Wind and Seismic Analysis of Building Using ETABS

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Abstract- Pune is the second most largest city metro politician city in the India state ofMaharashtra and the 8th most populous city in India. It has been ranked as "the most liveable city in India". Several time. Nowadays in pune there is rapid increase in construction field. So, there is need of multi storey building. In seismic and wind analysis of building by using ETABS in this project we mainly deal with analysis and design of multi storey building by using ETABS software, considering loads that is, seismic load and wind load. Pune comesunder zone II. We have taken G+11 storey building. The structure higher than G+5 is considered under the seismic loading. In this project we analysis and design of building using rectangular and circular column for economical structure. We find out the parameters like Bending Moments, Shear force, Base Reaction, Storey stiffness, Storey Shear, overturning moment, Storey displacement, Storey Drift etc. of all Storey of Building Discuss the results coming from the Linear Static Analysis method and Linear Dynamic Analysis (Response Spectrum Analysis)Method.

I. INTRODUCTION

In this modern technology of 21st century as urbanization increases the availability of land is becoming less, due to high population and cost of land become higher. To overcome this problem, the only solution is to prefer high rise structure. The effective design and construction of earthquake and wind resist structure have much greater importance in all over the world. For this ETABS provides both static and dynamic analysis for wide range of gravity, thermal and lateral loads. This analysis is mainly dealing with the study of an elliptical shaped plan by using AutoCAD software. It is to analyses the design of G+11. In this project, the "Seismic and Wind Analysis – Design of G+11 multi- storey RC residential building. The project is completed with reference to the Indian standard codes in planning we have used AutoCAD, Elevation, Interior and Exterior design with reference to National Building Code 2005 Completed. Analysis of the structure is done in manual as well as using ETAB software. Designing of structural component are carried out using Indian standard code in limit state method.

1.1 Aim & objective of study

1. Analysis and Design of Building Using Rectangular Column
2. Analysis and Design of Building Using Circular Column.
3. The project work is aimed to fulfil thefollowing objectives:

- Sizing and framing.
- Modelling and analysis in ETABS
- Design using Excel sheets developed
- Preparation of Reinforcement Drawings.
- To find out the parameters like

1. Ashcon cement grade: 43 Bending Moments, Shear force, Base Reaction, Storey stiffness, Storey Shear, overturning moment, Storey displacement, Storey Drift etc. of all Storey of Building Discuss the results coming from the Linear Static Analysis method and Linear Dynamic Analysis (Response Spectrum Analysis) Method

II. MATERIAL

- The model taken for the project is under construction.
- Soil strata: Black Cotton Soil.
- Depth of excavation: 5m
- Type of footing: Box footing
- Type of structure: RCC Framed structure

- Materials used:

1. Cement
2. Steel: Fe250, Fe415, Fe500
3. Masonry: Concrete Block Masnory
4. Grade of concrete: M15, M20, M25, M30.
5. Roof on cement, grade – 53

III. METHODOLOGY

Structural design is the primary aspect of civil engineering. The foremost basic in structural engineering is the design of simple basic components and members of a building viz., Slabs, Beams, Columns and Footings.

The process of structure design involves the following steps:

1. Structural Planning
2. Calculation of Loads
3. Analysis of Structure
4. Member Design
5. Drawing and Detailing.

IV. OBSERVATIONS

FOR SEISMIC ANALYSIS

Column size

Preliminary data required for analysis.
1 C 230X450

Type of Building: RCC (G+11) A WING
2 C 230X600

Zone of Earthquake: IV
3 C 230X680

1.2(DL+LL+EL)
1.5(DL+EL)
1.5(DL+LL)

Steel: HYSD415
4 C 230X750

Concrete: M20, M25, M30
5 C 230X830

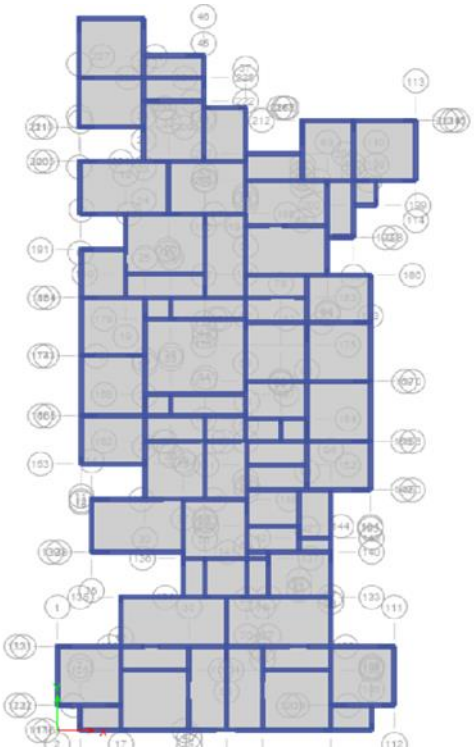
Beam size: .C 230X980

1. B230X650 7C 230X1200
2. B230X750

Slab thickness: 150mm

G+11 RCC Structure Table 1 story data

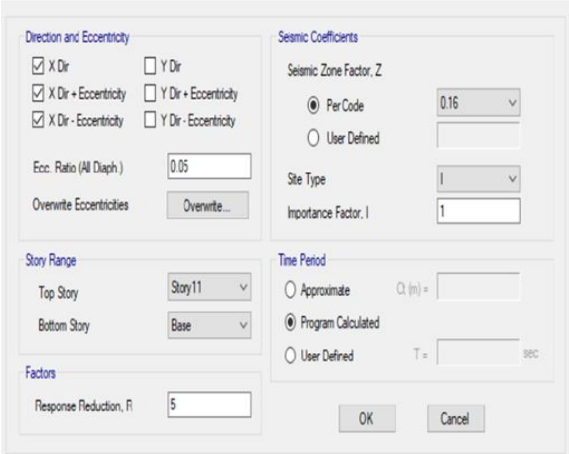
1.Without Shear wall



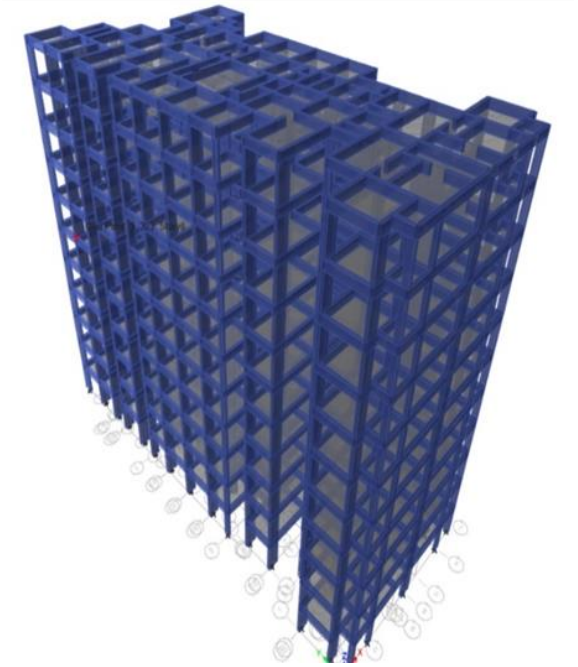
FLOOR PLAN

Load Cases Lad combinations for Seismic Analysis

Name	Height(mm)	Elevations
Terrace	3000	39000
11 floor	3000	36000
10 floor	3000	33000
09 floor	3000	30000
08 floor	3000	27000
07 floor	3000	24000
06 floor	3000	21000
05 floor	3000	18000
04 floor	3000	15000
03 floor	3000	12000
02 floor	3000	9000
01 floor	3000	6000
G floor	3000	3000
BASE	0	0



LOAD PATTERNS FOR SEISMIC LOAD



3D DESIGN

Preliminary data required for analysis.
1. C 230X450

Type of Building: RCC (G+11) B WING
2. C 230X600

Zone of Earthquake: IV
3. C 230X680

Steel: HYSD415
4. C 230X750

Concrete: M20, M25, M30
C 230X830

Beam size:
C 230X980
B230X650

C 230X1200
B230X750

Slab thickness: 150mm
G+11 RCC Structure Table 1 story data

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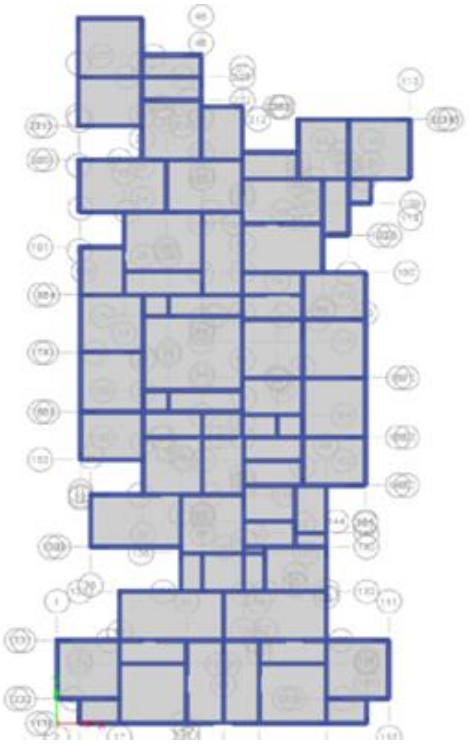
06 floor	3000	21000
05 floor	3000	18000
04 floor	3000	15000
03 floor	3000	12000
02 floor	3000	9000
01 floor	3000	6000
G floor	3000	3000
BASE	0	0

2.Without Shear wall

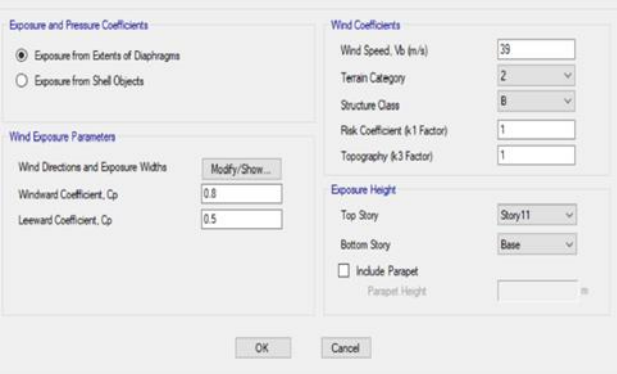


FLOOR PLAN

Load Cases Lad combinations for Seismic Analysis

Load case name	Load case type
Dead	Linear Static
Live	Linear Static
WL X	Linear Static
WL Y	Linear Static

1.2(DL+LL+WL)
1.5(DL+WL)
1.5(DL+WL)

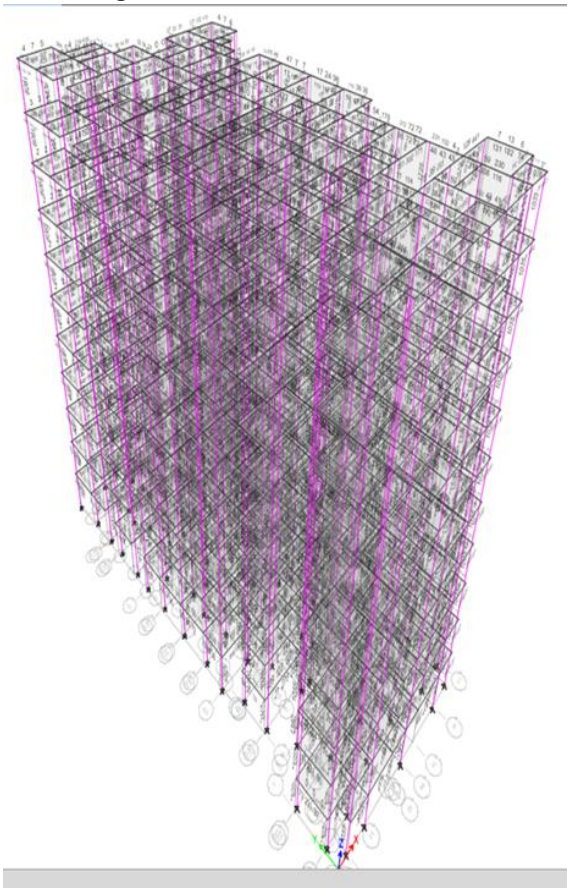


CONCLUSION

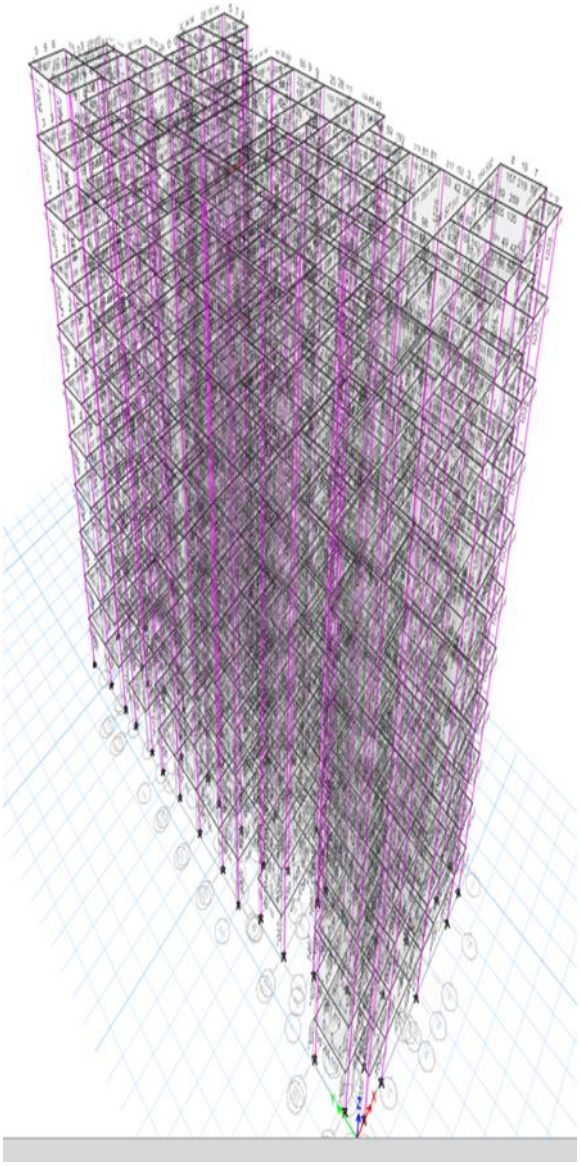
The analysis and design of a multi-storeyed building was done as part of our project. The study helped us to gain ample exposure various field practices in the analysis and design of multistoried buildings, and also in various construction techniques used in the industry. The analysis was done in ETABS 2015and detailing was done in Auto CAD 2010. The structural components beam, column, slabs, shear wall were designed manually. The designing and detailing were done according to standard specification of various codes to the possible extend. The various difficulties encountered in the design process and various constraints faced by the structural engineer in designing were well understood. This study helped to understand and analyse the structural problem faced by the construction industry.

RESULT

Frame design:

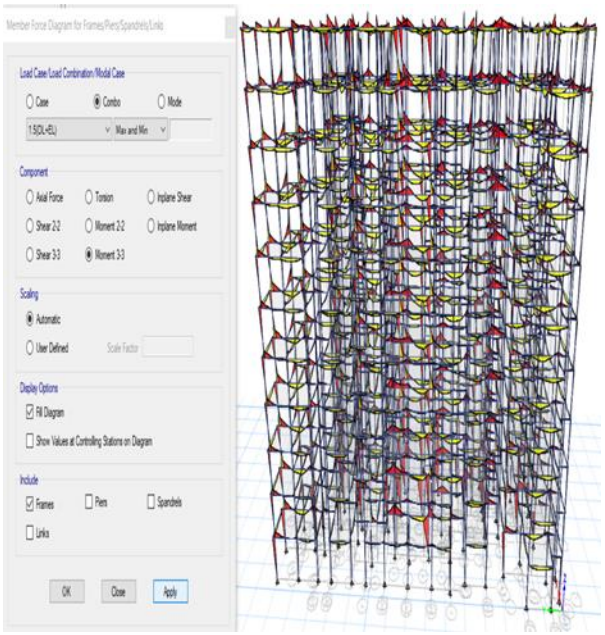


WIND FRAME DESIGN

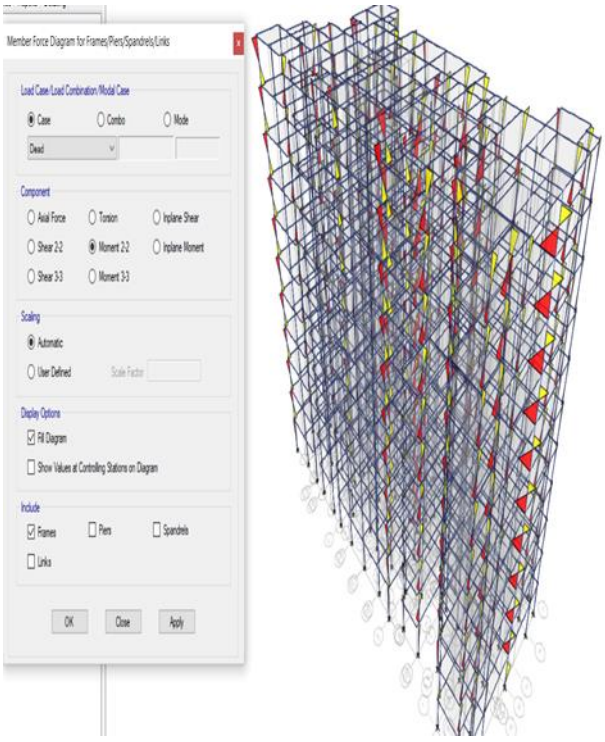


SEISMIC FRAME DESIGN

Moment Distribution:

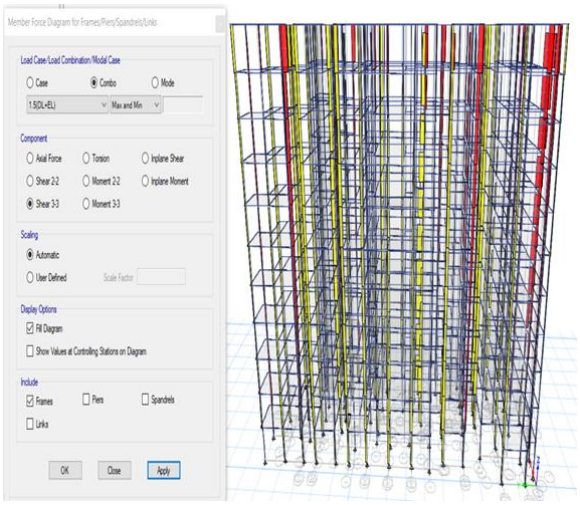


FOR SEISMIC



FOR WIND

Shear Distribution:



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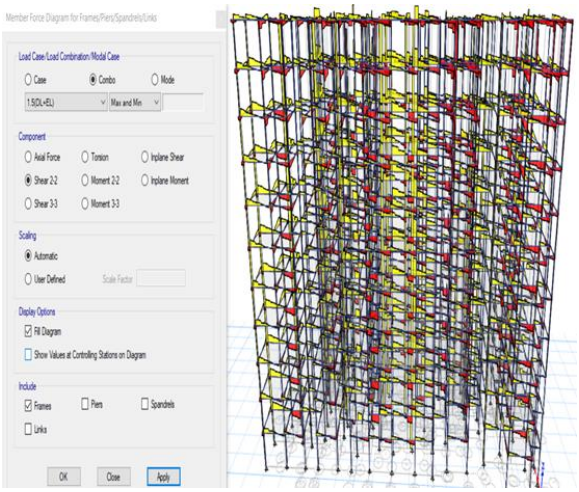

FOR WIND

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[6] Reference book of Dr Shah-Kale.