and reducing cost of section.

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