A Review Study of Earthquake Resistant Multi-Storied Building

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Abstract— Seismic design procedure has historically been developed by engineers by observations of the real buildings behavior and structures when subjected to destructive earthquakes. This knowledge was supplemented by a systematic improving process our basic understanding of earthquakes and ability to characterize and predict the of earthquakes and the structures response. Prescriptive requirements, based on features observed to result in the good performance, were developed after each and every earthquake.

Keywords: Earthquake, Resistant Multi-Storied Building

I. INTRODUCTION

The study of vibrations of earth is Seismology that is occurred by earthquake. Study of these vibrations by various techniques, various physical processes and understanding the nature and that generate them all from the seismology. The seismic design of high rise buildings assumed as per past experience. The other column in the same storey, where height is regular there are no walls adjoining them in many cases. For traditional methods adopted based on fundamental mode of the structure and distribution of earthquake forces as static forces at various stories may be adequate for structures of small height subjected to very low intensity earthquake but as the number of stories are increases the seismic design demand more rigor. The floor slab moving horizontally at time of earthquake and then the upper ends of the columns undergo the same displacement. The stiff walls also restrict the horizontal movement of the short column at the lower portion.

II. MATERIAL PROPERTIES

A. Concrete

All components are specified in design grade M25
Ec = 5000 N/mm2 = 5000 MN/m2 = 25 000 N/mm2 = 25 000 MN/m2.
M30 grade FOR central columns to plinth, ground floor (GF) and first floor (FF)
Ec = 5000 N/mm2 = 5000 MN/m2 = 27 386 N/mm2 = 27 386 MN/m2.

B. Steel

Fe 415 grade for HYSD reinforcement confirming to IS: 1786 is used throughout.

III. LITERATURE REVIEW

1) A.L. BHATT (2012) Comparison performed between European and American codes on the Non Linear Static analysis of the reinforcement buildings. In which this paper they explained about NSP that is a performance based seismic design of behaves sensible in seismic force than a strength designed in philosophy that is force based. They also evaluate deformation for Global and Component level.
2) GURUPRASAD (2017) Dynamic analysis performed of multi storied RC frame building of G+15 with three different shapes in plan by the ETABS software. Following parameters used for comparison- story drift, reations of support, story shear, section cut force and building mode. Drift values of stories increases for top to bottom story in all cases in X and Y direction. Irregular plan structure can resist more base shear than rectangular plan structure was found when earthquake load is applied in Y direction.
3) NITIN CHODHARY (2014) Pushover analysis of Reinforcement frame building along the shear wall. In this performance, multi storied reinforced concrete frame building of 4 floor situated in Zone-IV, is chooses for the purpose of analysis.
4) ANIKET KALI (2017) carried out the wind and the earthquake resistance analysis of multi storied buildings of many different shapes of same area by the CSI ETABS software.
5) JAY PARKASH KADLI (2015) by using pushover methodology, Performed the static analysis of multistoried reinforcement buildings. All frames with various configurations are designed and detailed as Special Ordinary Moment Resisting Frames and Moment Resisting Frames and as per INDIAN STANDARD-1893:2002.. The designs of SMRF buildings are done by using INDIAN STANDARD -3920:2002.

IV. CALCULATIONS

A. Unit Load Calculations

Assumed sizes of column and beam sections:
Columns: 500 x 500 for all typical floors
Area = 0.25 m^2
Columns: 600 x 600 below GL
Area = 0.36 m^2
Main beams: 300 x 600 for all floors
Area = 0.18 m^2
Ground beams: 300 x 600
Area = 0.18 m^2
I = 0.0054 m^4
Secondary beams: 200 x 600

B. Member Self Weights:

Columns-I (600 x 600) 0.60 x 0.60 x 25 = 9.0 (kN/m)
Columns-II (500 x 500) 0.50 x 0.50 x 25 = 6.3 (kN/m)
Ground beam-I (300 x 600) 0.30 x 0.60 x 25 = 4.5 (kN/m)
Main beams-II (300 x 600) 0.30 x 0.60 x 25 = 4.5 (kN/m)
Slab-I (100 mm thick) 0.1 x 25 = 2.5 kN/m2
Ground floor wall-I (height 3.5 m) 3.5 x 4.9 = 17.2 (kN/m)
Ground floor wall-II (height 0.7 m) 0.7 x 4.9 = 3.5 (kN/m)
Brick wall-I (230 mm thick) 0.23 x 19 (wall) +2 x 0.012 x 20
Floor wall-II (height 4.4 m) 4.4 x 4.9 = 21.6 (kN/m)

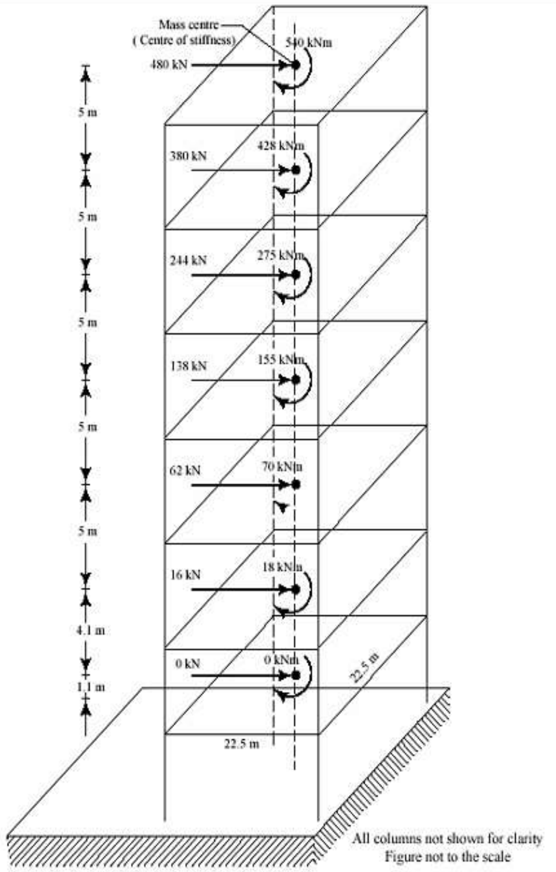
C. Beam and Frame Load Calculations:

Terrace Level (TL)

Floor beams from slab 2.05 x (1.50 + 5.50) = 13.80 + 3.80 kN/m
Self weight = 2.50 + 00 kN/m
Total = 16.30 + 3.80 kN/m
Reaction on the main beam 0.50 x 7.50 x (3.80+16.30) = 61.10 + 14.30 kN.
Note: Self-weights of main columns and beams are not considered because analysis software will directly add them. In calculation of design of earthquake loads these will be considered in the seismic weight.

V. ACCIDENTAL ECCENTRICITY

Design eccentricity is given by INDIAN STANDARD 1893:2002 (PART-I). For the present case the static eccentricity esi=0.19m and edi=0.19+ 0.05 x 22.50 = 1.41 m. This load is eccentric by 1.41 m from the mass centre. Eccentricity from centre of stiffness shall be calculated from the calculation purpose. It can be on either side that is minus or plus. Accidental eccentricity inducing torsion in the buckling is shown in the fig.



Accidental Eccentricity Inducing Torsion in the Building

VI. CONCLUSIONS

The conducted analysis illustrated that the main reasons of tragic earthquake In order to improve seismic safety of residents and to prevent huge property damage caused of earthquake it is necessary:

1) To conduct full-scale investigation of built-up area developments which are located in seismic active regions, and then in accordance with systematization and analysis of investigation results to carry out the measures in order to mitigate consequences of disaster.
2) To design and construct on seismic unfavorable sites only by authority of appropriate experts commission;
3) To develop guidance on design for buildings of some types and to specify series of current seismic code provisions;
4) To implement widely the test practice and quality control of building material and elements, used in construction; The buildings of new construction types must be put into operation only after conducting model and real tests;
5) To allow implementation of construction activity only for companies with appropriate license and documents proved the right on conducting certain kinds of works;

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