International Journal For Technological Research In Engineering
Volume 4, Issue 11, July-2017 *ISSN (Online): 2347 - 4718*

ANALYSIS AND DESIGN OF MULTISTOERY BUILDING

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ABSTRACT: The construction of high rise building followed in order to increase in population and growth of the city. The process of urbanization that started with the age of industrialization, is still in progress in developing countries like India. For analyzing the multi storey building has to consider all the possible loading against the all possible safe loading conditions. The present project deals analysis and design of G+10 storey building consists of 6 apartments in each floor. The foremost basic in structural engineering is the design of simple basic components and members of a building, Beams, Columns, shear wall and Footings. The design process included an architectural layout, structural framing options using both steel and concrete. The design has been done as per IS456-2000 using staad-pro software.

Key Word: Industrialization, , Beam, Column, Shear Wall and Footings

I. INTERODUCTION

Building construction is the engineering deals with the construction of building such as residential houses. In a simple building can be define as an enclose space by walls with roof, food, cloth and the basic needs of human beings. In the early ancient times humans lived in caves, over trees or under trees, to protect themselves from wild animals, rain, sun, etc. as the times passed as humans being started living in huts made of timber branches. The shelters of those old have been developed nowadays into beautiful houses. Rich people live in sophisticated condition houses. Buildings are the important indicator of social progress of the county. Every human has desire to own comfortable homes on an average generally one spends his two-third life times in the houses. The security civic sense of the responsibility. These are the few reasons which are responsible that the person do utmost 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. Draughtsman are responsible for doing the drawing works of building as for the direction of engineers and architects. The draughtsman must know his job and should be able to follow the instruction of the engineer and should be able to draw the required drawing of the building, site plans and layout plans etc, as for the requirements.

II. LITERATURE REVIEW

Analysis and design of multi storied structural system with wind load effects using staad pro and e-tabs

STAADPro and ETABS are the present day leading design softwares in the market. Many design companies use these softwares for their project design purposes. So, this project mainly deals with the comparative analysis of the results obtained from the design of a regular and a plan multi storey building structure when designed using STAADPro and ETABS softwares separately. These results will also be compared with manual calculations of a sample beam and column of the same structure designed as per IS 456.

Analysis and design of multistory building by using staad pro

The main aim of structural engineer is to design the structures for a safe technology in the computing field; the structural engineer can dare to tackle much more large and complex structure subjected to various type of loading condition. Earlier the loads acting on the structure are considered as static, but strictly speaking , with the exception of the self-weight (dead load) no structure load is static one.

Structural analysis of multistory building of different shear walls location and heights

Shear walls are structural systems which provide stability to structures from lateral loads like wind, seismic loads. These structural systems are constructed by reinforced concrete, plywood/timber enforcement masonry, reinforced masonry at which these systems are sub divided into coupled shear walls, shear wall frames, shear panels and staggered walls.

Analysis and design of multistory building using composite structure

The use of Steel in construction industry is very low in India compared to many developing countries. Experiences of other countries indicate that this is not due to the lack of economy of Steel as a construction material. There is a great potential for increasing the volume of Steel in construction, especially the current development needs in India.

Dynamic analysis of multistoried regular building

Analysis and design of buildings for static forces is a routine affair these days because of availability of affordable computers and specialized programs which can be used for the analysis. On the other hand, dynamic analysis is a time consuming process and requires additional input related to mass of the structure, and an understanding of structural dynamics for interpretation of analytical results. Reinforced concrete (RC) frame buildings are most common type of constructions in urban India, which are subjected to several types of forces during their lifetime, such as static forces due to dead and live loads and dynamic forces due to the wind and earthquake.

III. METHODOLOGY

The preceding chapter has given background information into the areas of study of the project

TABLE 1 Statement of project

Ground floor	4m
Floor to floor height	3.2M
Height of plinth	0.6M
Depth of foundation	1M
Concrete grade	M25,M30
All steel grades	Fe415 grade

and has provided a base for defining the various tasks needed to complete each major area of study. The following methodology discusses the approach to complete each task.

MODELLING:
(C+G+5) Residential and Commercial building.
LOADS:
1.5(Live Load +Dead Load).

ANALYSIS:
Analysis of RCC framed structure.
Shear Force and Bending Moment calculations.

DESIGN
Design of Beam, Column, and Footing
DESIGN PARAMETER
Beam = 450* 300mm.
Column = 800 * 300mm.
Slab = 150mm.

OBJECTIVES:

- Test for safe bearing capacity of soil.
- Generating structural framing plan
- Creating model in STAAD PRO
- Application of loads on the member
- Analysis of the structure
- Design the structure

BUILDING DESCRIPTION

Figure 1 auto cad plan

ANALYSIS AND DESIGN OF STRUCTURAL ELEMENTS

The modeling analysis is done in the STAAD PRO,

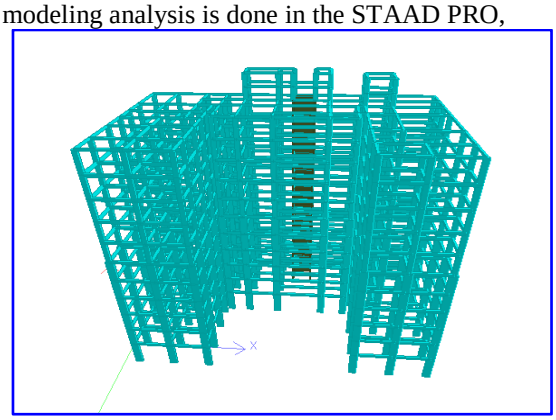


Figure 2 rendering

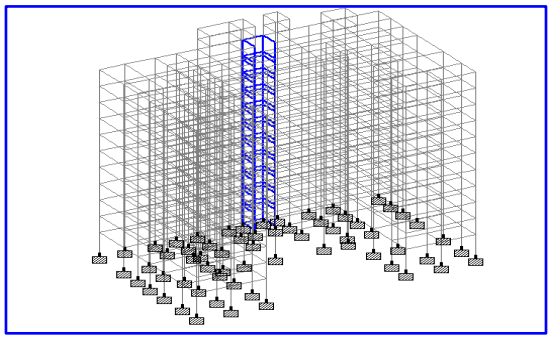


Figure 3 3 D VIEW OF BUILDING

TABLE 2 Geometric Details

Utility of building	residential complex
No of stories	G+10
Shape of the building	6 APARTMENTS
Apartment type	1BHK,2BHK,3BHK
No of staircases	2
No. of flats	60
No of lifts	1
Type of construction	R.C.C framed structure
Types of walls	Brick wall

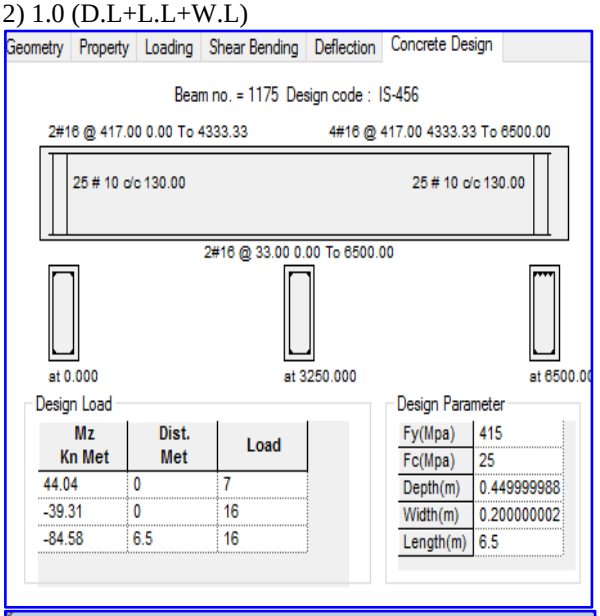
IV. DESIGN OF BEAM

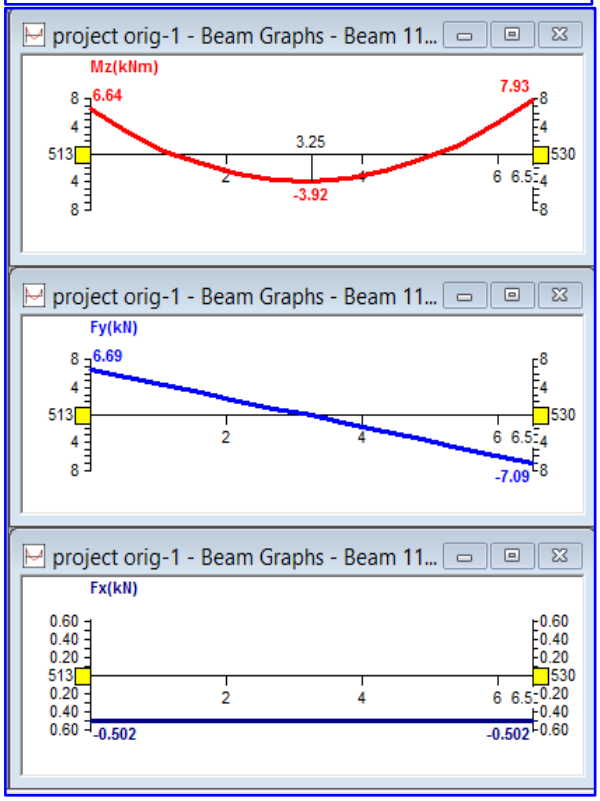
5.1.0. Assumptions in Design:

1. Using partial safety factor for loads in accordance with clause 36.4 of IS-456-2000 as ϒt=1.5.
2. Partial safety factor for material in accordance with clause 36.4.2 is IS-456-2000 is taken as 1.5 for concrete.
3. Using partial safety factors in accordance with clause 36.4 of IS-456-2000.

Combination Of Load.

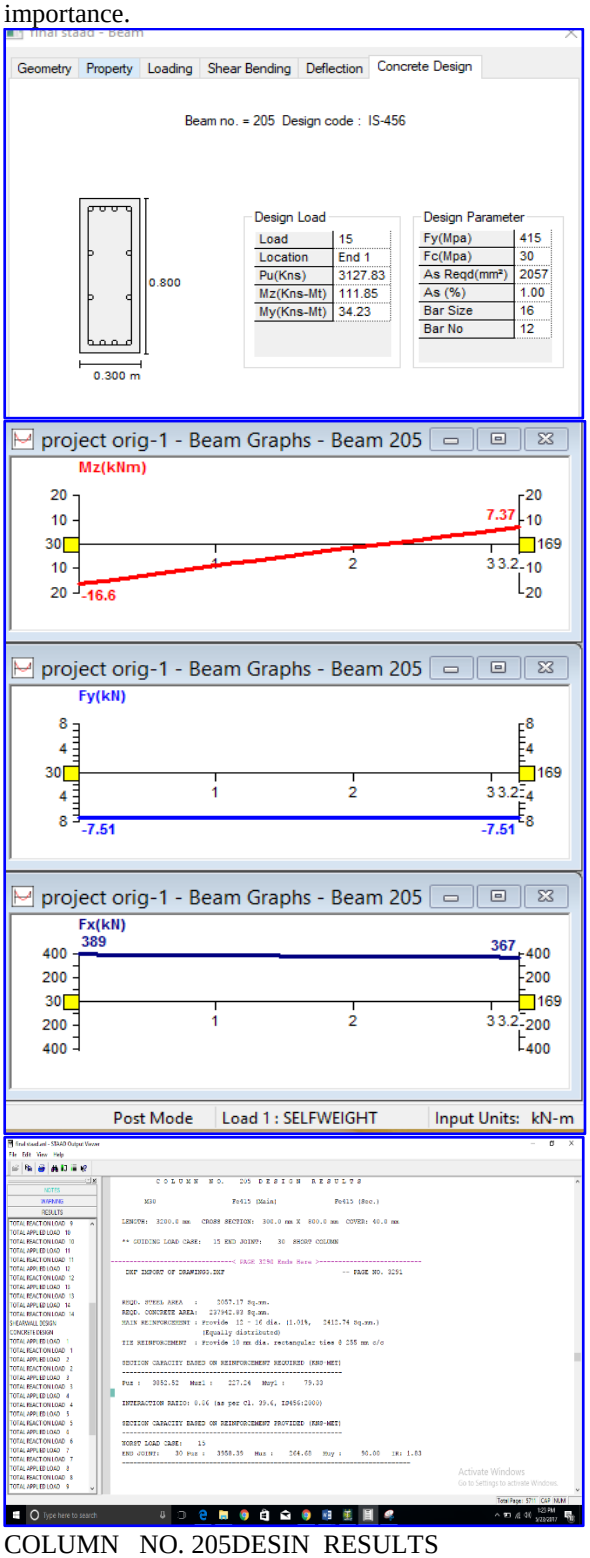
1) 1.5(D.L+L.L.)
2) 1.0 (D.L+L.L+W.L)





DESIGN OF COLUMN

A column can be defined as a vertical structural member designed to transmit a compressive load. A Column transmits the load from ceiling/roof slab and beam, including its own weight to the foundation. Hence it should be realized that the failure of a column results in the collapse of the entire structure. The design of a column should therefore receive importance.



COLUMN NO. 205DESIN RESULTS
M30 Fe415 (Main) Fe415 (Sec.)
LENGTH: 3200.0 mm CROSS SECTION: 300.0 mm X 800.0 mm COVER: 40.0 mm
** GUIDING LOAD CASE: 15 END JOINT: 30

SHORT COLUMN
DXF IMPORT OF DRAWINGG.DXF
REQD. STEEL AREA : 7.17 Sq.mm.
REQD CONCRETE AREA:237942.83 Sq.mm.
MAIN REINFORCEMENT : Provide 12 - 16 dia. (1.01%, 2412.74 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT : Provide 10 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)

Puz : 3852.52 Muz1 : 227.24 Muy1 : 79.33
INTERACTION RATIO: 0.86 (as per Cl. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
WORST LOAD CASE: 15END JOINT: 30 Puz : 3958.39 Muz : 264.68 Muy : 90.00 IR: 1.83..

DESIGN OF FOOTING
Reinforced concrete foundations, or footings, transmit loads from a structure to the supporting soil. Footings are designed based on the nature of the loading, the properties of the footing and the properties of the soil. Design of a footing typically consists of the following steps:
1. Determine the requirements for the footing, including the loading and the nature of the supported structure.
Select options for the footing and determine the necessary soils parameters. This step is often completed by consulting with a Geo-technical Engineer.
The geometry of the foundation is selected so that any minimum requirements based on soils parameters are met.
Footing Geometry
For moment w.r.t. X Axis (Mx)
As Per IS 456 2000 Clause 26.5.2.1
Critical Load Case = #16

Design Type	Dimension
Footing Thickness (Ft)	305.000 mm
Footing Length - X	1000.000 mm
Footing Width - Z (Fw)	1000.000 mm
Eccentricity along X (Oxd)	0.000 mm
Eccentricity along Z(Oxd)	0.000 mm

Minimum Area of Steel (Astmin) = 20013.840 mm2
Calculated Area of Steel (Ast) = 10827.348 mm2
Provided Area of Steel (Ast,Provided) = 20013.840 mm2
Astmin<= Ast,Provided Steel area is accepted
Selected bar Size (db) = Ø12
Minimum spacing allowed (Smin) = 52.000 mm
Selected spacing (S) = 64.136 mm
Smin <= S <= Smax and selected bar size < selected maximum bar size...
The reinforcement is accepted.
Based on spacing reinforcement increment; provided reinforcement is
Ø12 @ 60.000 mm o.c.

For moment w.r.t. Z Axis (Mz)
As Per IS 456 2000 Clause 26.5.2.1
Critical Load Case = #16
Minimum Area of Steel (Astmin) = 20013.840 mm2
Calculated Area of Steel (Ast) = 9558.261 mm2
Provided Area of Steel (Ast,Provided) = 20013.840 mm2
Astmin<= Ast,Provided Steel area is accepted
Selected bar Size (db) = Ø12
Minimum spacing allowed (Smin) = = 50.000 mm
Selected spacing (S) = 64.136 mm
Smin <= S <= Smax and selected bar size < selected maximum bar size...
The reinforcement is accepted.
Based on spacing reinforcement increment; provided reinforcement is
Ø12 @ 60.000 mm o.c.

V. RESULT AND CONCLUSION

We can conclude that there is difference between the theoretical and practical work done. As the scope of understanding will be much more when practical work is done. As we get more knowledge in such a situation where we have great experience doing the practical work.

- The design of beam, column, footing are done in limit state design which is safe at control of deflection and all other aspects.
- Using staad pro software, the design consideration has been taken a per IS codes. The design is safe in all condition.
- Designing using software reduces time in design work.
- Details of each and every member can be obtained using Staad pro.
- Accuracy improved by using software.

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