Analysis and Design of Multi Storied Building by Using Etabs Software

Engineering

Varikuppala Krishna	P G Student in Vardhaman College of Engineering Hyderabad
Chandrashekar	Assistant Professor in Malla Reddy Engineering College Hyderabad
Rajashekar	P G Student in St.Mary's College of Engineering and Technology Hyderabad

ABSTRACT   *Structural Engineers are facing the challenge of striving for the most efficient and economical design with accuracy in solution while ensuring that the final design of a building must be serviceable for its intended function over its design life - time. This project presents (Parking floor +5) upper stories RCC framed building analyzed and designed under the lateral loading effect of wind and earthquake using ETABS(Extended Three Dimensional Analysis of Building system). ETABS is incorporated with all the major analysis engines that is static, dynamic, Linear and non-linear, etc., and this Software is used to analyze and design especially the buildings. Because of the facilities provided in this software at the modeling stage, the buildings can be modeled as per the arrangement of the members of the project in Practical, and this software considers the beams, columns as Line members; slabs, Ramps/staircases, walls are as area members. Taking the horizontal loading effects of Wind & Seismic forces; In the design of this project, I take dynamic loading along with the Static loading and Live loads as per IS Code; And almost all the members of the project can be analyzed and designed as per Indian code using this software, where ever require I design the members using excel sheets which are prepared by me in this phase.*

INTRODUCTION

Due to concentration and increase of population into urban cities, there is a need to accommodate the influx in urban cities. However, due to rapid increase of land cost and limited availability of land, construction of high rise buildings were taking part in our daily life. The advantage of high rise buildings include but not limited to high ratio rentable floor space per unit area of land. These high rise buildings are sky scrapers are built not just for economy of space they are considered icons of a city's economic power and city's identity.

ETABS Software: The innovative and revolutionary new ETABS is the ultimate integrated software package for the structural analysis and design of buildings. This latest ETABS offers unmatched 3D object based on modeling and visualization tools, fast linear and nonlinear analytical power, sophisticated and comprehensive design capabilities for a wedge-range of materials, and insightful graphic displays, reports, and schematic drawings. CAD drawings can be directly converted into ETABS models. Design of steel and concrete frames, composite beams, composite columns, steel joists and concrete and masonry shear walls, as is the capacity check for steel connections and base plates. Comprehensive and customizable reports are available for all analysis and design output, and construction drawings of framing plans, details, and cross sections are generated for concrete and steel structures.
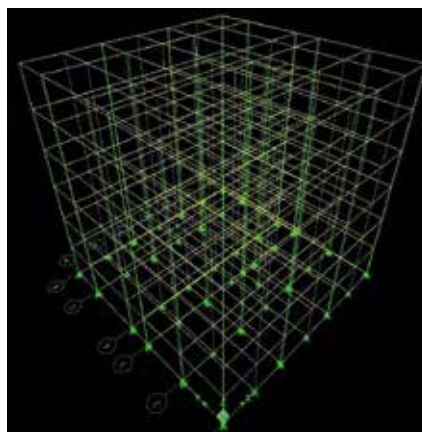
ARCHITECTURAL PLAN: Based on the client requirements and site conditions, we develop architectural drawing. In this project, I have planned for stilt+5floors which is an residential building as per the norms and basic requirements which includes municipal rules, vaastu, site conditions.**ANALYSIS AND DESIGN**: basic height of floor is 3m, loads patterns are DEAD load with self weight 1, live load, wall as dead load.

3D view of all members of all floors:

Analysis Results:
Structure result:Base Reactions

Load Case/Combo	FX kN	FY kN	FZ kN	MX kN-m	MY kN-m	MZ kN-m	X m	Y m	Z m
DEAD	1.781E-06	-478.9083	10220.8255	93862.2264	-87577.7871	-5105.0088	0	0	0
LIVE	0	0.0295	3497.5578	30446.4891	-29609.4621	0.3478	0	0	0
SDL	0	0.0221	2623.1684	22834.8668	-22207.0966	0.2609	0	0	0
WALL	-6.757E-07	0.099	6811.65	59109.144	-58968.1115	1.167	0	0	0
COMBINATION1	1.238E-06	-718.1808	29483.4658	263709.3558	-253129	-7655.3714	0	0	0
COMBINATION2	-5.593E-07	0.0442	5246.3367	45669.7336	-44414.1932	0.5218	0	0	0
COMBINATION3	-1428.3979	-711.8753	34729.8025	309302.3833	-315690	5200.7927	0	0	0
DCON1	1.238E-06	-718.1808	29483.4658	263709.3558	-253129	-7655.3714	0	0	0
DCON2	6.789E-07	-718.1365	34729.8025	309379.0894	-297544	-7654.8497	0	0	0
DJST1	8.255E-07	-478.7872	19655.6439	175806.2372	-168753	-5103.581	0	0	0
DJST2	0	-478.7577	23153.2017	206252.7263	-198362	-5103.2331	0	0	0

Load Case/Combo	FX kN	FY kN	FZ kN	MX kN-m	MY kN-m	MZ kN-m	X m	Y m	Z m
DWAL1	1.156E-06	-670.302	27517.9014	246128.7321	-236254	-7145.0133	0	0	0
DWAL2									0

After structure analysis, we get story analysis and story forces for each and every floor.

Then model results were taken and given the percentage of steel required for beams, columns, footings, slabs at all conditions.

Percentage of steel:
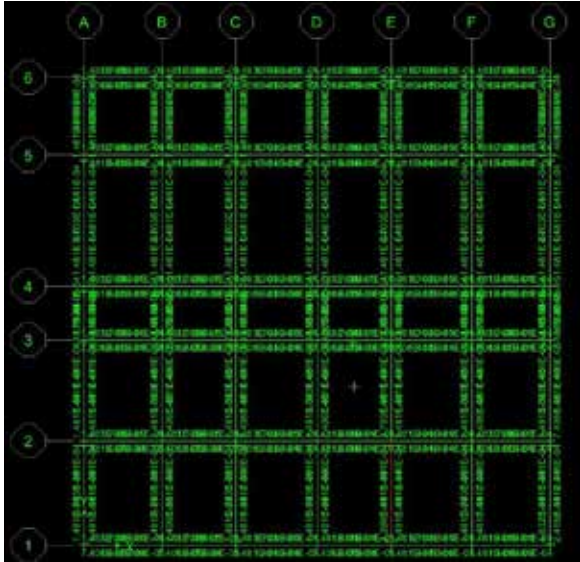
CONCLUSION:
Based on the analysis and design of multi-storied building, the following conclusions are made:

Building layout and design has to follow the nature especially for sunlight and wind directions. These types of principles were explained in vastu where followed at the beginning of project only.

Geotechnical engineering cannot be neglected while building the tall buildings. The geotechnical engineer needs to be consulted to do soil sampling, analysis, ground water depth and mainly for estimation of soil bearing capacity.

The proposed building should be in area where all the types of amenities are available.

In design IS456, IS875 were used for calculation of all forces and loads.

The use of light weight concrete and light weight materials will reduce the dead load of structure, which then allows the structural designer to reduce the size of the columns, footings, and other load bearing elements.

The occurrence and spread of fire is unpredictable and uncertain. It is therefore critical that fire proof materials and fire resistant products measure up to the highest possible standards of performance as well as reliability.

For more than 5 storey buildings it is better to provide the connecting beams in between the flats.

Limit state design is the best approach for designing the buildings.

SCOPE OF THE PROJECT:
this report is clear with the structural analysis and design of multistoried building which was designed by ETABS. This software is very innovative and easier which is better than staad pro. It is better for designing the high rise buildings under the applied live load, dead load, wind load, earthquake load, and seismic load. Construction of apartments were become a needy in urban areas, mainly construction of g+5 residential buildings for living were taking place. So I suggest my project will apt for above specified buildings with measurements, so that it reduces time period for designing.

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