

ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT BUILDING C+G+3 USING STAAD PRO & MANUAL DESIGNING

V. ABHILASH, TEJESHWAR REDDY, K. BHARATHI, BOBBILI SAI SUBRAMANYAM,
G. SHASHI KUMAR, M. SATHISH KUMAR

Dept. of Civil Engineering, SVITS, Mahbubnagar, Telangana, India.

Abstract: The basic needs of a human being are food, clothing and shelter. There have different kinds of housing, but multi storeyed RCC buildings from the core and it has become the need of the day. The main reason shifted from independent bungalows to RCC multi storeyed skyscrapers is the shortage of space metropolitan cities. Shortage of space in cities has pushed up the land cost necessitating the construction of multi storeyed structures. The planning and designing of multi storey structures involves a number of steps. The plan based on the functional requirements and the utility considerations. The loads coming on to the structures are taken as per IS:875. The loads are calculated as per provisional of IS:456-2000. This project is reflected in the recent revision of the code of practice of plain and reinforced cement concrete IS-456-2000 and design aids for reinforced concrete to IS: 456-1978(SP:16-1980) interaction diagrams. These codes place more emphasis on providing sufficient strength and ductility besides satisfactory Serviceability requirements of cracking and deflection in concrete structures. Both these codes are based on the principles of limit state design rather than working stress design. A complete structural analysis of a multi storeyed building is done in this project.

INTRODUCTION:

The objective of structural design is to plan a structure which meets the basic requirements of structural science and those of the user. The basic requirements of structural design are safety serviceability, durability and economy. In this project work it is proposed to design a multi-storeyed residential building consisting of 4 floors. Each floor consists of 4 flats. The building is served by one stair case and one lift.

IMPORTANCE OF MULTISTORIED BUILDINGS:

The rapid increase in population and Industrial growth and of shelter there is considerable rise in the price of shelter there is considerable rise in the

price of city land and as the space is limited horizontal expansion is difficult. Hence vertical expansion has become compulsory. This has led to the conception of apartments or flats. An apartment consists of 3 to 7 storeys and each storey may accommodate 2 to 4 tenements. The land and other amenities of apartments are shared by all the occupants.

As our country is in developing stage. The economy of people may permit to acquire costly flats. Hence for low income group LIG flats are within reach and are most preferred.

Multi storeyed building has been broadly classified into five types

- Load bearing constructions.
- Composite Constructions.
- Framed Construction.
- Reinforced Concrete framed Construction.
- Steel framed Construction.

The first method has got the limitation that it will be economical only up to 2-3 storey. By means of composite constructions technique the economy is achieved number is in

between 3 to 5. Any building having more than 6 storeys has to be dealt by means of framed constructions.

LITERATURE REVIEW

1. Assistant Professor Harshitha M N, Binod Kumar, Rajiv Kumar Chaudray, Saurabh Singh, Shivam Shivhar “**Study on Analysis and Design of a Commercial Building**”

This paper investigates about the Analysis and Design of a Commercial Building by using ETABS software and also gain sufficient knowledge in complete Analysis and Design Procedure. In this research they checked on G+4 Commercial Building frame made up of Reinforced Concrete. Providing with all necessary specifications. This project mostly stressed on Indian Standard Code Books and National Building Code (NBC) because planning and design of any building will be recognized as per the standards by these design aids. This paper provides information about the design procedure Analysis Results i.e. Shear Force, Bending Moment, Deflections etc. and various IS Code books.

2. Prof. Dr. H. J. Shah, Prof. Dr. Sudhir K Jain “**Seismic Analysis and Design of a five Storey Building**”

This Project has been developed by using Building Codes. In this paper the structure designed is used for exhibition an art gallery. It is the expanded with the existing building site therefore analysis and design is for this building is performed. Based on the span of structural member in each floor Dimension are found. Also they used

M25, M30 Grade concrete, Fe-415 steel, L.L., D.L., Seismic Load as per the IS:1893-2016. Analysis and complete Design of structure is completed in step by step procedure

METHODOLOGY OF ANALYSIS AND DESIGN DESIGN OF SLABS

INTRODUCTION:

Slabs are plane structural members whose thickness is small as compared to its length and breadth. Slabs are most frequently used as roof covering and floors in various shapes such as square, rectangular, circular, triangular etc in buildings. Slabs supports mainly transverse loads and transfer them to the supports transverse loads and transfer them to the supports by bending action in one or more directions. Beams or walls are common supports for the slab.

TYPES OF SLABS:

Depending up on the ratio of longer span to short span the slabs are classified in to:

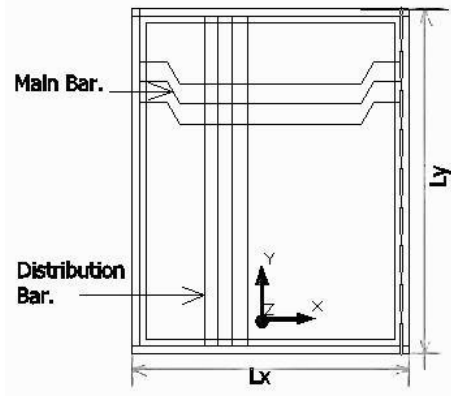
- a) One way slab
- b) Two way Slab

ONE WAY SLAB:

Slabs which are supported on all four edges and the ratio of longer span to the shorter Span (l_y/l_x) greater than 2 are called as one way slabs. One way bends in one direction along i.e. the shorter span and hence it needs main reinforcement in one direction only (along the shorter span) to resist one way bending as shown in Fig. However minimum reinforcement known as distribution is provided along the span

above the main reinforcement to distribute the load uniformly and resist temperature and shrinkage stresses.

Illustration example of one way slab :



TWO WAY SLAB:

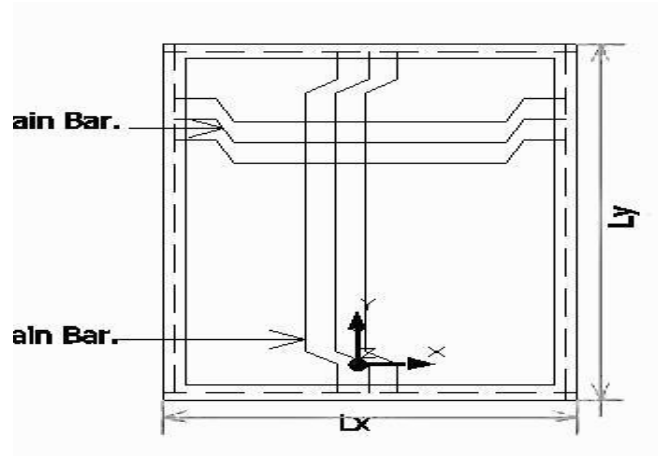
When the slabs are supported on all four edges and the ratio of longer span to the shorter span (l_y/l_x) is less than or equal to 2, the slabs are likely to bend along two spans and such slabs are called as two way slabs.

The load is transferred in both the directions to the four supporting edges and hence main reinforcement designed the to resist two way bending as shown below.

Note:

When a slab is supported only on two opposite edges, irrespective of longer span to shorter span ratio, the slab behaves like a one way slab as it one direction perpendicular to the support (span direction).

Illustration example of Two way slab :



C5

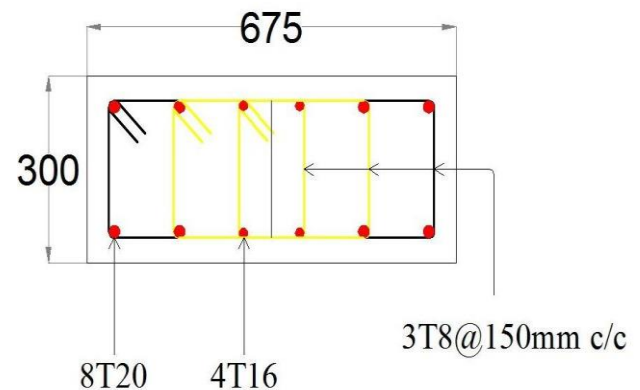
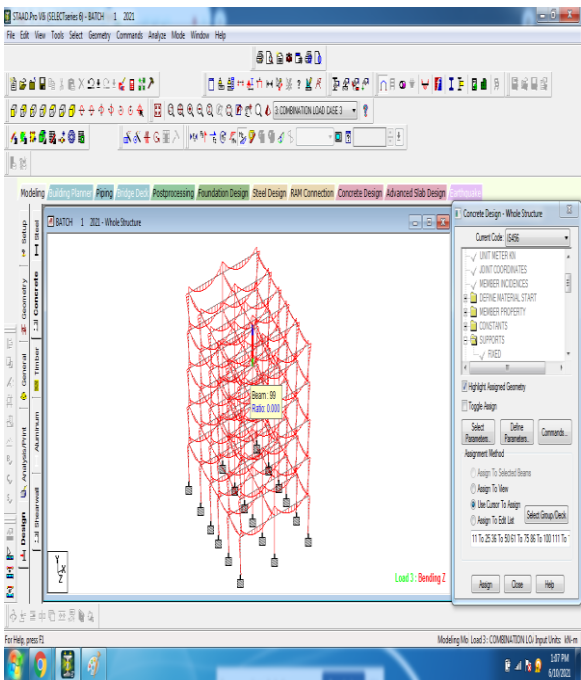
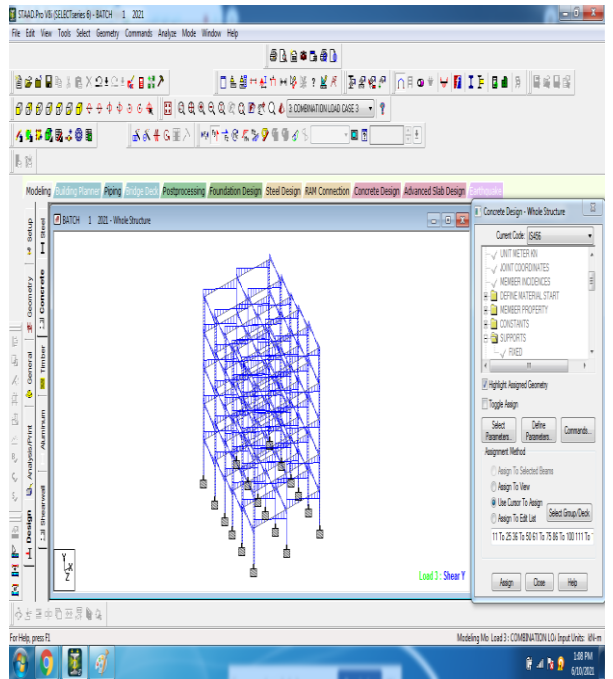
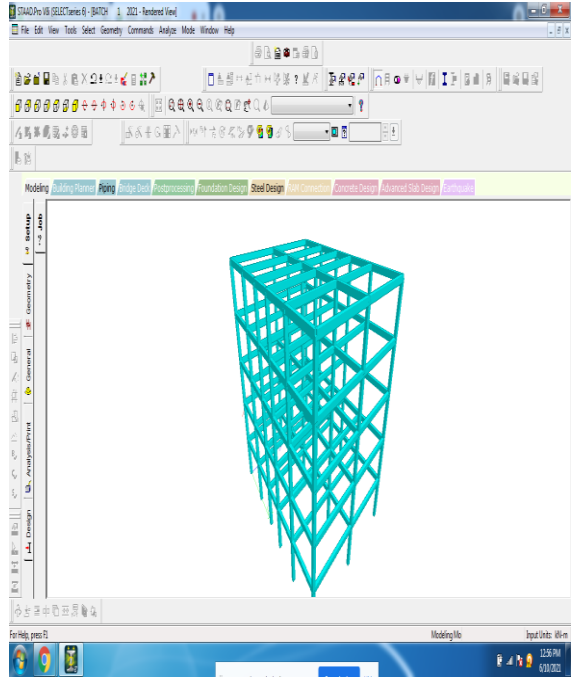
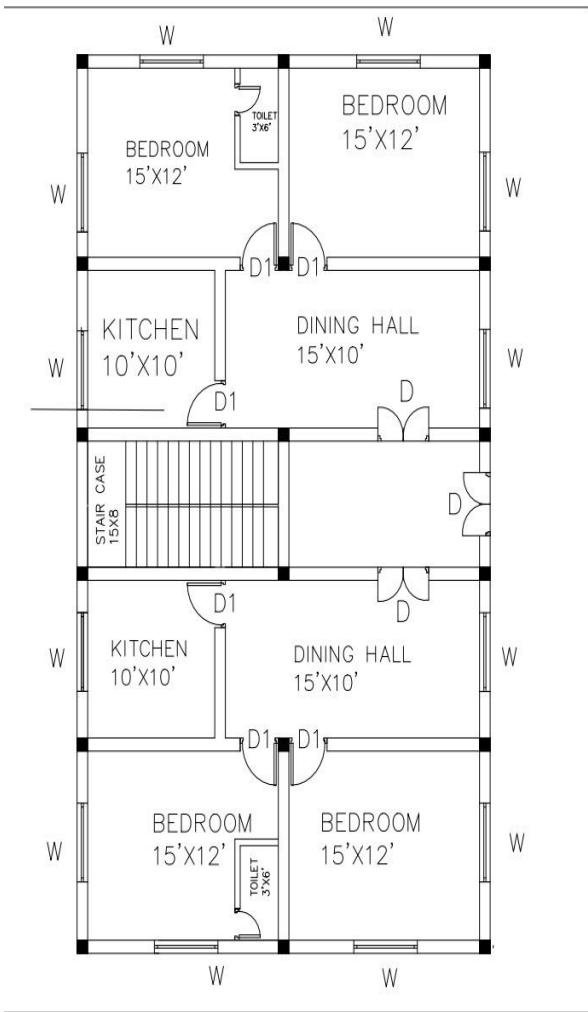
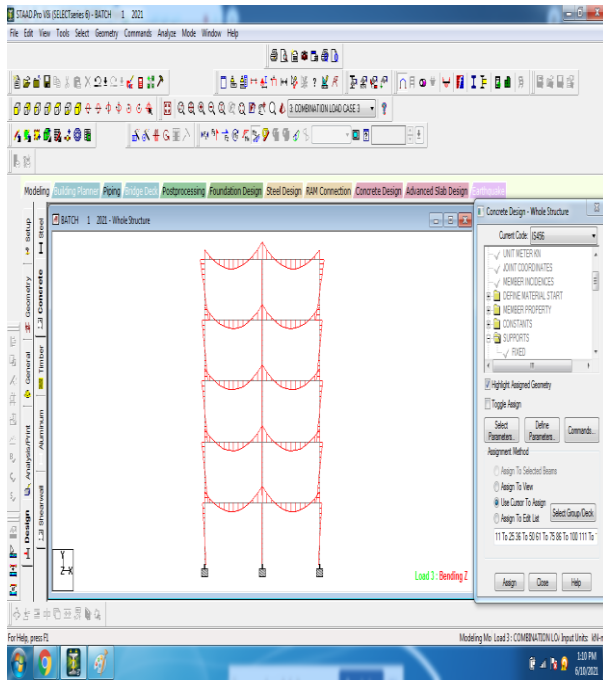


Figure- Reinforcement detailing of column

ARCHITECTURAL PLANS





implementations of more effective & professional engineering software. Further in case of rectification it is simple to change the values at the place where error occurred and the obtained results are generated in the output.

REFERENCES

- **IS: 875 (Part 1) – 1987 for Dead Loads**, Indian Standard Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures.
- **IS: 875 (Part 2) – 1987 for Imposed Loads**, Indian Standard Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures.
- **IS: 875 (Part 5) – 1987 for Special Loads and Combinations**, Indian Standard Code of Practice for Design Loads (Other Than Earthquake).
- **IS 1893 (Part 1)-2016**, Indian Standard Criteria for Earthquake Resistant Design of Structures, (Part 1- General Provisions and Buildings).
- **IS 456-2000**, Indian standard code of practice for plain and reinforced concrete (fourth revision), Bureau of Indian Standards, New Delhi, July 2000.

CONCLUSION

- 1) This project is mainly concentrated with the Design and Analysis of multi-storied residential building with all possible cases of the load combinations as per IS Code using Analysis Softwares tool meeting the design challenges are described in conceptual way.
- 2) To understand the Basic principles of structures by Understanding the standard Indian code. The scope of the study is to Produce good Structural work for performing Analysis and Design for residential/Commercial Structures.
- 3) This facilities for the

- **SP: 16-1980**, Design aids for reinforced concrete to IS: 456, Bureau of Indian standards, New Delhi, 1980.
- **SP: 34-1987**, Hand Book of Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi, 1987.
- Palli, S.U. And Menon. D, “**Reinforced concrete design**”, Second edition, Tata Mc Graw Hill Publishing Company Limited, New Delhi, 2003.
- Jain, A.K. “**Reinforced Concrete – Limit State Design**”, Sixth edition, New Chand & Bros, Roorkee, 2002



Authors Profile

V. ABHILASH B.Tech student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

TEJESHWAR REDDY B.Tech student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

K. BHARATHI B.Tech student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

BOBBILI SAI SUBRAMANYAM B.Tech student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

G. SHASHI KUMAR B.Tech student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.

M. SATHISH KUMAR Assistant Professor Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.