Design of Multistoried Building

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Abstract- *Structural planning and designing is an art and science if designing with economy, elegance, serviceability and a durable structure. The entire process of structural planning and designing requires not only imagination and conceptual thinking, but also sound knowledge of science of structural engineering besides knowledge of practical aspects, such as relevant design codes and bye-laws backed up by sample experience. The process of design commence with planning of a structure primarily to meet the functional requirements of the user. The requirements proposed by the client may not be well defined as he is not aware of various implications involved in the process of planning and design. The functional requirements and aspects of aesthetics are looked into normally by the architect while the aspects of safety, serviceability, durability and economy of the structure are attend by structural designer.*

Our project involves the design of building frames and design of structural elements. This project contains the design of a Multi Storied Building consists halls, bed rooms, kitchen, living rooms, etc. Specifications should be providing for individual structural components using codes.

I. INTRODUCTION

1.1 General

Necessity is the main reason to invent, due to day to day increase of population and migration of people from rural areas to urban areas results in scarcity of land in the cities. As Engineers we have to accommodate more number of people in the less space with their minimum requirements. The idea was developed to grow in vertical manner. The idea derived as the apartment system and Sky scrapers.

Functional designing of the building has become more important and requirements of buildings vary from building to building. Hence it is essential to finalize the program with reference to the people who will be using the buildings. So it is necessary that every Civil Engineer knows the basic principles involved in design of R.C.C. structures.
R.C.C Framed buildings are units of column and beams interconnected with each other so as to form a grid of beams and girders in orders to carry various floor loads, the slabs are built monolithically.

Large –scale industrialization and too much of land cost India have resulted in a vast expansion in the program, a stage have been reached how where in multistoried construction is essential and inevitable. A common concept in our country is about 5-6 stories. In framed structure several construction activities can be carried simultaneously, like construction of frame work of the upper floors and finishing the lower floors simultaneously. Thus
speed in construction is achieved. Now a day's more of the framed structures can be seen then load bearing structures, because of easy and speed in construction. Now our aim is to provide accommodation for group of people for living.

1.2 BUILDING BYE LAWS & REGULATIONS

A BYE law is a local law framed by subordinate authority building codes are defined as 'BYE LAWS' under standard specifications for design. Grant minimum safe guards to the workers during constructions.

1. To the health and comfort of users
2. To provide enough safety to the public in general

The laws relating to the urban development, town planning and construction of buildings in Andhra Pradesh and is governed by the AP. Urban areas development act 1975, AP town planning act 1970, HYD MUNICIPAL CORPORATION ACT.

1.3 STRUCTURAL PLANNING:

Structural planning is first stage in any stage in any structural design. It involves the determination of appropriate form of structure, material to be used, and the structural system, the layout of its components and the method of analysis. As the success of any engineering project measured in terms of safety and economy, the emphasis today is being more on economy. Structural planning is the first step towards successful structural design.

1.4 PRINCIPLES OF PLANNING:

The basic objective of planning of buildings is to arrange all the units of a building on all floors and at level according to their functional requirements making best use of the space available for a building. The shape of such a plan is

governed by several factors such as climatic conditions, site location, accommodation requirement, local by-laws, surrounding environment, etc. In spite of the certain principles or factors, which govern the theory of planning, are common to all buildings of all classes intended to be used for residential purposes.

1. Aspect
2. Prospect
3. Privacy
4. Grouping
5. Roominess
6. Furniture Requirement
7. Sanitation
8. Flexibility
9. Circulation
10. Elegance
11. Economy
12. Practical Considerations

1.5 STRUCTURAL DESIGINING

Structural design for framed R.C.C structure can be done by three methods:

a. working Stress Methods
b. Ultimate Strength Methods
c. Limit State Method.

II. LITERATURE RIEVIEW

RECONNANISSANCE SURVEY

The following have been observed during the reconnaissance of the site.

a) Site located at Rajahmundry.
b) The site is connected by Morumpudi road from the nearest main road i.e. road connections Morumpudi and Venkateswara Nagar.
c) The area of the site is limited to approximately 622.85 sq.mts.and plinth area is flat 1&3 328.57sq.mts and flat 379.48 sq.mts whose ends can be clearly distinguished.
d) The site is very clear land without any dry grass and other than plants over the entire area.
e) No leveling is required since the land is almost uniformly leveled.
f) The soil can be classified as hard dry clay soil.

LOCATION OF THE SITE

The site is located at Venkateswara Nagar near to the Morumpudi Junction, Rajahmundry.

AREA OF THE SITE

The area of the site is 622.85 sq.mts.

NATURE OF THE SOIL

It has hard dry clay and the bearing capacity of soil is 150 KN/m^2.

SPECIFICATIONS

Structure :R.C.C Framed structure
Brick Walls :230mm outer &115mm inner brick walls.
Main doors :Teak frame with teak veneer doors.
Other doors :Non- teak frame with mounded flush doors.
Windows :Hardwood windows with safety grills 4 mm pin headed glass.
Flooring :All rooms with quality vitrified tiles.
Kitchen :Cooking platform topped with black granite and 600mm height tiles dado above platform.
Toilet :Anti skid ceramic flooring & ceramic tiles dado upto 1800mm with one IWC & one EWC commode.
Paintings :Internal-2 coats of lump sum finish with plastic emulsion paints. Enamel painting 2 coats for wood work and grills.
Electrical :Concealed PVC pipes and copper wiring with adequate points for light, fans, T.V and telephone with modular switches.
Plumbing :All UPVC pipe lines and CPVC pipe line for hot water.
Lift :6 passengers standard make lift.
Water supply :24hrs water availability.

III. DESIGN

3.1 Slab details

Along short span: 8 mm dia @ 300 mm c/c
Along long Span: 8 mm dia @ 300 mm c/c
Edge strip reinforcement: 6 mm dia @ 240 mm c/c
Torsion reinforcement: 6 mm dia @ 300 mm c/c
Depth of Slab is 200 mm

r = $\frac{ly}{lx}$	Moment in KN/m
1.01	Short span At supports = 3.09 At mid span = 2.31 Long span At supports = 3.09 At mid span = 2.31
1.03	Short span At supports = 3.40 At mid span = 2.6 Long span At supports = 3.32

	At mid span = 2.52
1.13	Short span At supports = 5.24 At mid span = 3.96 Long span At supports = 4.31 At mid span = 3.26
1.19	Short span At supports = 4.76 At mid span = 3.56 Long span At supports = 3.67 At mid span = 2.78
1.24	Short span At supports = 4.26 At mid span = 3.19 Long span At supports = 3.10 At mid span = 2.32
1.25	Short span At supports = 2.92 At mid span = 2.21 Long span At supports = 2.08 At mid span = 1.56
1.33	Short span At supports = 3.99 At mid span = 3.08 Long span At supports = 2.66 At mid span = 1.99
1.39	Short span At supports = 7.33 At mid span = 5.47 Long span At supports = 4.30 At mid span = 3.25
1.53	Short span At supports = 5.21 At mid span = 3.96 Long span At supports = 3.09 At mid span = 2.31
1.54	Short span At supports = 2.29 At mid span = 1.74 Long span At supports = 1.36 At mid span = 1.02
1.87	Short span At supports = 2.83
	At mid span = 2.6 Long span At supports = 1.57 At mid span = 1.19

V. CONCLUSION

- ✓ While we designing this project we got the knowledge that, there is difference between constructions of structure theoretically and practically. In practical method we design the structure from the bottom level on words like:
  Footing → Columns → Beams → Slabs
  But in the theoretical method we design the structure from superstructure like:
  Slabs → Beams → Columns → Footings

- ✓ The loads in the slabs will be depends on the ratio of longer span to shorter span of panels. These slab loads are distributed to beams and beam to columns and columns to footings. We designed to total number of slabs in this project are 31.

- ✓ In design of beams we designed total no. of beams are 69. They are represented by RB-1, RB-2, RB-3, CB, with respected dimensions are: 230 x 230; 230 x 450; 230 x 550; 230 x 350 mm with provided suitable reinforcement for them.

- ✓ Coming to the columns we designed 52 columns for each floor by grouping them by C-1, C-2, C3, having respected dimensions are: 230 x 230; 230 x 381; 230 x 458 mm, provided of suitable reinforcement.

- ✓ While designing the footings we calculated entire load how it will carried out. In this project we designed 52 footings with suitable reinforcements. These footings are represented by F-1, F-2 F-3, having dimensions respectively 2000 x 2000; 2500 x 2500; 2800 x 2800 mm.

- ✓ For design of stair case having length approximately 3.69 m and having suitable thread and rises and provided with special and suitable reinforcement for them.

Further Scope:

This Project will have a scope to extend up to G-5 floors extra without any complications. This project has a further scope to design the structure for EARTHQUAKE Resistance and Wind load. Finally we declare that this insertion of our work is fully satisfactory regarding all provisions of IS Codes as per safety guidelines prescribed.

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