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Analysis and Housing Design (G+4) Using E-Tabs

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Abstract:

Structural engineers to save time in growing specialty markets in order to combat this are very important. It's a sequel to the analysis and design of multi-storey building of e-processing software package tab is trying to use. And all possible loading process that is being seen in a multi-storey building structure for analysis of all possible loading conditions, which is protected against, Kanye such methods, and methods of cantilever, through the portal, and as a way to analyze various matrix framework there are several ways. And analysis +6 floor of a multi-storey residential building G is associated with the current project. Goes dead load and live load is applied to the design of the columns and beams, and such basic capabilities, and Microsoft Excel with other major programs as the Data Exchange as well as its predecessors, and to dispel compotators New features with the feet are obtained. We e-Tab A lot of time is very accurate and can save design, which is a very powerful tool that conclusion. So it packages of electronic signals are suitable for the design of multi-storey building, which eventually. Planning and construction of the main objective of such an assembly, privacy, side, likely, and furniture is needed, and communication systems for the construction of various principles to ensure riding, and riding ease and comfortable accommodation facility needed can, so that provision of sanitation facilities.

I. INTRODUCTION:

Human existence food, clothing and shelter is needed foundation. Man's age and always seek to improve their standard of living. His point of trying to provide economic and efficient asylum. Shelter and basic controls used, and security, give a sense of responsibility, and showed the man's social status. Every man must be fun like organizing a peaceful atmosphere, and this unit to a place of residence, such as a place to relax, located in a safe and comfortable place and enjoyable living thought and attention required Being placed in is achieved. A Peaceful environment.

Safety from all natural source & climate conditions General facilities for community of his residential area. The engineer has to keep in mind the municipal conditions, building bye laws, environment, financial capacity, water supply, sewage arrangement, provision of future, aeration, ventilation etc., in suggestion a particular type of plan to any client. In order to compete in the ever growing competent market it is very important for a structural engineer to save time. As a sequel to this an attempt is made to analyze and design a multistoried building by using software package e-tabs. For analyzing a multi storied building one has to consider all the possible loadings and see that the structure is safe against all possible loading conditions. The design process of structural planning and design requires not only imagination and conceptual thinking but also sound knowledge of science of structural engineering besides the knowledge of practical aspects, such as recent design codes, bye laws, backed up by ample experience, intuition and judgment. The purpose of standards is to ensure and enhance the safety, keeping careful balance between economy and safety.

1.1. DEMAND OF HOUSES

The house is the first unit of the society and it is the primary unit of human habitation. The house is built to grant the protection against wind, weathers, and to give insurance against physical insecurity of all kinds.

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The special features of the demand for housing consist of in its unique nature and depend on the following factors.

- Availability of cheap finance & Availability of skilled labors.
- Availability of transport facility & Taxation policy on real estates.
- Cost of labors & material of construction
- Predictions of future demand & Rate of interest on investment.
- Rate of population growth and urbanization.
- Supply of developed plots at reasonable prices.

1.2. SELECTION OF PLOT AND STUDY

Selection of plot is very important for buildings a house. Site should be in good place where there community but service is convenient but not so closed that becomes a source of inconvenience or noisy.

The factor to be considered while selecting the building site is as follows**:-**

- Agriculture polytonality of the land & Access to park & play ground.
- Availability of public utility services, especially water, electricity
- Contour of land in relation the building cost. Cost of land.
- Ease of drainage & sewage disposal.
- Location with respect to school, collage & public buildings.
- Transport facilities & Wind velocity and direction

1.3 INTRODUCTION TO PRINCIPLES OF PLANNING

The basic of building of is to range all the units a building on the floors according to their functional requirement making best use of the space available for the building the planning is governed by several factors such as climatic conditions of the location, accommodation requirements local bylaws etc.

ASPECT

Aspect means the method of arrangements of doors and windows in external walls, of a residential building. This enables the occupation to enjoy the natural gifts. Such as sunshine, breeze, scenery etc. Different rooms in building needs different aspect.

Living room

most part of the living room should be towards north. It so because north aspect receives natural north lights which is used in most of day times.

Kitchen

Eastern aspect to admit morning suns to refresh and purity me the air.

Study room

North aspect this make more light to enter and will be diffused which results in uniform distribution of light.

Bed room

North aspects or south west aspect is very good for bed rooms.

PROSPECT

Prospect in its proper sense is the impression that a person viewing from out site likely to get. Prospect must not only make outer appearance attractive but also maintain qualities, such as cheerfulness, security. One must feel the sense of pride in having a house, which is pleasing in appearance and reflecting its individuality.

1.3 FURNITURE REQUIRMENTS

Furniture is the functional requirement of a living room. Living room, drawing room, kitchen, class room, laboratory room, office room etc. Will have their own requirements.

ROOMINESS

In planning a building an architect deals with length.Width and height of rooms. The feeling of

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space i.e. whether it is sufficient less or more depends upon suitable and adequate proportions of length.

A square room is found to be inconvenient as compared to rectangular room of the same area from utility point of view. Hence the length to width ratio should be between 1.2 to 1.5 less width with more lengths causes tunnel effect.

GROUPING

Grouping means setting different rooms of a building accordance to their inter relationship of the spaces should be such that it is a feeling of invitation and transition rather than feeling of abrupt change. For examples in residential building, dining room should be close to the kitchen. At the same time kitchen should be kept away. From main living room to avoid smoke and smells.

CIRCULATION

Access or internal through fares between rooms of the same floor (or) between different floors in known as circulation passages, corridors, halls and lobbies serve the purpose of horizontal circulation. Circulation between rooms of the same floor is known as horizontal circulation.

PRIVACY

In all building some sort of privacy is essential feature. In residential building in particular optimum privacy has to secure in planning. The internal privacy means, screening interior or one room from other room's parts. The extent of privacy of a building from the street lanes and neighboring buildings depends on its function. Disposition of doors and windows greatly affect internal privacy. Lobbies and screens also provide internal privacy toilets lavatories.

SANITATION

Sanitation includes light, cleanliness, ventilation and sanitary conveniences.

a. Lighting

Lighting is required to provide sufficient illumination in the building and to keep hygiene. Lighting may be natural or artificial. Natural lighting is achieved by properly positioning the adequate number of windows to admit the required amount of sum inside the room. Good day lighting means not too much light but sufficient light free from glare.

b. Ventilation

Ventilation is system of supplying (or) removing air by natural or mechanical means to or from any enclosed space to create and maintain comfortable conditions.

c. Sanitary Convenience

Water Closet and bathrooms should be provided }1'ith glazed tiles so that they can be deemed regularly sanitary convenience include W C. Urinals, Bathrooms and their number should be sufficient in relation to the occupant load .

ELEGANCE

Elegance is related to the effect produced by elevation. Which depends upon the proportion of width height of doors and windows choice of materials will also affect the elegance of building. The other factors are:

a. The visualization of elevation should always be kept in mind while preparing plan.

b. Architectural design and composition should be studied in detail for achieving success in creating an elegant structure.

c. Selection of site for the building greatly affects the elegance.

d. A slight adjustment or modifications in the elevation through the requirements of the plan are maintained will definitely improve the elegance of building.

ECONOMY

The economy may not be a principle of planning but definitely a factor affects in it. Economy restricts the liberties which otherwise would have been enjoyed by the planner to .fit the proposed scheme omissions in the original plan have to be affected. But economy

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should not affect the utility and strength of the structure.

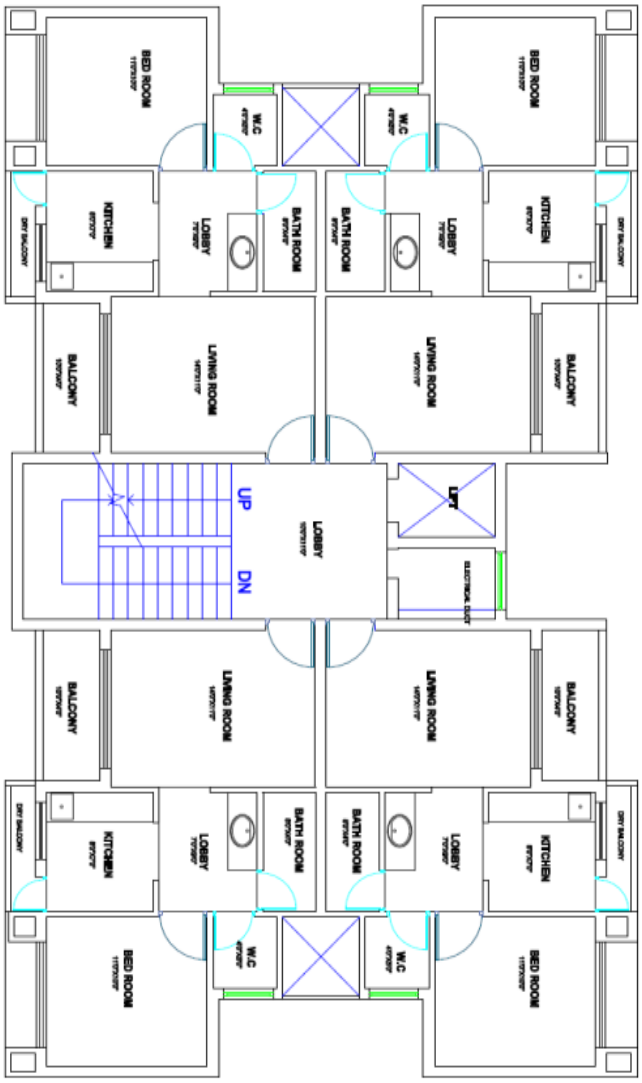

FIG 1: PLAN

II.METHODOLOGIES

Reinforced concrete structures can be designed by using one of the following design methodologies.

1) Working Stress Method (WSM)
2) Ultimate Load Method (ULM)
3) Limit State Method (LSM)

Working stress method used over decades is now practically out dated. It is not used at all in many advanced countries of the world because of its inherent drawbacks. The latest I.S. Code 456:2000 gives emphasis on Limit State method which is the modified version of Ultimate load method. It is a judicious amalgamation of WSM and ULM removing all drawbacks of both methods but maintaining their good points. It is also based on sound scientific principles backed up by 25 years of research. The limit state method has proved to have an edge over the working stress design from the view point of economy. This revision incorporates a number of important changes. The major thrust in the revision is on the following lines: In recent years, durability of concrete structures has become the cause of concern to all concrete technologists. This has led to the need to codify the durability requirements world over. In this revision of the code, in order to introduce in-built protection from factors affecting a structure, earlier clause on durability has been elaborated and a detailed clause covering different aspects of design of durable structure has been incorporated.

a). All the three grades of ordinary Portland cement, namely 33 grade, 43 grade and 53 grade and sulphate resisting Portland cement have been included in the list of types of cement used (in addition to other types of cement).

b). The permissible limits for solids in water have been modified keeping in view the durability requirements.

c). The clause on admixtures has been modified in view of the availability of new types of admixtures including super plasticizers.

d). Grades of Concrete', grades higher than M 40 have been included.

e). Durability clause has been enlarged to include detailed guidance concerning the factors affecting durability. The table on 'Environmental Exposure Conditions' has been modified to include 'very severe' and 'extreme' exposure conditions. This clause also covers requirements for shape and size of member, depth of concrete cover, concrete quality, requirement against exposure to aggressive chemical and sulphate

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attack, minimum cement requirement and maximum water cement ratio, limits of chloride content, alkali silica reaction, and importance of compaction, finishing and curing.

f). A clause on 'Quality Assurance Measures' has been incorporated to give due emphasis to good practices of concreting.

g). values of span to effective depth to control the deflection of flexural member has been modified.

III. ANALYSIS RESULTS

This chapter provides analysis results.

3.1 Story Max/Avg Displacements

Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Story4	ex 1	X	22	20.1	1.094638
Story3	ex 1	X	16.6	15.1	1.100917
Story2	ex 1	X	10.7	9.6	1.109604
Story1	ex 1	X	4.4	4	1.111559
Base	ex 1	Y	0	0	
Story4	ex 2	X	21.2	19.9	1.064535
Story3	ex 2	X	16	14.9	1.070054
Story2	ex 2	X	10.2	9.5	1.078475
Story1	ex 2	X	4.2	3.9	1.082166
Base	ex 2	Y	0	0	
Story4	ex 3	X	22.8	20.3	1.124111
Story3	ex 3	X	17.3	15.3	1.131083
Story2	ex 3	X	11.1	9.7	1.139971
Story1	ex 3	X	4.6	4	1.140222
Base	ex 3	Y	0	0	
Story4	ey 1	Y	7	6.7	1.038121
Story3	ey 1	Y	5.3	5	1.044969
Story2	ey 1	Y	3.3	3.1	1.054405
Story1	ey 1	Y	1.2	1.2	1.063878
Base	ey 1	Y	0	0	
Story4	ey 2	Y	8.8	6.7	1.302484
Story3	ey 2	Y	6.7	5.1	1.317406
Story2	ey 2	Y	4.2	3.1	1.338865
Story1	ey 2	Y	1.6	1.2	1.362544
Base	ey 2	Y	0	0	
Story4	ey 3	Y	8.2	6.7	1.228464
Story3	ey 3	Y	6.2	5	1.230143
Story2	ey 3	Y	3.8	3.1	1.233397
Story1	ey 3	Y	1.4	1.1	1.238889
Base	ey 3	Y	0	0	
Story4	wx	X	0.5	0.4	1.096451
Story3	wx	X	0.4	0.3	1.104828
Story2	wx	X	0.3	0.2	1.114456
Story1	wx	X	0.1	0.1	1.114816
Base	wx	Y	0	0	
Story4	wy	Y	0.3	0.3	1.044029
Story3	wy	Y	0.2	0.2	1.052612
Story2	wy	Y	0.2	0.1	1.063828
Story1	wy	Y	0.1	0.1	1.074133
Base	wy	Y	0	0	
Story4	specx Max	X	18.7	15.9	1.176911
Story3	specx Max	X	14.7	12.4	1.187477
Story2	specx Max	X	9.9	8.3	1.198292
Story1	specx Max	X	4.3	3.6	1.194781
Base	specx Max	Y	0	0	
Story4	specy Max	Y	6.2	5.9	1.052448
Story3	specy Max	Y	4.8	4.5	1.047987
Story2	specy Max	Y	3	2.9	1.043261
Story1	specy Max	Y	1.2	1.1	1.040026
Base	specy Max	Y	0	0	
Story4	udspecx Max	X	28.2	23.9	1.180957
Story3	udspecx Max	X	22.2	18.6	1.190535
Story2	udspecx Max	X	14.9	12.4	1.200416
Story1	udspecx Max	X	6.4	5.4	1.196006
Base	udspecx Max	Y	0	0	
Story4	udspecx Min	X	27.9	23.8	1.172848
Story3	udspecx Min	X	22	18.6	1.184409
Story2	udspecx Min	X	14.8	12.4	1.196162
Story1	udspecx Min	X	6.4	5.4	1.193552
Base	udspecx Min	Y	0	0	
Story4	udspecy Max	Y	7.4	7.1	1.036163
Story3	udspecy Max	Y	5.9	5.7	1.035987
Story2	udspecy Max	Y	3.9	3.8	1.03427
Story1	udspecy Max	Y	1.6	1.5	1.034049
Base	udspecy Max	Y	0	0	
Story4	udspecy Min	Y	11.2	10.5	1.063483
Story3	udspecy Min	Y	8.4	7.9	1.056647
Story2	udspecy Min	Y	5.2	4.9	1.050161
Story1	udspecy Min	Y	1.9	1.8	1.044927
Base	udspecy Min	Y	0	0	
Story4	udlspecx Max	X	22.6	19.1	1.181749
Story3	udlspecx Max	X	17.8	14.9	1.19115
Story2	udlspecx Max	X	11.9	10	1.20088
Story1	udlspecx Max	X	5.1	4.3	1.196309
Base	udlspecx Max	Y	0	0	

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Story	Load Case/Combo	Direction	Maximum mm	Average mm	Ratio
Story4	udlspecx Min	X	22.3	19	1.172052
Story3	udlspecx Min	X	17.6	14.9	1.183791
Story2	udlspecx Min	X	11.9	9.9	1.195696
Story1	udlspecx Min	X	5.1	4.3	1.193248

3.2. PLACING OF REINFORCEMENT

*Spacing =0.785*122*1000/2215 = 55 mm*
Provide 12 mm dia @ 55 mm c/c in both directions.

3.2.1. ONE WAY SHEAR

The critical section is taken at distance d away from the face of column

Shear force

$$Vu = 298 \times 2 \times \left[\left[\frac{2-0.23}{2}\right] - 0.210\right]$$

Vu=400 KN

Nominal Shear stress $\tau_v = \frac{V_u}{bd}$

$$\tau_v = \frac{400x10^3}{2200 \text{ x } 204} = 0.89 N/mm^2$$

Shear strength of M20

$$\tau_c = 0.25 \sqrt{fck} = 0.25X20 = 1.11$$

$$\tau_v < \tau_c$$

3.2.2. Shear two way action

Shear force *Vu =298 [4-(0.23+0.60) 2]*
Vu = 986 KN

Nominal shear stress $\tau_v = \frac{V_u}{bd}$

$$= \frac{986x10^3}{4(230+600)x204}$$

$=1.45 \text{ N/mm}^2$

Shear strength of M15 concrete

$$\tau^1_c = k_s X \tau_c$$

$$K_s = (0.5+\beta_c)$$

$$\beta_c = \frac{\text{length of shorter side of column}}{\text{length of longer side of column}}$$

$=0.23/0.60=0.38$

$K_s = 0.5+0.38=0.88 < 1$

$K_s = 1$

$$\tau^1_c = \tau_c = 0.25 \text{ x } \sqrt{f_{ck}}$$

$=1.11 > 0.38 N/mm^2$ (O.K)

Fig: footing details

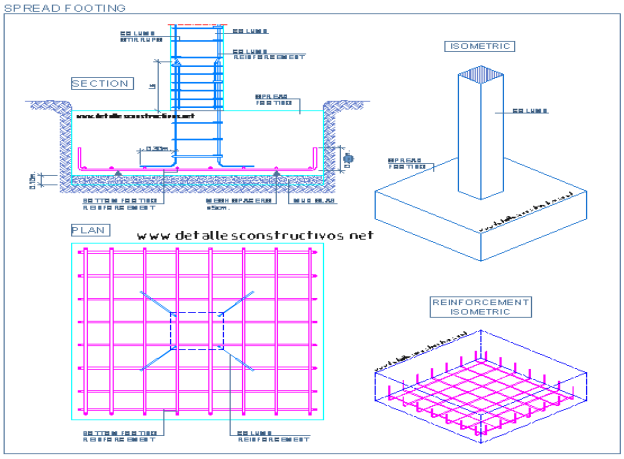

Fig: footing reinforcement

IV.CONCLUSION

Based on the planning, analysis, design and estimation of residential multi storied building (g+6) the following conclusions are made.

1. It is opinion that building layout and design has to follow the nature to some extent especially for the sun light and wind directions.

2. Geotechnical engineering analysis cannot be neglected for tall buildings. The geotechnical engineer needs to be consulted to do soil sampling analysis,

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ground water depth and mainly for the estimation of soil bearing capacity.

The soil bearing capacity that is used in this project is 300 KN/m2.

3. The selected site for G+6 residential building should be in areas where all types of amnesties are available.

4. In the design IS 456-200, sp16 is used for the design of beam, column, slab, footing calculations respectively.

5. Limit state design is the best approach for designing the building.

6. In the design various types of slabs, beams and columns are encountered but only one type of slab, beam and column are designed.

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9.2 shear strength.
9.3 give flexural strength.
9.6 give openings in shear walls.
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