ANALYSIS AND DESIGN OF A COMMERCIAL HUMAN BUILDING STRUCTURE BY USING E-TABS

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ABSTRACT

The analysis and design of a Commercial Human Building Structure is done in this paper. The undertaking of Commercial Human Building Structure is another and distinctive arranged structure. This is planned by including different kinds of outline techniques for various parts of the structure. ETABS will be utilized for analysis of skyscrapers, packing garages, steel, concrete constructions, low & tall buildings and also for framed structures. This project is done preferably to emphasize the behavior of structure i.e., for a G+21 multistoried building which have an aesthetic appearance of two humans carrying a box. The analysis and design of multistoried building with static and dynamic loads had carried out in this project as per IS code provisions. The acting burdens considered in the present investigation were self weight, floor stack, wind load and seismic stack under the seismic ZONE II. The structure is composed with the states of seismic and wind loads. The total area of the entire structure is 4048 SFT and the tallness of the structure is 295 ft. The basic edge is examined and outlined by various techniques as indicated by state of its segments considering the IS codes – 456, 875, 3370.In this project the various types of designs are carried out such as flat slab, fixed arch, RCC & OHBR (Over head balanced reservoir).The Response spectrum method was adopted in order to analyze the structure under Static & Dynamic loading. Finally the structure had withstand the Gravity loads & seismic loads under seismic zone-II & in the design the reinforcement of steel was evaluated as economical.

Keywords: ETABS, Fixed arch design, Gravity loads, Seismic loads, wind loads, OHBR, Response spectrum, Static & Dynamic loading.

1.0 INTRODUCTION

ETABS designed program is developed specifically for building system is a sophisticated and easy to use. The full form of ETABS is Extended Three-dimensional Analysis of Building System. ETABS 2016 features an in intuitional and powerful graphical interface with modeling, analysis, design and detailing procedures, all integrated with common database. ETABS 2016 looks completely different from its predecessors of 40 years ago the process is same to provide most efficient and comprehensive software for the analysis and design of building. Most structures are of clear geometry with horizontal beams and vertical columns. Although any structure configuration is possible in ETABS, in most cases simple grid system defined by horizontal floors and vertical columns. Mostly all floor levels are similar in building, it can be reduce the modeling and design time. In most of structures, the dimensions are large in bay widths and story heights, those dimensions are effect on the stiffness of frame.

2.0 AIM AND OBJECTIVES

AIM OF THE STUDY: The aim of the study is to analyze and design of the shape of human building structure by using ETABS.

OBJECTIVE:

- The objective of this project is to analyze and design of commercial human building structure.
- To analyze forces, deformations and displacements with seismic and wind forces.
- To design the structure according to the seismic and wind forces.

3.0 REVIEW OF LITERATURE

Balaji.U and Selvarasan M.E (2016) [1] chipped away at investigation and plan of multi-storied working with static and dynamic stacking conditions utilizing ETABS. In this work a G+13 story private building was examined for the earth shudder loads utilizing ETABS. They acknowledged that material property to be immediate, static and dynamic investigations were performed. The non-direct examination was completed by considering extreme seismic zones and the conduct was surveyed by considering compose II soil condition. Diverse outcomes like relocations, base shear were plotted and contemplated.

Geethu et.al (2016) [2] made a similar report on examination and outline of multi storied working by STAAD.Pro and ETABS software's. They gave the subtle elements of both private and business building outline. The arranging was made as per the national construction regulation and drafted utilizing Auto CAD programming. They inferred that while looking at both programming results, ETABS programming demonstrates higher benefits of bowing minute and pivotal power.

Chandrashekar et.al (2015) [3] investigated and outlined the multi-storeyed working by utilizing ETABS programming. A G+5 story working under the horizontal stacking impact of wind was considered for this investigation and examination is finished by utilizing ETABS. They have likewise considered the odds of event of spread of flame and the importent of utilization of flame resistant material up to most elevated conceivable models of execution and in addition unwavering quality. They recommended that the wide possibility of ETABS programming which is exceptionally creative and less demanding for elevated structures with the goal that time brought about for outlining is lessened.

4.0 DESIGN AND ANALYSIS

4.1 LAYOUT OF STRUCTURE

4.1.1 FRAME STRUCTURE

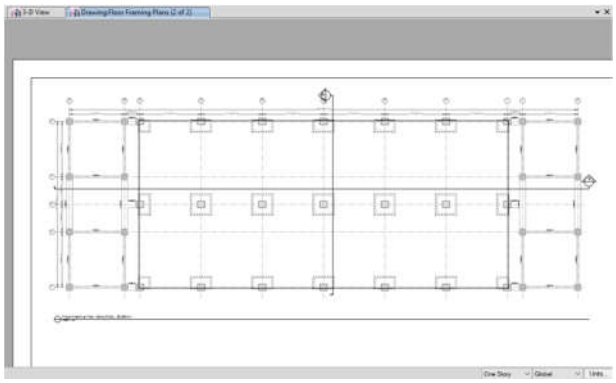

Fig.1PLAN

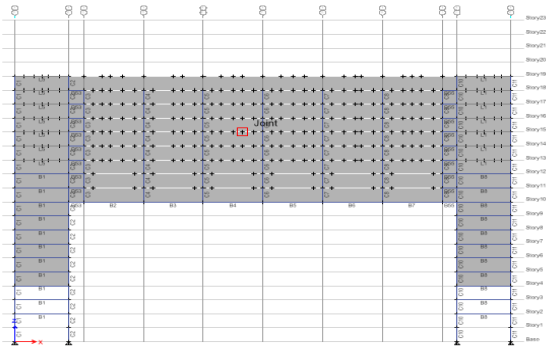

Fig.2 ELEVATION

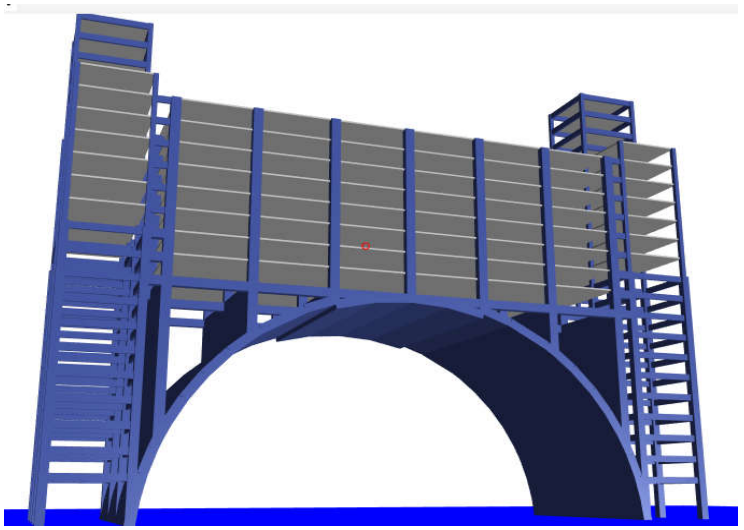

Fig.3 3D VIEW

4.2 GENEAL DATA

4.2.1 FRAME STRUCTURE DATA

S.NO.	PERTICULAR	DIMENSIONS
1	Length of building	83 m
2	Width of building	27 m
3	Height of building	69 m
4	Typical story height	3 m

4.2.2 Loads description

i. Live load (on floor) = 3 KN/m^2 (IS 875: 1987- PART-2)
ii. Live load (on roof) = 1.5 KN/m^2 (IS 875: 1987- PART-2)
iii. Wall load = 2.3 KN/m^2
iv. Density of wall = 10 KN/m^2
v. Floor finish = 1 KN/m^2
vi. Density of concrete = 25 KN/m^2
vii. Grade of concrete = M_{20} & M_{25} KN/m^3
viii. Grade of steel = Fe 415
ix. Zone = II
x. Zone factor = 0.10

5.0 ANALYSIS OF FRAME STRUCTURE

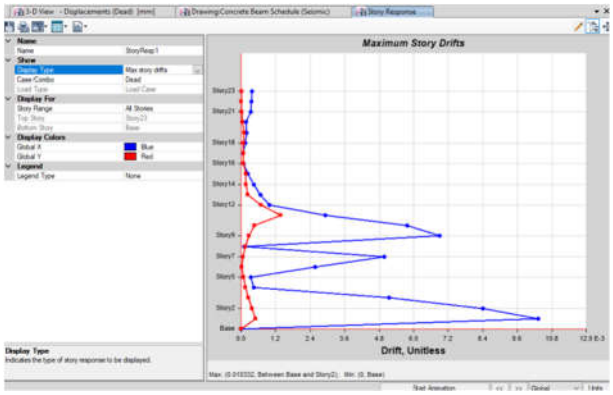

Fig.4 MAX STORY DRIFT

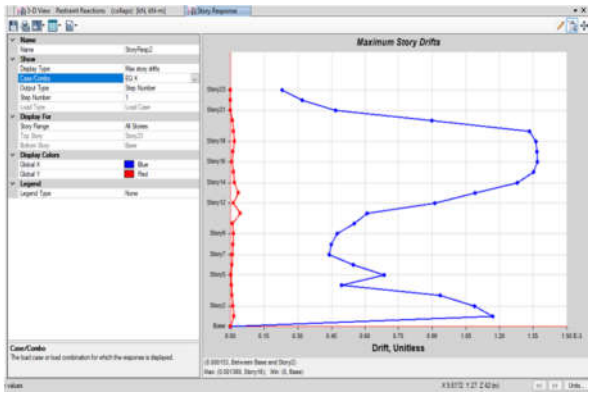

Fig.5 MAX STORY DRIFT (EQ)

RESULTS:

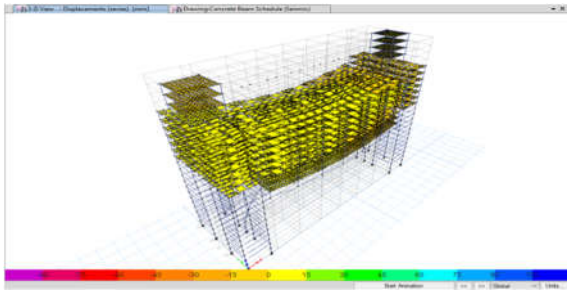

Fig.6 DIFFLECTION DETAILS

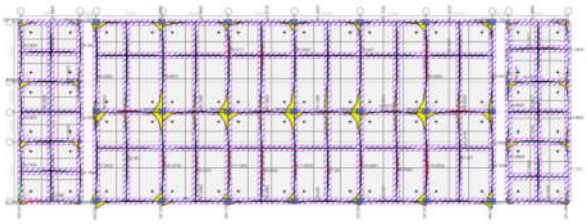

Fig.7 SHEAR FORCE DETAILS

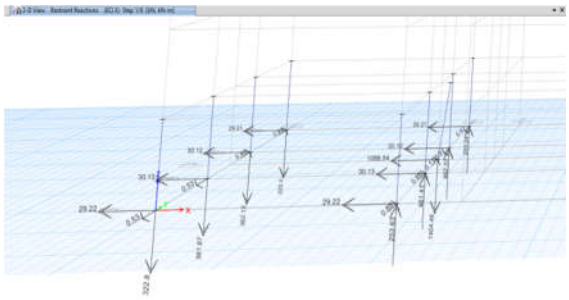

Fig.8EARTHQUAKE REACTIONS

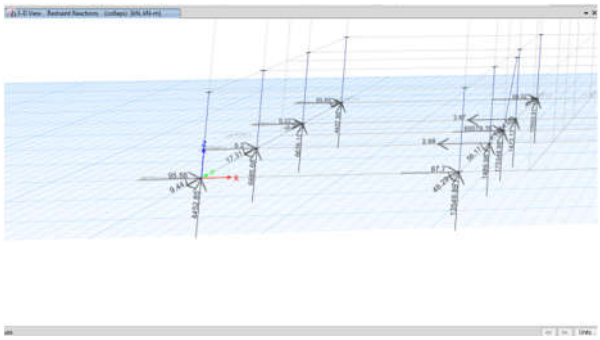

Fig.9 SUPPORT REACTIONS

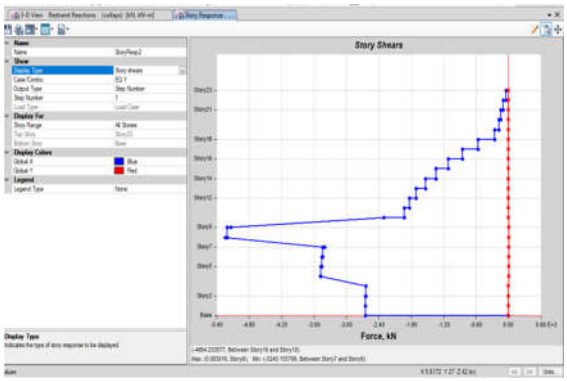

Fig.10 STORY SHEAR DUE TO EQ

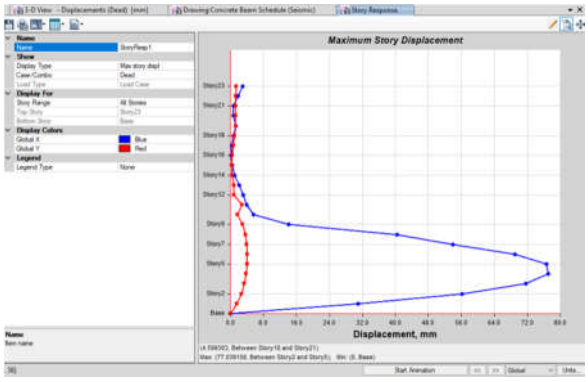

Fig.11 STORY DISPLACEMENT

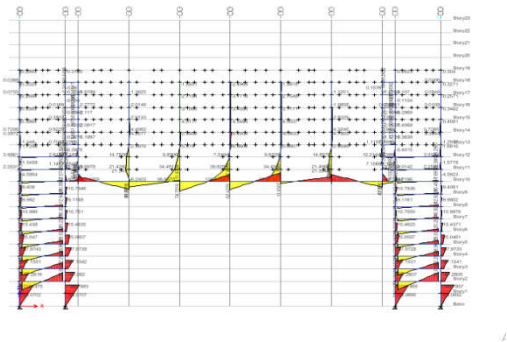

Fig.12 BENDING MOMENT

6.0 CONCLUSION

From the above research the following conclusions were made**:** The behavior of high rise structure for both the scheme is studied in present paper. In this paper we got the outcomes from scientific model for models. The graph clearly shows the story drift, story shear, support reactions. It is also notice that the results are more conservative in Static analysis as compared to the dynamic method resulting uneconomical structure in zone2.

i. The story drift increases from top story to bottom story in zone2 at story 23 the drift is maximum as compared to other stories.

ii. The story shear is more for the moments as we compared with the all forces.

iii. The Z direction force for support reactions has maximum value as we compared with X direction and Y direction support reactions.

iv. The assigned designs are safe and those gets good results.

v. In only S.M.R.F (special moment resisting frame) the cross sectional properties of beams and columns are high, and the axial forces, moments, shear force, tensile force, storey lateral load, drifts and base shear are maximum in this case.

vi. The seismic analysis results are included in this project.

vii. The design reinforcement of the project the percentage of steel is came economical of 0.8%.

viii. From the results, it is clear that, shear walls are to be present in the high rise buildings to control storey displacement, storey drift and centre of mass displacement.

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