

# A COMPARATIVE ANALYSIS AND DESIGN OF G + 5 MULTISTORIED BUILDING USING DIFFERENT METHODS

R. RAJ KUMAR<sup>1</sup>, M. MANOJ PRAVALI<sup>2</sup>

<sup>1</sup>PG Student, Department of Civil Engineering, Nova College of Engineering & Technology, Jangareddygudem, India,

<sup>2</sup>Assistant Proffesor, Department of Civil Engineering College, Nova College of Engineering & Technology, Jangareddygudem, India

\*\*\*

**ABSTRACT:-** The design process of structural planning and design requires not only imagination and conceptual thinking but also sound knowledge of science of structural engineering. In the present study G+5 (B-BLOCK), Hyderabad. There are several methods for analysis of different frames like Kani's method, cantilever method, portal method, and matrix method. In order to design them, it is important to first obtain the plan of the particular building that is, positioning of the particular rooms. Depending on the suitability; plan layout of beams and the position of columns are fixed. Thereafter, the loads are calculated namely the dead loads, which depend on the unit weight of the materials used (concrete, brick) and the live loads, which according to the code IS:456-2000 and HYSD BARS Fe415 as per IS:800-2007. Footings are designed based on the safe bearing capacity of the soil. For this purpose, frame analysis is done by limit state method and substitution frame method and the values of each design procedure are compared. The manual deign has been done by using various methods and comparative analysis is tabulated in the present investigation.

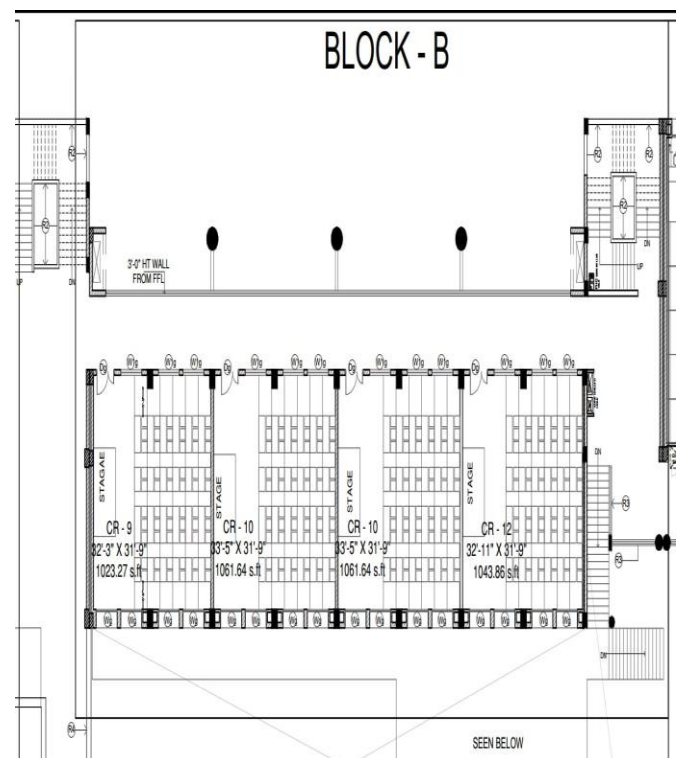
## INTRODUCTION:

A multi-story building is a building that supports two or more floors above ground. There is no formal restriction on the height of such a building or the number of floors a multi-story building may contain, though taller buildings do face more practical difficulties. Buildings are the important indicator of social progress of the county. Every human has desire to own comfortable homes on an average where one spends his two-third life time in the houses. The security civic sense of the responsibility. These are the few reasons which areresponsible that the person doutmost effort and spend hard earned saving in owning houses. Nowadays the house building is major work of the social progress of the county. Daily new techniques are being developed for the construction of houses economically, quickly and fulfilling the requirements of the community engineers and architects do the design work, planning and layout, etc., of the buildings. Draughtsmen are responsible for doing the drawingworks of building as for the direction of engineers and architects.

## STATEMENT OF THE PROJECT:

1. Salient features:
2. Utility of building : educational building
3. No of stories : G+5
4. Shape of the building : block-b
5. No of staircases : 2
6. Type of construction : R.C.C framed structure
7. Types of walls : brick wall
8. Geometric details:
9. Ground floor : 3.1m
10. Floor to floor height : 3.1m.
11. Height of plinth : 0.6m
12. Depth of foundation: 2 m
13. Materials:
14. Concrete grade : M 30,M 20
15. All steel grades: Fe415 grade
16. Bearing capacity of soil: 200 kN/m

## PLAN:



**LOADINGS:**

Types of loads on an hypothetical building are as follows.

- Vertical Loads
- Dead (gravity)
- Live (gravity)
- Snow(gravity)
- Wind (uplift on roof)
- Seismic and wind (overturning)
- Seismic (vertical ground motion).

**LOAD CALCULATIONS:**

**Dead load:**

Self weight floor finish=3.75+1=4.75 KN/m<sup>2</sup>

**Live Load:**

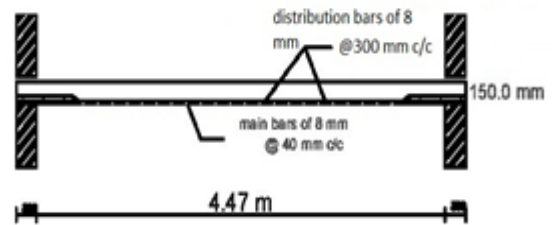
For our structure live load is taken as **5 KN/m**

Loads on columns:

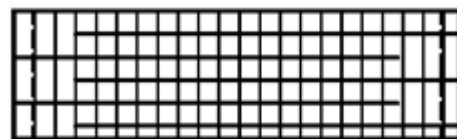
Columns	Total Load (kN)
C-1	1617.7
C-2	1580.126
C-3	1580.126
C-4	1580.126
C-5	1580.126
C-6	1580.126
C-7	1190.974
C-8	1094.605
C-9	370.48
C-10	2190.385
C-11	2253.88
C-12	937.28
C-13	2468.26
C-14	1265.63
C-15	2617.24
C-16	3321.9
C-17	3321.9
C-18	3321.9
C-19	3321.9
C-20	3321.9
C-21	2669.2
C-22	3129.3
C-23	1708.52
C-24	1615.54
C-25	1656.43

**DESIGN OF SLAB:**

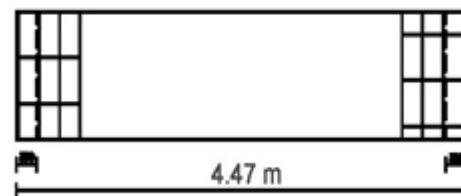
One way slab:



CROSS SECTION

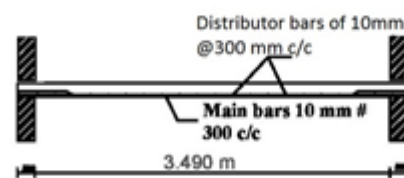


PLAN SHOWING BOTTOM REINFORCEMENT

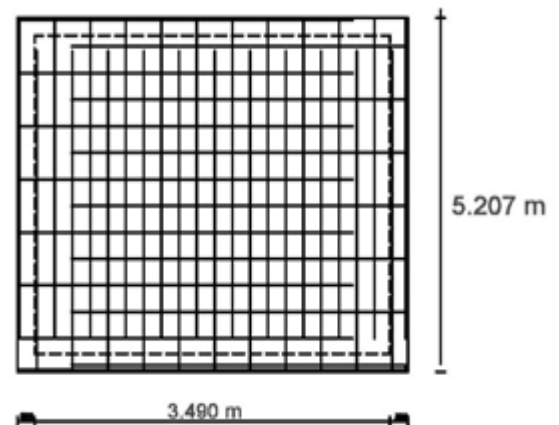


PLAN SHOWING TOP REINFORCEMENT

Two way slab:



CROSS SECTION



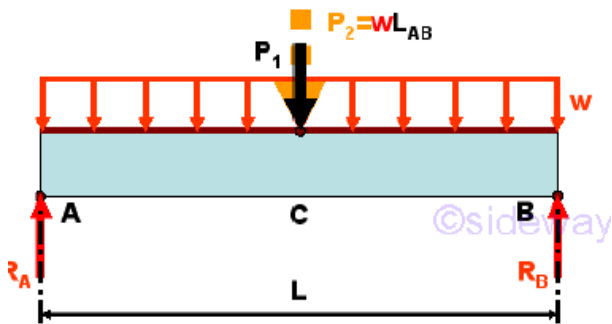
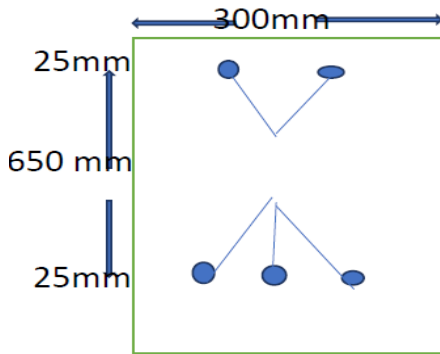
PLAN SHOWING BOTTOM REINFORCEMENT

**Beams:**

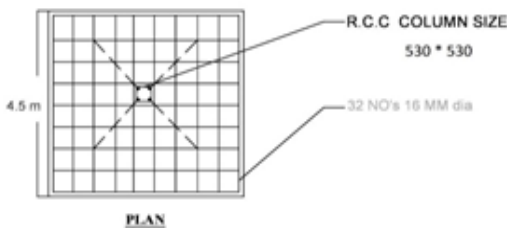
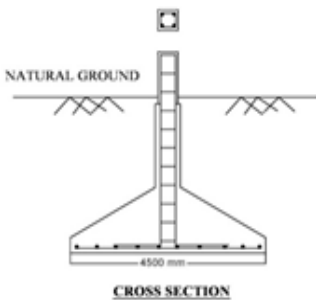
Beam dimension=300\*500

Beam dimension=230\*500

Beam dimension=300\*700



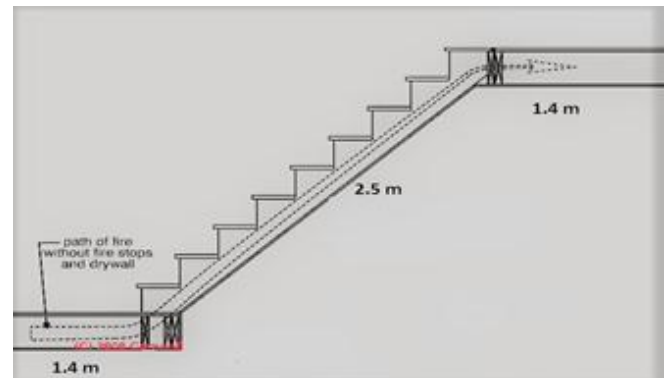
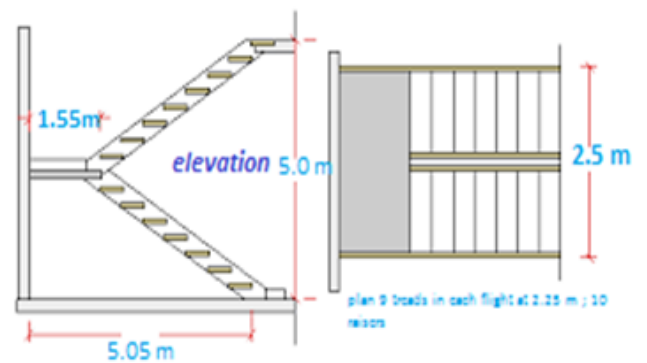
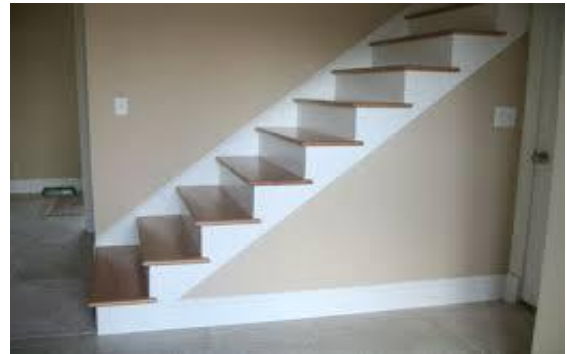
**FOOTINGS:**



**COLUMN FOOTING**

**DESIGN OF STAIR CASE:**

Dog Legged Stair Case



**Stair Case**

**DESIGN BY KANI'S METHOD:**

**Methodology Adopted:**

- A 4-storey-4-bay unsymmetrical frame structure was set as a problem frame.
- Kani's analysis was performed for vertical loading conditions.
- Same problem frame was analyzed using substitute frame method for vertical loads.
- Approximate substitute frame analysis results were then compared with those found by the accurate Kani's analysis and corresponding percentage deviations were determined.

- Substitute frame analysis was performed using some assumptions, then again the results were compared with the Kani's analysis.

**Comparison of Kani's method end moments and substitute frame method end moments**

Member	Kani's method End moments (kN)	Substitute frame method End moments (kN)	Kani's Vs Substitute frame method
AB	40.11	-54.36	26.2%
BA	83.76	72.27	13.7%
BC	-76.8	-75	2.34%
CB	77.45	75	3.16%
CD	-77.484	-77	0.62%
DC	77.483	74	4.49%
DE	-77.482	-74.79	3.47%
ED	77.481	74.79	3.47%
EF	-77.480	-74.81	3.4%
FE	77.485	74.81	3.4%
FG	-77.481	-74.81	3.4%
GF	77.480	74.81	3.4%
HG	-77.481	-74.81	3.4%
GH	77.480	75.5	2.55%
HI	-84.62	-74.91	11.4%
IH	66.1	66.7	0.89%

**CONCLUSIONS:**

Thus the building is designed as per standards. Here the procedures followed are under standards and the methods are "SUBSTITUTE FRAME METHOD & KANI'S METHOD".

As all the calculations are done manually, it is better if we use any soft-wares for the design.

EX: Stadd.pro. It is a soft-ware that also shows us errors before the completion of the analysis.

Being dependent on Manual calculations is not good all the times. For small scale residential building manual calculations are good but for large scale constructions manual are not suitable.

All the calculations are done manually and the values of both the methods are compared with each other. According to the comparison and further studies "KANI'S METHOD" is better than the "SUBSTITUTE FRAME METHOD" as it is handy and less time taking method.

The major advantages of using modern software are-

- They reduce the manual work to be done
- They increase the accuracy of values obtained
- They are easy to access
- If any errors they are displayed well before the completion of analysis
- They give compact outputs easily accessible at any point of time.

**REFERENCES:**

- Raz Sarwar Alam. Analytical Methods in Structural Engineering. Wiley Eastern Private Limited, New Delhi, India.
- Vazirani V.N. & Ratwani M.M. Analysis of Structures, Khanna Publishers, Delhi, India.
- Volokh, K.Y. (2002). On foundations of the Hardy Cross method. International Journal of Solids and Structures, Volume 39, Issue 16, August 2002, Pages 4197-4200.
- Text book "SUBSTITUTE FRAME METHOD" by
- CODE BOOK IS: 456:2000, IS: 875 (Part-1, 2, 3), SP-16.
- [http://www.iosrjournals.org/nitrkl.ac.in/2395/1/study of "substitute frame method" pdf.](http://www.iosrjournals.org/nitrkl.ac.in/2395/1/study%20of%20substitute%20frame%20method.pdf)
- Anand A.S. Theory of structures (Indeterminate structural analysis), Satya Prakashan, 1989.