A PROJECT REPORT ON ANALYSIS AND DESIGN OF COMMERCIAL BUILDING (G+4) USING STAADPro

[1]Mr. MOHD IBRAHIM, [2] MOHAMMAD ABDUL RIZWAAN, [3] MIRZA FAIYYAZ ALI BAIG, [4] SIRAJUDDIN MOHAMMED SIDDIQUI, [5]FASIH MOHAMMED BILAL

[1]Assistant Professor (CIVIL), Deccan College Of Engineering & Technology, Hyderabad, Telangana

[2,3,4,5]UG Scholar (CIVIL), Deccan College Of Engineering & Technology, Hyderabad, Telangana

ABSTRACT

Proper planning and scheduling is very important in construction project for reducing and controlling delays of the project. Substantial amount of time, money, sources are wasted each year in construction industry, due to improper planning and scheduling. With globalisation the construction have become vast and complex. Planning of such project requires huge amount of paper work which can be reduce with the help of projectplanning software. Providing good planning, proper organization, sufficient flow of resources to a project cannot be automatically achieved the desired result. The warning mechanism must be present which can alert the organization about its impossible success and failure throughout the project. The main objective of the study are to plan , schedule, and track a residential project with the help of primavera software, study the result generated , it is possible to suggest which method is suitable for the selected residential project. Also, recommend measures to the organization for enhancing their project planning skills for similar project in future. This project is a Commercial building G+4 floor of rectangular shape RCC framed structure with the total area of 996.5 Sq.Mtr. the height of the floor is 3.6m. In this project work, we have analyzed the building frame using STAADPro program and designed the RCC structural elements by Limit State method of Design

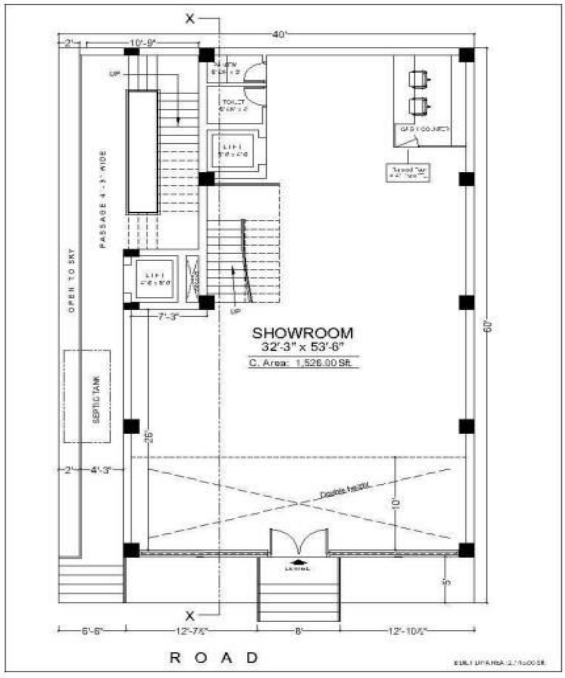
1.INTRODUCTION

It cannot be over emphasized that the present housing accommodation in India is not on y unsatisfactory but also likely to worse in future. Inadequate housing naturally retards the growth and development of the country. Housing as presently understood is no longer a mere covered roof for every person but should form an integral part of a social unit, based on the principle of neighborhood and community. The modern concept of housing deems primarily as a biological institution to serve the functions of reproduction, nutrition and growth.

Need for Multi-Storied Housing: -

The rapid industrial growth and population explosion have given rise to acute housing shortage, especially in urban and metropolitan areas. High land costs and the need for proximity between the house and work space in the view of the rising transport costs, have made multistoried buildings an appropriate solution to overcome the housing problem to some extent. High rise buildings have their own limitations to provide a comfortable, healthy accommodation. Even so, perhaps they provide a reasonable satisfactory solution. The construction of the high buildings has been possible because of the recent advances in design and construction technology coupled with innovative materials for providing services. Especially reinforced concrete construction has established the most popular technique for high rise buildings.

COLUMN ORIENTATION AS PER THE ARCHITECTURE CLIENT



2. STRUCTURAL PLANNING

Structural planning is first 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 an engineering project is 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.

Structural Planning of Reinforced Concrete Framed Building

Structural Planning of R.C framed building involves determination of:

COLUMN POSITIONS

BEAM LOCATIONS

SPANNING OF SLABS

LAYOUT AND PLANNING OF STAIRS

TYPE OF FOOTING

DESIGN OF SLABS

Slabs are plain structural members forming floors and roofs of buildings whose thickness is quite small compared to their dimensions. These carry load primarily by flexure and are in various shapes such as square, rectangular, circular and triangular in buildings, tanks etc inclined slabs may be used as ramps for multi storeyed as per parking. A staircase is considered to be an inclined slab.

Slab may be supported by beams or by walls and may be simply supported or continuous over one or more support. When the ratio of the to the width of a slab is more than 2 then most of the load is carried by the shorter span, in such case it acts as one-way slab. In case the ratio is less than 2 then it is called a two way slab, which is further classified as restrained and simply supported slabs. The various other types of the slabs are flat slabs, which rest directly on columns with beams and grid floors and ribbed slabs.

The thickness of the reinforced concrete slabs ranges from 75mm to 300mm. Slabs are designed just like beams keeping the breadth of slab as unity depending on the system of units. Thus the total slab is assumed to be consisting of strips of unit width, compression reinforcement is used only in exceptional basis in the slab. Shear stress in a slab are very low and hence shear reinforcement is never provided and if necessary it is preferred to increase the depth of the slab to reduce the stress than providing the reinforcement.

Temperature reinforcement is provided at right angles to the main longitudional reinforcement. The design of the slab is in accordance with the code IS-456 2000. In design of the slab the following assumptions are made :

M20 Concrete and Fe550 steel is used both for design and execution purpose.

The overall depth of the slab is restricted to 125mm with a clear cover of 20mm.

The main reinforcement consists of tar steel bars and temperature.

The total depth of the section is obtained from the maximum bending moment of all moments on the span.

3. Analysis of structure

The primary function of a structure is to receive loads at certain points and transmit them to some other point. In performing this primary function the structure develops internal forces in its component members known as structural elements. It is the duty of the structural engineer to perform their functions adequately. The inadequancy of one or more structural element may lead to malfunctioning or even collapse of the entire structure. The object of structural analysis as well as those of the entire structural system. The safety and proper functioning of the structure can be ensured only through a thorough structural analysis. The importance of proper structural analysis cannot, therefore, be over emphasized.

A systematic analysis of structural system can be carried out by using matrices. The matrix approach for the solution of structural problems is also eminently suitable for a solution using modern digital computers. Hence the advantage of using the matrix approach for large structural problems is evident.

By using matrix approach, the structural analysis can be performed in two methods:

Flexibility method

Stiffness method

In this project, the frames have been analyzed by using StaadPro., which uses the stiffness method for analysis of structure.

Staad pro, over the years, has developed to become the world's most popular and powerful structural engineering software. StaadPRo features a state-of-the-art user interface, visualization tools, and seismic analysis capabilities. From model generation, analysis and design to visualization and result verification.

StaadPro is the choice of the design professionals around the world for the analysis and design of steel, concrete, composite, timber, aluminum and cold-formed steel structures.

4. DESIGN OF SLABS

(One- way & Two-way slabs)

Slabs are plain structural members forming floors and roofs of buildings whose thickness

is quitesmall compared to their dimensions. These carry load primarily by flexure and are in various shapes such as square, rectangular, circular and triangular in buildings, tanks etc inclined slabs may be used as ramps for multi storeyed as per parking. A staircase is considered to be an inclined slab.

Slab may be supported by beams or by walls and may be simply supported or continuous over one or more support. When the ratio of the to the width of a slab is more than 2 then most of the load is carried by the shorter span, in such case it acts as one-way slab. In case the ratio is less than 2 then it is called a two way slab, which is further classified as restrained and simply supported slabs. The various other types of the slabs are flat slabs, which rest directly on columns with beams and grid floors and ribbed slabs.

The thickness of the reinforced concrete slabs ranges from 75mm to 300mm. Slabs are designed just like beams keeping the breadth of slab as unity depending on the system of units. Thus the total slab is assumed to be consisting of strips of unit width, compression reinforcement is used only in exceptional basis in the slab. Shear stress in a slab are very low and hence shear reinforcement is never provided and if necessary it is preferred to increase the depth of the slabto reduce the stress than providing the reinforcement.

Temperature reinforcement is provided at right angles to the main longitudional reinforcement. The design of the slab is in accordance with the code IS-456 2000. In design of the slab the following assumptions are made :

M20 Concrete and Fe550 steel is used both for design and execution purpose.

The overall depth of the slab is restricted to 125mm with a clear cover of 20mm.

The main reinforcement consists of tar steel bars and temperature.

The total depth of the section is obtained from the maximum bending moment of all moments on the span.

5. ANALYSIS OF STRUCTURE

Analysis of structure

The primary function of a structure is to receive loads at certain points and transmit them to some other point. In performing this primary function the structure develops internal forces in its component members

known as structural elements. It is the duty of the structural engineer to perform their functions adequately. The inadequancy of one or more structural element may lead to malfunctioning or even collapse of the entire structure. The object of structural analysis as well as those of the entire structural system. The safety and proper functioning of the structure can be ensured only through a thorough structural analysis. The importance of proper structural analysis cannot, therefore, be over emphasized.

A systematic analysis of structural system can be carried out by using matrices. The matrix approach for the solution of structural problems is also eminently suitable for a solution using modern digital computers. Hence the advantage of using the matrix approach for large structural problems is evident.

By using matrix approach, the structural analysis can be performed in two methods:

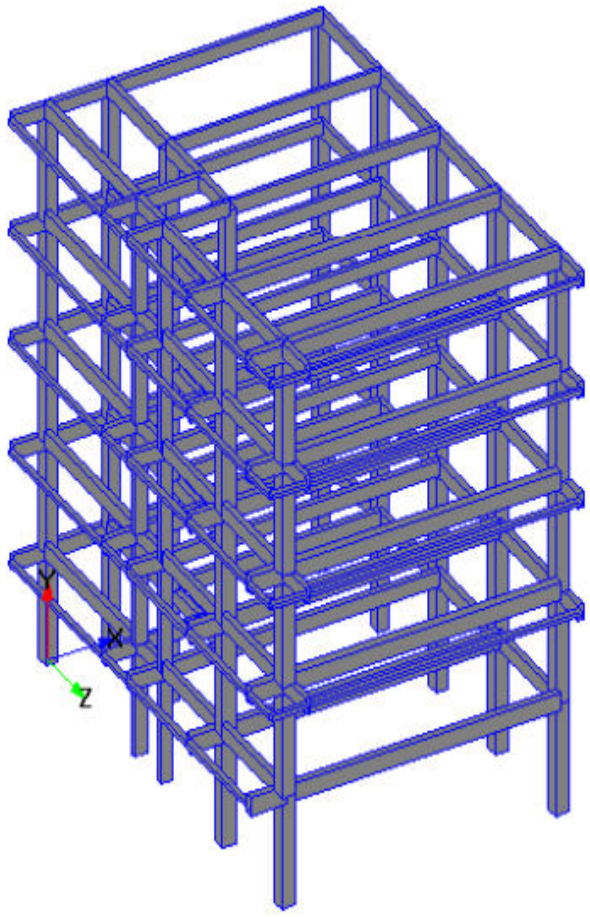
Flexibility method

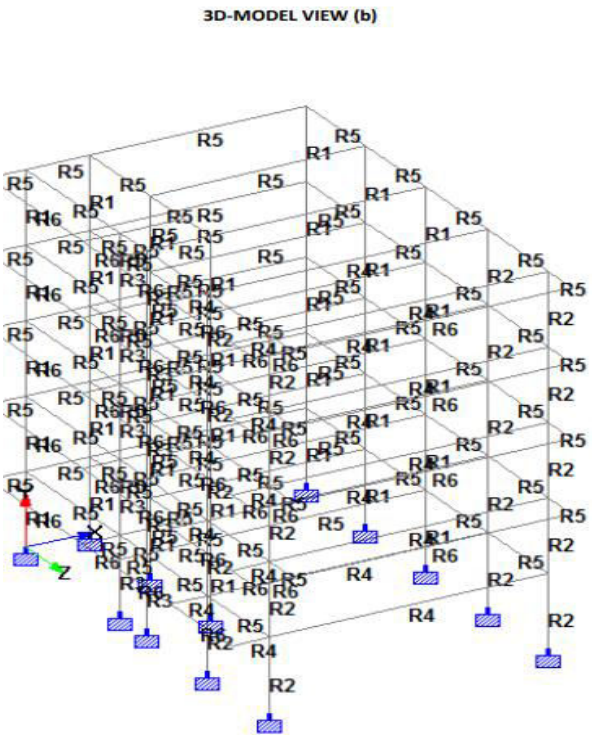
Stiffness method

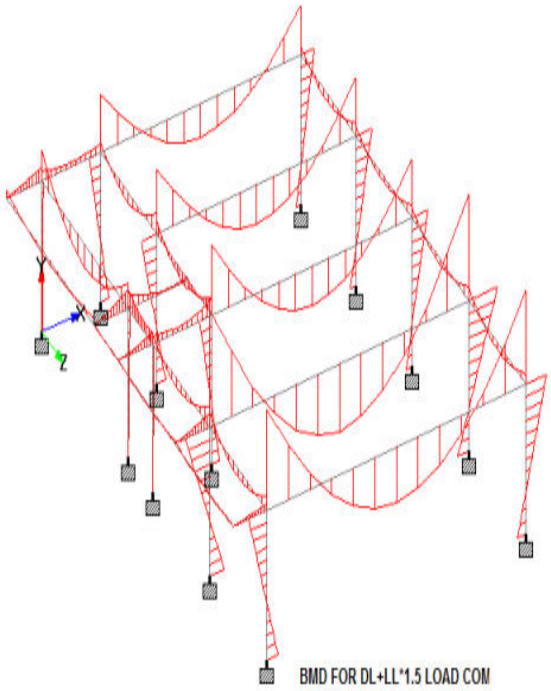
In this project, the frames have been analyzed by using StaadPro., which uses the stiffness method for analysis of structure.

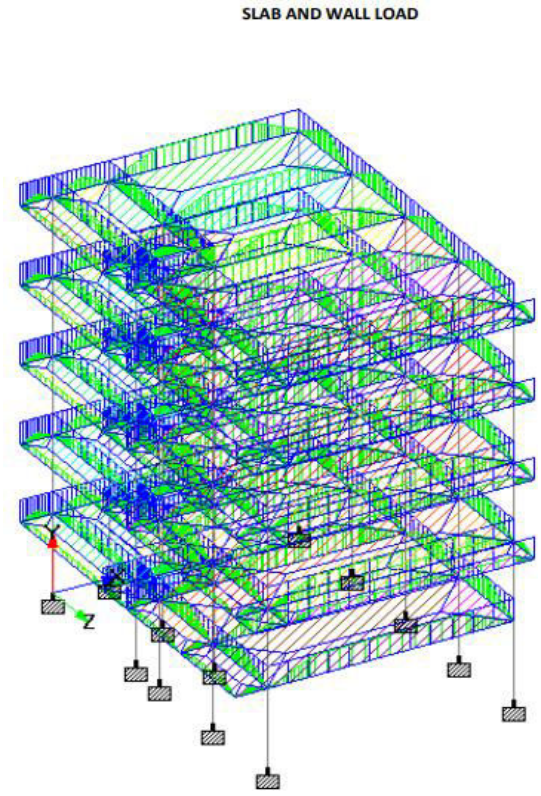
Staad pro, over the years, has developed to become the world's most popular and powerful structural engineering software. StaadPRo features a state-of-the-art user interface, visualization tools, and seismic analysis capabilities. From model generation, analysis and design to visualization and result verification.

3D-MODEL VIEW (a)









6. ANALYSIS AND DESIGN OF FOOTINGS

Foundations

Foundations are structural elements that transfer loads from the buildings or individual column to the earth. If these loads are to be properly transmitted, foundations must be designed to prevent excessive settlement of rotation, to minimize differential settlement and to provide adequate safety against sliding and overturning,

Foundations may be classified as follows:

Isolated footings under individual columns.

These may be square, rectangular or circular in plan.

Strip Foundations and wall footings.

Combined footing supporting two or more column loads.

These may be rectangular or trapezoidal in plan or they may be isolated base joinedby a beam. The later case is referred to as a strap footing.

Raft or mat foundation.

It is a large continuous foundation supporting all the column of a structure.

This is normally used when soil conditions are poor or differential settlement is to be avoided.

Pile foundations

Pile caps are used to tie a group of piles together. These may support isolated column, or groups of several column or load bearing walls.

The analysis and design of footing can be broadly divided in the following steps:

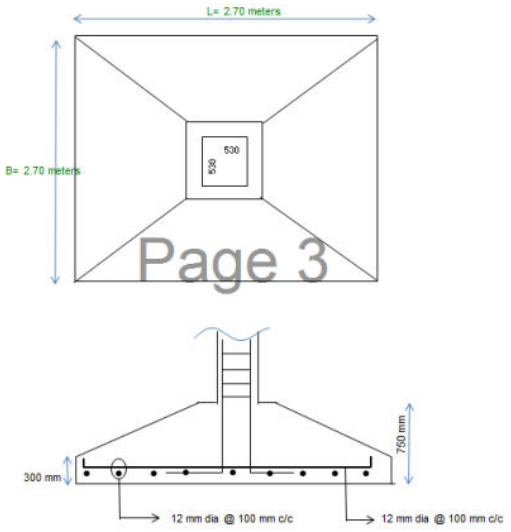
Determination of the area of footing.

Determination of bending moments and shears at critical section and fixing thedepth of footing.

Determination of the area reinforcement.

Check for development length at critical section.

The area of the footing is worked out based on the number including self-weight of footing and bearing capacity of the soil. The calculations for bending moment, shear force, development length etc, are made based on provision in IS code. The various recommendations made in IS 456 design of footing are given below.



7. CONCLUSION

The following conclusions are arrived at from the above project work. 1) The slabs were designed by limit state method using excel sheets. 2) The design of Beams and columns can be done in Staadpro efficiently by

making model and interpretation of results. 3) Footings can be designed efficiently by Limit state method using excel sheet. 4) AutoCAD was very useful in making structural drawings and coordination of design.

8. REFERENCES

1. National Building Code of India in 1983 and Building Construction by Rangwala.

2. Planning & Layout of drawings by using N. Srinivasulu, A. Kamal and S. Subramanyam.

3. Computer aided analysis and design of multistoreyed builing by Bhattacharjee Bedabrata 2007 4. Structural analysis by Ramamrutham and Dr. Prakash Rao.

5. RCC by A.K.Ashok ,Devdas Menon and Pilley, Carvay and Shas.

6. Code of Practice (RCC) -IS- 456-2000.

7. Code of Practice (loads) –IS-875-Part 1 (Dead Load)

8. Code of Practise (Loads) –IS-875-Part 2 (Live Load)

9. Use of SP- 16 (Design for Flexure percentage of steel)

10. Use of SP-34 (Detailing)