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# Study on analysis and design of G+7 story Building using STAADPro and ETABS software

Priyanka M. Patel

VAibhav S. Taksal

Pradnya J. Kulkarni

Apurva S. Kanade

***Abstract*—analyze and design of G+7 storey building structure by using software**

***Keywords—SMRF(special moment resisting frmae), seismic behavior and design, Autocad, staadpro, Etabs***

## I. INTRODUCTION

The term building in civil engineering is used to mean a structure having various components like foundation, walls, columns, floors, roof, door, window, staircase, lift, various types of surface finishes etc. structural analysis and design is use to produce a structure capable of resisting all applied loads, earthquake load, wind load and stable the structure without failure during its intended life and to check the strength, stiffness and resist the displacement of the building by proper designs and details of the building and is able to design the proper gravity loads. This depends upon the design of the building. The paper deals with analysis. Now a days various software packages are available in market for analyzing and designing practically all types of structures like RISA, STAADpro, ETABS, MIDAS, SAP and RAM etc. STAADpro and ETBAS are the present day leading design software in the market. Many design companies use this software for their project design purpose. So, this project mainly deals with the comparative analysis of the result obtained from the design of multistoried building structure when design using STAADpro and ETABS software separately. In this project work the structure to be design is a seven storey reinforced concrete residential building by using STAADpro and ETABS

The innovative and revolutionary new ETABS is ultimate integrated software package for the structural analysis and design of building. In cooperating 40 years of continuous research and development. This latest ETABS offers unmatched 3D object based modeling and visualization tools and non linear analytical power sophisticated and comprehensive design capability for a wide range of material and insightfully graphic displace, reports and schematic drawings that allow users to quickly and easily understand analysis and design results.

## II. LITERATURE REVIEW

### *A. Eric Hallebrand and Wilhelm Jakobsson*

Study about design of high rise building are exposed to both static and dynamic loads depending on the method used and how the structure is modeled in finite element software the results can vary. Some of the issues and modeling techniques, introduces below, are investigated in this master thesis. Dynamic effect such as resonances frequencies and acceleration are considered. The variation in the static results from reaction forces, overturning moments, deflection, critical buckling load forces between prefabricated elements and force distribution between concrete cores are investigated different model, such as construction stage analysis, to study the impact this have on the results.

### *B. Prakash Sngamnerkar(2015)*

He has done the comparative study on the static and dynamic behavior of reinforced concrete framed regular building. Comparison of static and vibrant behavior of a six storey structure is considered in this paper and it is analyzed by using computerized solution available in all four seismic zones i.e II, III, IV and V.This is important for building design and resistant from earth quake.

### *C M.S. Aainawala (2014).comparative study of multi-storied R.C.C. Buildings with and without shear walls.*

He did the comparative study of multi storied R.C.C buildings with and without shear walls. They applied the earthquake load to a building for G+12 ,G+25, G+38 located in a zone II, zone III, zone IV, zone V for different cases of shear wall position. They calculated the lateral displacement and storey drift in all the cases it was observed thst multi storied R.C.C building with shear wall is economical as compared to without shear wall. As per analysis, it was concluded the displacement at different level with shear wall is comparatively lesser in multistoried building as compared to R.C.C building without shear wall which is important for building design and use of shear walls.

### *D Girish babu*

Study about seismic analysis and design of G+7 residential structure using STAADpro. structural designing required structural analysis and earthquake and seismic analysis of structure of prior to construction. Various seismic data are necessary to carry out the seismic analysis of the structure.

### *E Alberto carpintery.*

Study of structural analysis of high rise building under horizontal load. The study on the intesa senpaolo tower in turin. The results are compared, in terms of displacement and rotation, with those shown in final project of the building

### *F Mohit Sharma*

He considered a G+30 storied regular R.C framed building. The static and dynamic analysis has done on computer with the help of STAADpro software using the parameters for the design as per IS-1893-2002-part 1 for the

zones II and III. It was concluded that not much difference in the values of axial forces as obtained by static, dynamic analysis

## III. METHODOLOGY

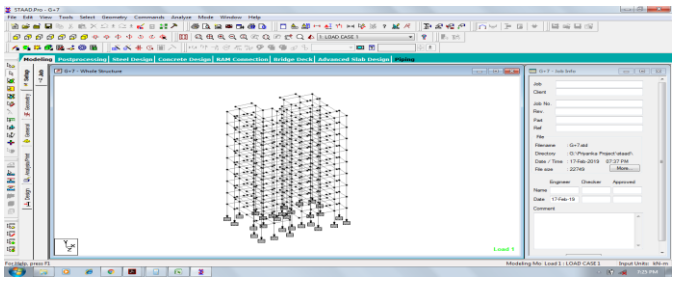

FIG 1. FORCE ACTING ON MEMBER

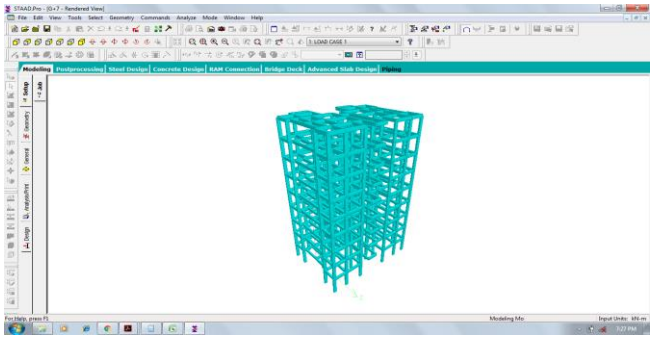

FIG 2. RENDERED VIEW

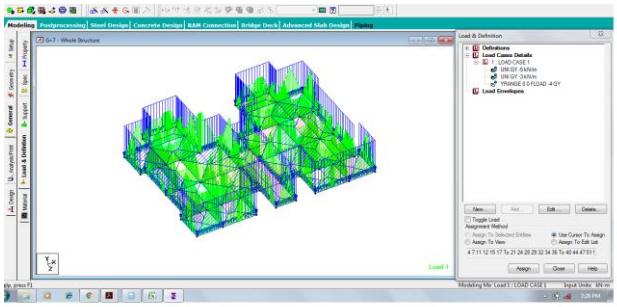

FIG 3. G+7 WHOLE STRUCTURE

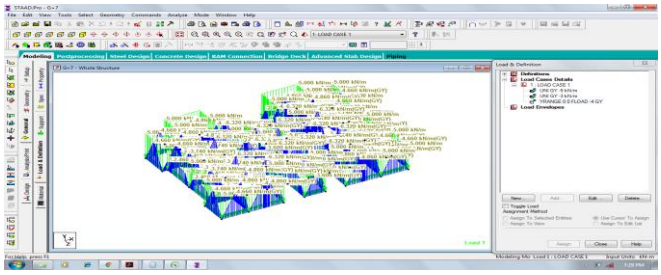

FIG 4. SHEAR FORCE AND BENDING MOMENT

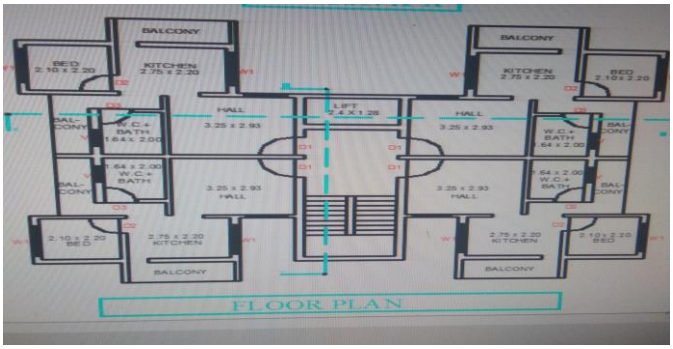


FIG 5. PLAN

## IV. ANALYSIS OF G+7 STORIED BUILDING

*Material properties*- the analysis has been done considering the following material properties.
Structural steel- Tor steel.
Reinforced concrete
Steel reinforced- Fe415
Stirrups and links- Fe415
***Load calculation***- following assumption are made for load calculation.
Density of concrete- 25 KN/m3
Density of brick- 18 KN/m3
Density of brick bat coba- 20KN/m3
Thickness of slab-150 mm
Thickness of wall- 230 mm
Floor finish- 1 KN/m
Live load on floor slabs- 3KN/m2

## V. DESIGN AND ANALYSIS OF G+7 STOREY BUILDING BY STAADPRO

**INTRODUCTION** – our project is based on design and analysis of multistoried building is done through using the staad pro. Notation adopted throughout the project is same as in IS-456-2000.
CODE- IS-456-20000:DESIGN CODE FOR RCC STRUCTURE, 'SP-16 : DESIGN CODE FOR COLUMNS, IS-875-PART 1: CODE FOR DEAD LOADS, IS-875-PART 2: CODE FOR LIVE LOAD, IS-875-PART 3: CODE FOR WIND LOADS.

Table:4.3.1 Zone factor

| Seismic Zone | II | III | IV | V |
|---|---|---|---|---|
| Seismic intensity | Low | Moderate | Severe | Very Severe |
| Z | 0.1 | 0.16 | 0.24 | 0.36 |

**SOFTWARE –** this project is mainly based on software and it is essential to know the details of this software. STAADpro and autocad.

STAAD(structural analysis and design) STAAD is the powerful design software licensed by Bentley**.** to calculate SFD and BMD of complex loading beam it takes about an hour. So when it comes up to building with several members it will take a week. STAAD is very powerful to which it does this job in just an hours STAAD is a best alternative for high rise buildings which makes a compulsion for civil engineer to know about this software.

AUTOCAD is a powerful software licensed by auto desk company and cad stand for computer aided design. It is used for drawing different layout, elevation, details, section, different section can be shown in autocad. We use for drawing the plan of multistoried building.

**STATEMENT OF THE PROJECT-**

1. Utility of building – residential building
2. Number of storey- G+7
3. Number of staircase- 8
4. Shape of building- rectangular
5. Type of construction- RCC framed structure
6. Type of wall- brick wall

Geometrical details

1. Ground floor height- 3 m
2. Floor height- 3m
3. External wall thickness- 230 mm
4. Internal wall thickness- 150mm
5. Slab thickness- 150mm
6. Plinth height- 900mm
7. Rise- 170mm
8. Tread- 250 mm

**ANALYSIS –** analysis is done by using STAADpro develop by BENTLEY. Once the loads and load combination are assigned to the structures analysis is to be done for RCC structure.

1.Assign the properties of structures
2.Assign loads on the slab
3.Load assign on the walls
4.Assign wind load on the structure (x+ve direction)
5.Assign wind load on the structure (x-ve direction)
6.Assign wind load on the structure (z+vedirection)
7.Assign wind load on the structure (z-ve direction)

## VI. SCOPE

Scope of STAADpro software-

1. faster method of designing structure.
2. Does not involve any manual calculation
3. Suitable for almost all types of material for designing i.e. steel, concrete, aluminum etc.
4. Shows accuracy in result i.e. shear force, bending moment diagram for each and every beams and columns of the structure that yours doing manually shows result for number of reinforcement use longitudinally, shear reinforcement.
5. Helps you to make improvement in structure, section, dimension
6. We can design a structure for any type of load i.e. dead load, live load, wind load, snow load, area load, floor load etc.
7. We can design simple beam to sky scraper and analyze weather it will fail at applied load.
8. We can import design from Autocad to STAAD

Scope of ETABS software-

1. 3D view of model, plan view, elevation, development view, custom view define by the user
2. Graphic input of cross section of any geometry and material.
3. Copy and paste of geometry model and from spread sheet.
4. Export of the model geometry to .dxf files
5. The input output and a numerical solution techniques of ETABS are specially design to take advantage of the unique physical and numerical characteristics associated with the building type structure. As a result, this analysis and design tool expedites data preparation, output interpretation and execution throughout.

### *Conclusion*

With this we conclude that steel required in STAADPro software is much more as compared to ETABS software.

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