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EARTHQUAKE RESISTANCE COLUMN BY USING HELICAL REINFORCEMENT

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Abstract – *The major reason for the failure like damage in Rcc buildings is non ductile Designs. It has been observed that in Rcc buildings, defects (damage/crack) has arisen from using of concrete having not sufficient resistance against vibratory shocks. The members like columns, beams are not tied in one line. Sometimes in buildings, as a result of fixing two consecutive members like beams to different tips of the column, the additional torsion in these columns has caused severe defects/damage/cracks in the members of the building. In India, last and heavily destructive earthquake had occurred in Bhuj, on January 26, 2001. The earthquake had a moment magnitude of 6.9. In this earthquake, many buildings were heavily damaged and some have totally collapsed. In the results of such findingsv, essentials given by Indian Earthquake Regulation with respect to design shall be discussed particularly for buildings constructed after the date such regulation is put into effect, and seismic features of the earthquake shall be commentated according to the data in connection with the strong ground motion obtained. The encouragement to use appropriate material and the use of ready mixed concrete will ensure that the damage will be minimized in probable future Earthquakes. By means of illustrations and photographs demonstrating damages and collapses obtained during the investigation in connection with the structural system elements/members, recommendation shall be made. Finally, suitable and effective reinforcement discussed with respect to reinforced concrete buildings defects/cracks/damaged.*

Key Words*: *Seismic performance, earthquake damages, reinforced concrete.

1. INTRODUCTION *(Size 11 , cambria font)*

The vertical members (column, strut) in RC buildings, contain two types of steel reinforcement, namely:

(a) Long bars (called longitudinal bars) placed vertically along the length, and

(b) Closed loops of smaller diameter steel bars (called transverse ties) placed horizontally at regular intervals along its full length (Figure 1). Columns can bear two types of damage, i.e axial-flexural failure and shear failure. Shear damage is brittle in nature and must be avoided in columns by providing transverse ties.

The main reason for the damage/crack/defects in reinforced concrete buildings is that those buildings are not designed to show a ductile behavior to vibratory shocks/earthquake. During the R/C structural system choosing and designing of the column/strut, the column axis, dimensions of column/struts and beam concrete sections, rigid direction of columns and distribution of the rigid directions of columns, and its directions are important points for the structural design. A structural design based on the earthquake effects. In some special cases biaxial earthquake analysis is not satisfactory; therefore, well-designed structures should be capable of resisting motions equally from three directions of earthquake effects.

On the other hand, it has been observed that the damages/defects/cracks in reinforced concrete buildings happened because of design and construction reasons, the weak reinforcement of soft stories and column beam joints. The damages in without reinforced buildings occurs because it is not according to the construction rules properly .In this study , the observations and findings on the cracks/damaged/defects in reinforced concrete and unreinforced buildings have been discussed, the Indian Earthquake Codes gives the direction towards design have been discussed especially for buildings constructed after that Indian Earthquake codes have become effective, the seismic properties of the earthquake have been analysed based on the obtained data of great vibratory shocks.

2. Vertical Bars tied together with Helical reinforcement

Helical reinforcement/ties help the structure in different ways, like

(i) They carry the horizontal shear forces induced by earthquakes, and thereby resist diagonal shear cracks,

(ii) They bound together the vertical bars and prevent them from excessively bending outwards

(iii) They contain the concrete in the column within the closed loops. The ends of the ties must be bent as 135° hooks (Figure b).

2.1 Advantages of Helical Reinforcement:-

Helical Reinforcement has the potential advantage of protecting columns against vibratory shocks. When the members/structural element (beam/column/strut) reaches the stage of failure, the concrete peels off the structural member, providing a warning signal for to take preventive measures. Helical Reinforcement can take up higher working load than normal reinforcement.

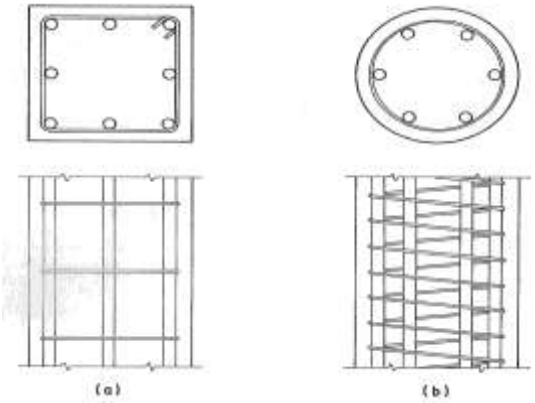

Fig -1: Helical Reinforcement

3. DESIGN STRATEGY

Designing of structural member like column involves selection of materials (i.e., grades of concrete and steel bars), shape and size, and Calculating amount and distribution of steel reinforcement.

The Indian Ductile Detailing Code IS: 13920-1993 requires columns to be at least 300mm wide. A column width of up to 200mm is allowed if unsupported length is less than 4m. Columns must be designed to prevent shear failure by a suitable selection of reinforcement.

Indian Standard IS13920-1993 gives following details for earthquake-resistant columns:

(1) Closely spaced ties must be provided at the two Ends of the column over a length not less than Larger dimension of the column, one-sixth the Column height or 450mm.

(2) Over the distance specified in item (1) above and below a beam-column junction, the vertical spacing of ties in columns should not exceed D/4 for where D is the smallest dimension of the column.

(3) The length of tie beyond the 135□ bends must be at least 10 times diameter of steel bar used to make the closed tie; this extension beyond the bend should not be less than 75mm.

4. DISCUSSION OF TEST RESULTS

By using vertical reinforcement with helical ties, we found that it can bear 6.0 magnitude earthquakes. We have done this by cast a circular column. In this circular column we have used 6 nos of 16mm diameter and M20 grade of concrete. After 28 days when specimen is ready then apply 6 magnitudes vibration by using vibration table.

5. CONCLUSION

By providing helical reinforcement in columns we can protect the structure from vibratory shocks as comparison to ties reinforcement. In future it would be beneficial for the construction to avoid damage to the buildings. And by this way can save the wastage of money and can save life.

REFERENCES

1.https://nptel.ac.in/content/storage2/courses/105105104/pdf/m10l22.pdf

2. https://unacademy.com/lesson/example-of-circular-column-with-helical-reinforcement-lsm/HXLD84LY

3.https://thecivilengineeringdaily.wordpress.com/2015/02/17/for-column-reinforcements-why-is-helical-reinforcement-sometimes-designed-instead-of-normal-links/

4. https://www.youtube.com/watch?v=fMnGi6_ROkk

5. Wind and earthquake resistance building by bungale S. Taranth

6. Earthauke engineering for structural design by W.F. chen , E . M lui

7. **IS code –IS 13920-1993**

8. **IS 1893-2002**