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DESIGN OF EARTHQUAKE RESISTANCE BUILDING (G+5)

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Abstract-Earthquakes are the indication of transformation in the earth's internal structure, seismic activity is common in most parts of the world and through the frequency of its occurrence is a function of local tectonic setup. Though it's impossible to stop an earthquake. The least that can be achieved in reducing the damage is to make the building earthquake resistant. The paper aims to create an awareness about the earthquake by showing the drifting of each floor of 6 storey building. Safe building in various seismic zones. Recommendations are given to the local construction practices wherever it is found necessary with relevance to the codal provisions according to it.

***Key Words*: Seismic code, Earthquake resistant design, Non-structural component, Drifting, Collapse prevention**

1. INTRODUCTION

Seismology is the study of earthquakes and seismic waves that move through the around the earth. It is a science that deals with the world quakes and with artificially produced vibrations of the earth. The study of those vibrations by various techniques, understanding the character and various physical processes that generate them from major a part of the seismology. The building design is of G+5 floor, concerning the drift

1.1 PROBLEM STATEMENT

i. Location-Gomti Nagar, Lucknow.
ii. Earthquake Load-As per IS-1893.
iii. Type of soil-Type-2 medium soil.
iv. Average thickness of footing-Isolated footing.
v. Floors-G.F. +5 upper floors
vi. Height of building is 32m.

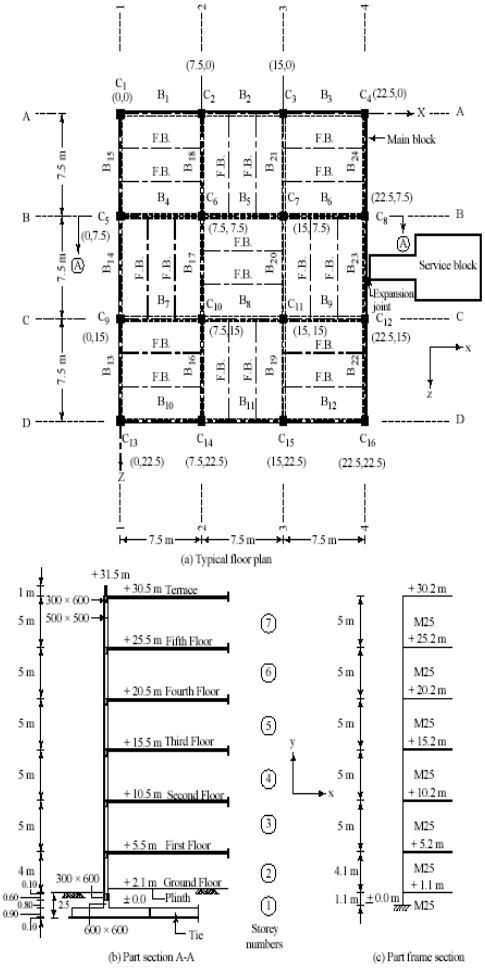

Figure 1 General lay-out of the Building.

Fig-1: General lay-out of the Building.

vii. Area of building= 22.5 x 22.5 m².

1.2 LOAD CALCULATIONS

Seismic Weight Calculation-:
Storey 7(Terrace): Total =5167KN
Storey 6, 5, 4, 3: Total=5935KN
Storey 2: Total=5694KN
Storey 1(Plinth): Total=1943KN
Seismic weight of the entire building-
= 5167+4x5935+5694+1943=36544KN
The seismic weight of the floor is the lumped weight, which acts at the respective floor level at the centre of mass of the floor.

Design Seismic Load-:

$$\left[Qi = \frac{Wihi^2 * VB/\sum}{Wihi^2}\right]\text{KN}$$

Hence response reduction factors, R=5.0
A_h = (Z/2) × (I/R) × (Sa/g)
= (0.16/2) × (1.5/5) × (1.402)
= 0.0366
W= 36544KN
V_B =0.0336×36544 =1229KN
Base shear, VB=Ah W=1508.5KN. The total Horizontal load=1508.5KN
Accidental Eccentricity-:

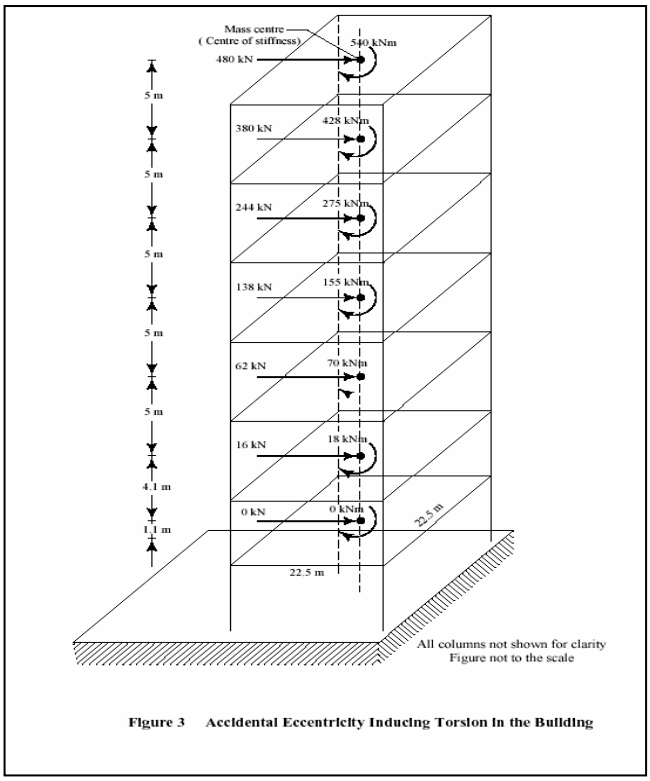

Fig-2 Accidental Eccentricity Inducing Torsion in the Building.

Result:- The storey drift in any storey due to specified design lateral force with partial load factor of 1.0, shall not exceed 0.004 times the storey height. From the frame analysis the displacements of the mass centers of various floors are obtained and are shown in Table 4 along with storey drift.

Storey	Displacement (mm)	Storey Drift(mm)
7(Fifth floor)	79.80	7.6
6(Fourth floor)	72.40	12.39
5(Third floor)	61.1	16.77
4(Second floor)	44.78	18.03
3(First floor)	26.80	17.28
2(Ground floor)	9.51	9.10
1(Below Plinth)	0.43	0.43
0(Footing Top)	0	0

Maximum drift is for fourth storey = 18.03 mm.
Maximum drift permitted = 0.004 x 5000 = 20 mm. Hence, ok.

Sometimes it may so happen that the requirement of storey drift is not satisfied. However, as per Clause 7.11.1, IS: 1893 (Part 1): 2002; "For the purpose of displacement requirements only, it is permissible to use seismic force obtained from the computed fundamental period (T) of the building without the lower bound limit on design seismic force." In such cases one may check storey drifts by using the relatively lower magnitude seismic forces obtained from a dynamic analysis.

3. CONCLUSIONS

The tasks of providing absolute seismic safety for the residents in habiting the most earthquake prone regions are far from being solved.

In the regulations adopted for implementation in India the following factors have been found to be critically imported in the design and construction of seismic resistant building.

The modifications in construction and design that have been introduced increase seismic reliability of the building and seismic safety for human life

In order to improve seismic safety of residents and to prevent huge property damage caused of earthquake it is necessary:

- ✓ To strengthen role of design and construction control by state body.
- ✓ To design and construction on seismic unfavorable sites only experts commission.
- ✓ 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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[6] STAAD.Pro is a 3D structural analysis and Design software by Bentley.

BIOGRAPHIES

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