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RESEARCH ARTICLE

Behavior of Concrete Columns under Axial and Biaxial Bending Loads

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Abstract
RC columns are the main strengthen components of structure design. The reliability of this structure design depends on the column design and placement. The behavior of these RC column under uncertain situation is quite effective. This paper has discussed the placement of these columns in heavy load and critical situations. The paper has discussed the causes and effects of failure situations such as earthquakes on building under the effect of RC column placement. The paper has also explored the geometric and displacement features of RC columns under uniaxial and biaxial cyclic behavior.

Keywords – RC Column Design, Earthquake, Uniaxial, Biaxial

I. Introduction

While designing the structure elements or the components, columns are considered as the most critical elements. To generate the structure design some safe consideration and specification is also taken. These considerations includes the specification of different material based, environmental and stress vector based analysis. One of the most critical analysis in column based design structure is the load case analysis. This analysis includes the safety and reliability under behavioral aspects. One of such aspect is confinement. This aspect actually analyzes the column component under ductility and capacity. A predictive and mathematical analysis is performed under different vector to estimate the degree of confinement. But, there are only a new tools available to perform such kind of analysis and these tools are also available under limited consideration. The eccentric load conditions are analyzed with axially loaded design components. The effect analysis is performed under mis alignment and tolerance vector so that effective column design over the structure design will be performed[1][2].

There are number of such confinement models under concentric axial compression and column design. The design assessment based consideration under different vectors is done. These confinement model are defined under different factors called area based analysis, strength analysis and ductility analysis. While performing the stress or safety analysis over these column based structure design, the structural response analysis is performed. This response analysis includes the earthquake effect analysis under the horizontal load and damage situation and event based analysis. These axially loaded members are also analyzed under critical events such as biaxial bending based history analysis. The uncertainity analysis over the bending moment analysis is performed for orthogonal direction analysis with complication handling. This kind of knowledge based behaviour analysis will be performed under biaxial cyclic moment analysis with uniaxial load and bending load analysis. These models include the fibre based model where the analytical behavior analysis is performed in contrast with global model specification. These analytical models can perform the incorporation of code standard over these models so that the design deficiencies will be reduced[3][4].

The column design based performance analysis is performed for earthquake performance analysis. This kind of failure analysis is observed under seismic event analysis. Different causes of failure of RC building are listed here under

- Lack of Confinement
- Bond Splitting or slipping
- Inadequate Shear Capacity
- Inadequate Flexural Capacity
- Joint based Shear Strength Analysis
- Influence Analysis of Infill Masonary
- Irregularity over the Design Structure
- Mode Effects
- Weak Column Mechanism
- Structural Deficiencies

While dealing with design consideration and construction deficiencies, the extensive damage of structure can cause. To handle these potential problems, it is required to design the columns in a systematic way under the load considerations. The load consideration must be preventive to the failure as well as ductile behavior based analysis must be defined. RC column failures are also associated with flexural capacity based analysis so that the confinement deficiencies and eventual analysis will be performed[5][6].

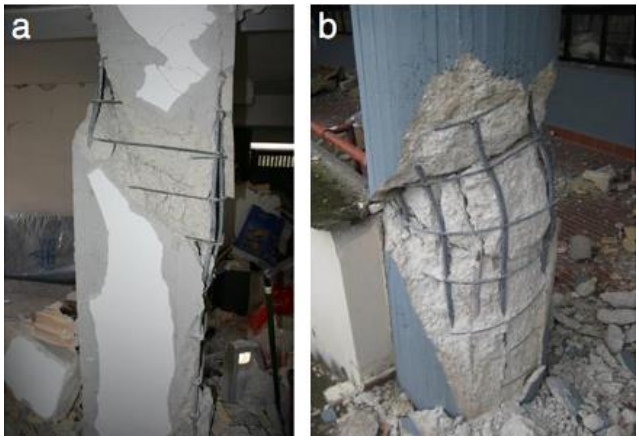

Figure 1 : Shear Column and Circular Column situation in Earthquake

Another problem in column failure is obtained in case of shear failure or diagonal fracture in the column area. These column situations are shown in figure 1. This kind of failure occurs if the insufficient area of the beam or column traversed under inforcing steel. The spacing and deficiency also increases the chances of fracture over the column. Improper length also the reason of bents in these bars. The bean columns having the greatest importance in RC building. But the poor behavior of column joints gives the quick collapse and damage of building in case of heavy load or earthquakes[7].

In this paper, the column RC building is and the beam points are been discussed under the failure and earthquake situation. The paper includes the case study on behavior of RC column. This section includes the exploration of RC columns under biaxial and uniaxial situations. In section II, the column specimen analysis is performed under different situations including the damage or failure conditions.

II. COLUMN SPECIMEN ANALYSIS

The structural engineering is basically design an tested under different cases of load and failure problems. One of such problem under which the testing is performed is Earthquake analysis. RC columns used in bridges and builiding include the cyclic loading for horizontal columns. The main purpose of this study is to test and analyze the behavior of RC columns under biaxial cyclic loading. There are different kind of RC column designs under different geometric characteristics and reinforcement adjustments. These are also tested under different load histories. These column types are tested under uniaxial and biaxial loading. The axial forns and displacement is applied over these columns under controlled conditions. The column specimens are defined strong enough with concrete foundation block so that effective construction plan will be obtained[8][9].

The column designs are also analyzed under the reaction frames and the strore analysis. The prestressed steel bars are used to avoid the sliding and overturning situation so that effective frame generation will be obtained. Axial load is defined under the column specimen deflects so that the sliding device is used in order to minimize the friction effect. The tested specimens are defined under constant axial force so that the absolute axial force can be applied over it. The characterization of column specimens with cyclic lateral displacements are used with smooth demand levels. The deformation of these laterals is performed at demand level so that the column behavior and the comparison between the test can be obtained under different numerical models. The cyclic repetition is performed for each displacement demand for capturing of information under the column strength analysis so that the peak displacement based analysis will be performed. This displacement analysis also avoids the fracture situation[10].

To analyze the load over these columns another effective approach is shear drift curve placed from uniaxial and biaxial loading test. These curves provide the apparent strength reduction with biaxial loading for both directions. This effect is analyzed for weak as well as the maximum strength based analysis so that effective load observation over these columns will be performed. While maintaining these load cases, the consideration is given in terms of damage evolution defined in this section.

A) Damage Evolution

Another consideration while studying the consequences of biaxial loading in column is the damage control or damage effect analysis. Different specimens are studied under different stages for crack analysis and reinforcement analysis. This analysis includes the study or effect analysis under different situations such as spalling, longitudinal reinforcement, fracture situation etc. These analysis are helpful to identify the situation of column failure. This also required to identify the maximum strength point as well as to obtain the strength point so that effective damage situation in columns will be identified. Biaxial loading also induces the damage in columns in case of heavy load on corners. The uniaxial columns are also analyzed under rupture and bar fracture situations[11][2].

III. EXPERIMENTAL STUDY ON BEHAVIOUR OF RC COLUMNS

In this section, the experimental study of RC columns is defined in case of failure, earthquakes or heavy load. The observational analysis and the performance measurement is performed under different components of RC columns. The analysis is here defined under with or without axial load. These kind of axial force includes the associated beams so that the uniaxial behavior of elements is defined. The experimental study is here defined under the axial load and different variable and constant definition. These kind of elements includes the behavioral cross sectional study under the shear span ratio so that the effective flexure and shear mechanisms will be analyzed. This study includes the experimentation under rectangular columns with horizontal load conditions in biaxial behavior. The building structure is analyzed under earthquake situations. The earthquake is considered as the three dimensional response situation with random variable values and different kind of irregularities over the structure. This kind of analysis includes the bend analysis under moment ratio analysis so that the

section tend will be performed under capacity situation. The acceleration and the strength analysis is defined under successive load situations so that effective frame structure analysis deterioration in beans and the behavior under vertical potential situation will be performed[13].

The effect of biaxial loading on columns and 3D features is performed under the contribution of inelasticity and damage concentration. The RC frame structure based analysis is performed under load situations. The response analysis is performed for RC columns under the bending load conditions so that uncertain situations will be handled. The experimental setups is performed with knowledge concerning response for biaxial cyclic moments. The test results in biaxial bending constant load are defined with uniaxial bending so that effective column experimentation under cyclic load situation will be defined[14].
The criticality or the risk level in such designs increases when the testing becomes more difficult and the cyclic behavior in biaxial bending is applied with constant force and bending load. These kind of directional and dimensional force under longitudinal reinforcement characterize the RC column strength and stiffness. The analysis in such system must be focused on biaxial lateral loading with constant and varying axial force. The biaxial tests are performed on bare frame structure so that effective frame finding will be performed[15].

A) Column Geometrics

In cyclic biaxial tests, two kind of column types is generally used. These columns are fixed against the rotational ends so that effective test configuration and the flexibility will be obtained. The curvature specimens under rigid zones are applied from top to bottom to assure the building column. The feature factors are applied under the difference analysis under different configuration vectors so that effective placement of columns will be performed. The cantilever model includes the inflection point under the column change. The column based flexural behavior is been defined under the damage situation at column end.

B) Displacement Patterns

The behavior of RC column is defined under geometric and mechanical characteristics. These kind of columns are designed under cross section and axial load analysis. The displacement pattern is defined in global behavior with biaxial bending forces. These forces are applied in two orthogonal directions. The displacement patterns are effective enough for biaxial tests so that effective configuration under displacement pattern is defined. These displacement patterns are defined in biaxial test so that uniaxial and biaxial load path is defined.

IV. CONCLUSION

In this paper, RC columns based structures are designed under heavy load, failures and earthquake situations. The paper has covered different kind of Vertical and horizontal beams under the biaxial and uniaxial cyclic moments. The load situations are discussed in extreme situations. The paper also discussed the causes and effects of these loads.

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