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BEHAVIOR OF REINFORCED CONCRETE COLUMN BEAM JOINT AT DIFFERENT POSITIONS UNDER SEISMIC LOAD USING ANSYS

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ABSTRACT:- *The behavior of beam-column joints under seismic loading have long been recognized as a significant factor that affects the overall behavior of reinforced concrete (RC) framed structures. The reversal of forces in beam-column joints during earthquakes may cause distress and often failure, when not designed and detailed appropriately. In the present study, finite element modeling of different type of beam-column joint specimens is done by using ANSYS10.0.The first specimen conforms to the guide lines of IS 13920: 1993 for seismic resistant design. The specimens are subjected to similar reverse cyclic loading to simulate earthquake loading in structures. It is observed that the deformation of models which are detailed under the instructions of IS 456 – 2000 are more, compare to the deformation of models are detailed under the instructions of IS 13920 –1993.*

Key Words: Beam column, Ansys, CFRP sheets, Ferro-cement

Introduction

General

In high rise structures the deflections in the structural frame joints is large in severe reverse cyclic loading. The beam- column joints are not consider (or) designed properly will cause effect on the performance of moment resisting frames. Basic assumptions of frame analysis at the joints must resist the forces, moments, axial force and shear forces generated by the loading, and to transfer the loading from beams to columns in most of the cases.

Since last four decades extensive investigation was carried out and studying the performance of joints under seismic load by using experimental and analytical studies. The thesis is designed at creating designers responsive of the theory on the plan of beam-column joints importance necessary factors distressing seismic performance of joint.

The structural members like beams and columns in an RCC (reinforced cement concrete) frame remain unbroken; the structure was compromise if the joints are unsuccessful in recent earthquakes. Beam column joints had remained collapse prior than the nearby members due to the damage of joint zone. This collapse is frequently happens in exterior joints. In the beam- column joints the ductility and energy amalgamation or absorption capacity is the most necessary in the earthquake resistance of structures.

Knowing the joint behavior under seismic loading is necessary in exercise correct judgments in the design of connections. The performance of external joint assemblage designed for seismic loads as per IS1893:2002.

serious zone in a reinforced concrete (RCC) frame. It is subjected to severe forces during brutal land quaking and its behavior has a significant control on the reaction of the structure. While design the joint core, it is essential to examine the shear resistance and anchorage circumstances of the reinforcement in the joint section. The details of joint existence in flexible fail to examine the belongings of high shear forces recognized within the beam-column joint.

The shear collapse is always brittle (breakable) in nature which is not a satisfactory structural performance particularly in earthquake conditions. Accepting the joint performance is essentially in exercise correct decision in the design of joints. Therefore it is important to discuss about the earthquake events on different types of joints and to emphasize the dangerous parameters that influence joint act with unusual reference to bond and shear transfer.

The anchorage span necessities aimed at beam bars, the facility of transverse reinforcement and the character of them in shear transfer at the joint remain the main issue. A learning of the usage of extra transverse bars present an added new device of shear transfer and diagonal cleavage will be escaped. However, there were only restricted experimental and critical studies for the usage of non-conventional describing of exterior joints. Inspire of the extensive addition of test data, the guidance of transverse bars on shear strength of joint has not remained mentioned in main international codes. In this exertion try has made to develop the confinement of core concrete with transverse reinforcement in joints.

The recommendations are written to satisfy strength and ductility necessities linked to the task in the beam-column joint. This dissertation considers typical structural frames joints in cast-in-place RCC buildings. Although the recommendations are suggested to apply first and foremost to building structures, they can be comprehensive to other type of frame structures when

similar forces and structural conditions exist.As per the Indian code of practice the reinforced concrete joints are not specifically designed, with the consideration been reserved to the provision of sufficient anchorage for the beam longitudinal reinforcement. This probably satisfactory when the frame is rendering to seismic activity loads. The poor plan to design carry out to the beam column joints is compounded by the high demands executed by the adjoining beams and columns.

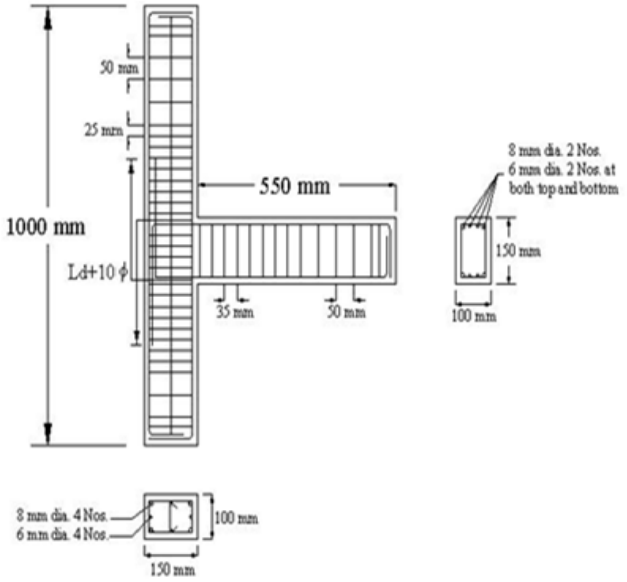


Figure: 1: Reinforcement details of the beam-column joint specimen as per IS456 (BIS,2000)

Many studies have proved that beam column assemblages under high axial compressive forces are determental to the joints. IS13920 covers the demands of design and ductile detailing of the reinforcement concrete structures influences to seismic forces. In the proposed revision of IS13920 the guide lines on beam column joints are included.

The pattern of loads performing on a joint depends on arrangement of the joints and the type of loads acting on it at joints.

Objectives of this study

1) To model the different position of beam column connections. (One beam one column, one column two beams [2]) by using ANSYS.

2) To design the respective models which are detailed as per Indian standard 456-2000, and Indian standard13920-1993.

3) To study the behavior of column beam joint under the application of seismic loads and axial load.

4) To study the various technical parameters such as deformation, stresses, and strains.

5) To plot the graph of load v/s deformation and stresses v/s strains.

6) To recommend the best model for earthquake resistant structures.

7) To present the possibilities of future scope of work.

Modelling

In modeling we have to select create. In create we have to define key points and should join the key points with the line command straight lines. In this copy option also be present, we can use it for copy lines or key points. In this area option will be present, in this we can create the areas as based on our dimensions. Before creating areas we have to mesh the lines and should select the lines to give the cross sectional area of diameter of steel.

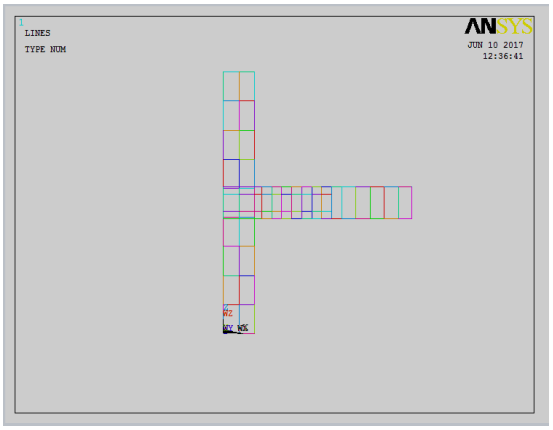
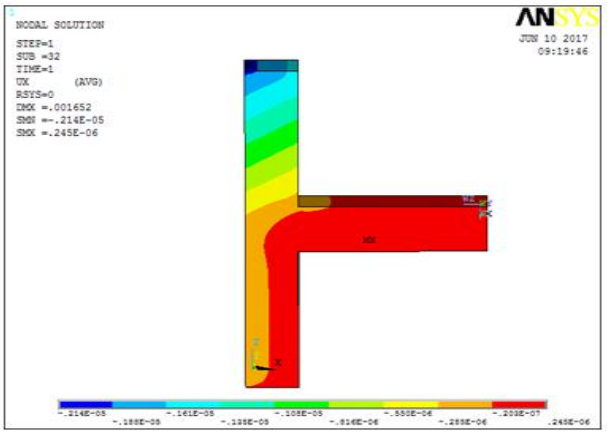


Figure :2: Modeling of beam-column joint

Results and Discussions:



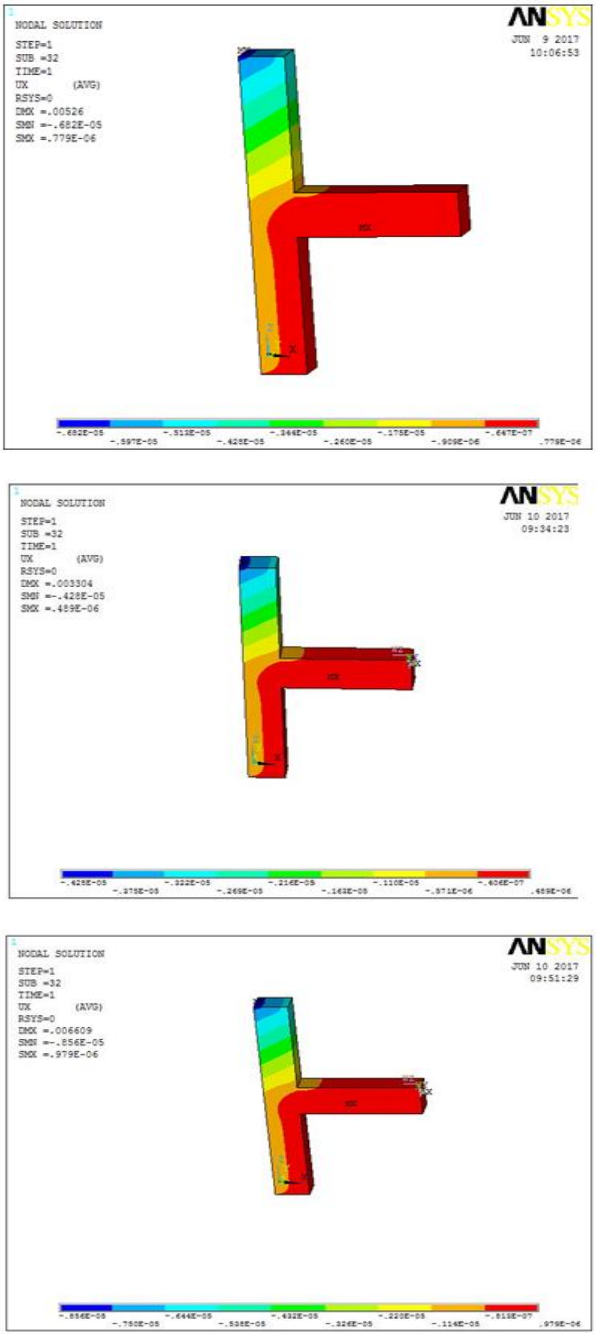


Figure :3 :Deformation of T jointfor5,10,15,20 KN

Table:1: Comparison of deflection IS 456 V/S IS 13920

load	deflection of model 1 as per IS 456	deflection of model 1 as per 13920
5	1.652	0.986
10	3.304	1.972
15	5.26	3.139
20	6.609	3.943

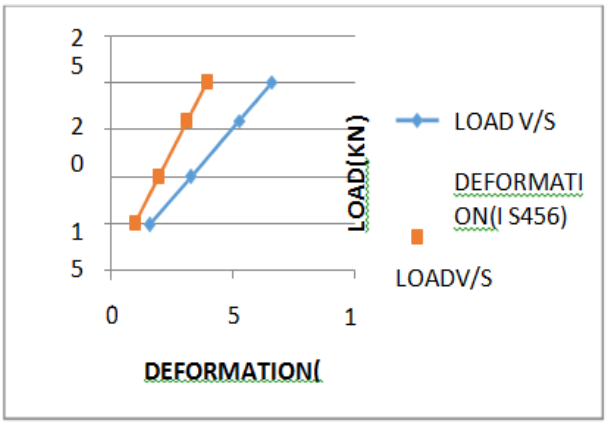


Figure:4: Load v/s deformation

Table:2: Comparison of deflection IS 456 V/S IS 13920

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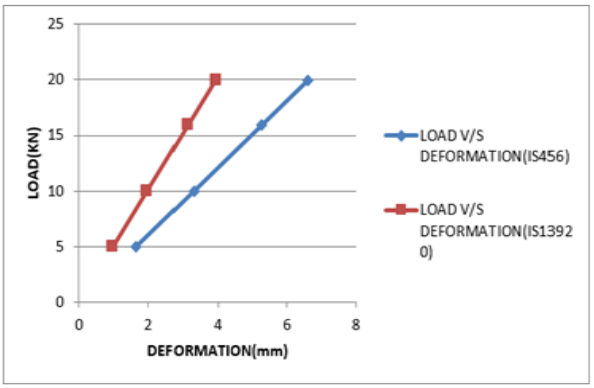

Figure:5: Load v/s deformation

Conclusion

From the present dissertation following conclusions are made

1) Ansys is a software which helps to do a model of different components of the structure in a different ways with number of positions of them.

2) Comparison is made between the models detailed according to the IS 456-2000, and IS13920-1993.

3) Values of deformation obtained for IS 13920 models were lesser than deformation values obtained for IS 456models.

4) The deformation of second set models comparatively lesser than that of other two models.

5) It is observed that the deformation of models which are detailed under the instructions of IS 456 – 2000 are more, compare to the deformation of models are detailed under the instructions of IS 13920 –1993.

6) Stresses and strains of all the models are linear.

Future scope of work

- In the present study the use of FEM to estimate beam column connection is proven.
- Further work can be guided towards comparative studies among experimental and analytical results.
- Analysis can be done for three beams and four beams also.
- Beam column joint can be stiffen by using CFRP sheets, Ferro-cement or any other suitable material.

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