IJMTARC – VOLUME – IX – ISSUE – 34, APR - JUN, 2021 ISSN: 2320-1363

ANALYSIS AND STRUCTURAL DESIGN OF HOSPITAL BUILDING C+G+5 USING ETABS

G. VISHNU VARDHAN GOUD, MEENIGE HARSHITHA, KOSGI RAVI, S. ARUNACHALAM GOUD, G. CHANDRASHEKAR, Dr. AFTAB TANVEER
Dept. of Civil Engineering, SVITS, Mahbubnagar, Telangana, India.

***Abstract*:** The main steps of any building construction and planning is drafting, analysing and designing the building. In the present days of improving science and technology, analysing and designing of a building has been made easy by using ETABS software. ETABS software helps civil engineers to make their work easy and decreases time necessary for planning. The project going to be done is design of a multi-storey building which is going to be used as a residential. The building plan has been drafted using the AutoCAD software by the requirement and available area. The super structure i.e. the building frame has been analysed and designed using the ETABS software. In the present project C+G+5 building consider to analysis and design for gravity and lateral (wind and earth quake) loads as per Indian standard. By using the software building can be analysed and we can check for any failures in the analysis and redesign them, so that we can prevent failures after construction. By using the output building can be constructed according to the design.

INTRODUCTION

A building is a man-made structure with a roof and walls standing more or less permanently in one place. Buildings come in a variety of shapes, sizes and functions, and have been adapted throughout history for a wide number of factors, from building materials available, to weather conditions, to land prices, ground conditions, specific uses and aesthetic reasons. To better understand the term building compares the list of structures. Buildings serve several needs of society – primarily as shelter from weather, security, living space, privacy, to store belongings, and to comfortably live and work. A building as a shelter represents a physical division of the human habitat (a place of comfort and safety) and the outside (a place that at times may be harsh and harmful). Ever since the first cave paintings, buildings have also become objects or canvases of artistic expression. In recent years, interest in sustainable planning and building practices has also become an intentional part of the design process of many new buildings. A slab is a flat two dimensional planar structural element having thickness small compared to its other two dimensions. It provides a working flat surface or a covering shelter in buildings. It primarily transfers the load by bending in one or two directions. Reinforced concrete slabs are used in floors, roofs and walls of buildings and as the decks of bridges. The floor system of a structure can take many forms such as in situ solid slab, ribbed slab or pre-cast units. Slabs may be supported on monolithic concrete beam, steel beams, walls or directly over the columns. Concrete slab behave primarily as flexural members and the design is similar to that of beams.

IJMTARC – VOLUME – IX – ISSUE – 34, APR - JUN, 2021 ISSN: 2320-1363

TYPES OF LOADS

The buildings are subjected to both vertical and horizontal loads. At the preliminary design stage all the components of buildings are designed for vertical loads only. Ideally an efficient system should not require an increase in the sizes of members when the effect of lateral load is also incorporated. Such designers are known as 'premium free' designers and may be different to achieve.

Horizontal loads can be divided into the following three categories:

- Wind loads
- Earthquake loads

WIND LOADS

A mass of air moving at a certain velocity has a kinetic energy to 1/2MV*V, where M and V are the mass and velocity of air in motion. When an obstacle like a building is met in its path, a part of the kinetic energy of air in motion gets converted to potential energy of pressure. The actual intensity of wind pressure depends on a number of factors like angle of incidence of the wind, roughness of the surrounding area, effects of architecture features, i.e., shape of the structure etc. and lateral resistance of the structure. Apart from these, the maximum design wind pressure depends on the duration of the gusts and the probability of occurrence of an exceptional wind pressure. However, for most of the buildings, the wind pressure, specified in the code (Indian Standards, I.S 875-1964) are usually sufficient.

In every tall and slender building (not common in India) aerodynamic instability may develop. This is because of the fact that during a wind storm the building is constantly buffeted by gusts and starts vibrating in its fundamental mode. If the energy absorbed by the building is more than the energy it can dissipate by structural damping, the amplitude of the vibration goes on increasing till failure occurs. A detailed study supported by wind tunnel experiments is often necessary in these cases. Some useful details about dynamic wind loads on structure have been by Davenport.

EARTHQUAKE LOADS

An earthquake (also known as a quake, tremor or temblor) is the result of a sudden release of energy in the Earth'scrust that creates seismic waves. The seismicity, seismic or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time.

Earthquakes are measured using observations from seismometers. The moment magnitude is the most common scale on which earthquakes larger than approximately 5 are reported for the entire globe. The more numerous earthquakes smaller than magnitude 5 reported by national seismological observatories are measured mostly on the local magnitude scale, also referred to as the Richter scale. These two scales are numerically similar over their range of validity. Magnitude 3 or lower earthquakes are mostly almost imperceptible or weak and magnitudes 7 and over potentially cause serious damage over larger areas, depending on their depth. The largest earthquakes in historic times have been of magnitude slightly over 9, although there is no limit to the possible magnitude. The most recent large earthquake of magnitude 9.0 or

IJMTARC – VOLUME – IX – ISSUE – 34, APR - JUN, 2021 ISSN: 2320-1363

larger was a 9.0 magnitude earthquake in Japan in 2011 (as of October 2012), and it was the largest Japanese earthquake since records began. Intensity of shaking is measured on the modified Mercalli scale. The shallower an earthquake, the more damage to structures it causes, all else being equal.

MODELING OF THE STRUCTURE

GENERAL

R.C moment resisting frame structure having G+15 storey is analysed for garvity and latral load (earth quake and wind loads). The effect of axial force, out of plane moments, lateral loads, shear force, storey drift, storey shear and tensile force are observed for different stories. The analysis is carried out using ETABS and data base is prepared for different storey levels as follows.

MODELLING OF R.C MOMENT RESISTING FRAME STRUCTURE

In this present study conventional building is considered. The constriction Technology is R.C.C frame structure and slabs. The modelling is done in ETABS as follows.

- The structure is divided into beam and column elements.
- The nodes are created as plan architect plan and node are connected through beam command, columns also connected.
- Boundary conditions are assigned to the nodes wherever it is required. Boundary conditions are assigned at the bottom of the structure i.e., at ground level where restraints should be against all movements to imitate the behavior of structure.
- The material properties are defined such as mass, weight, modulus of elasticity, Poisson's ratio, strength characteristics etc. The material properties used in the models.
- The geometric properties of the elements are dimensions for the section.
- Elements are assigned to structure.
- Loads are assigned to the joints as they will be applied in the real structure.

The model should be ready to be analysed forces, stresses and displacements

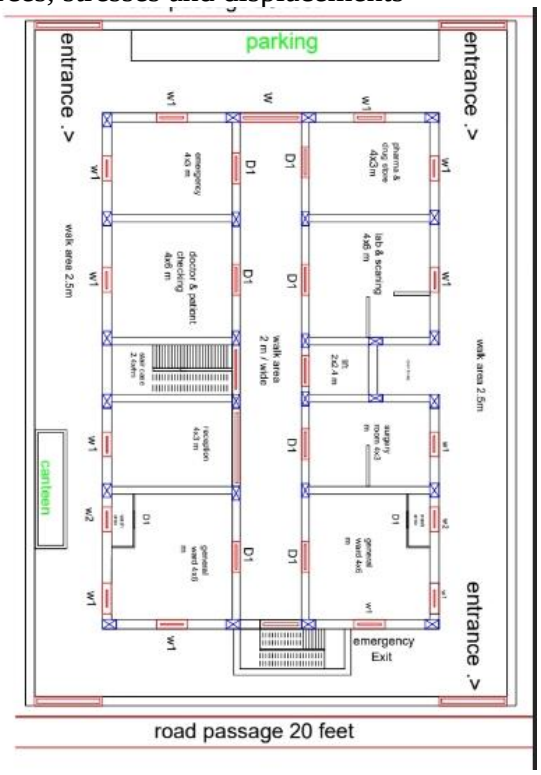

Fig: Plan of the structure

IJMTARC – VOLUME – IX – ISSUE – 34, APR - JUN, 2021

ISSN: 2320-1363

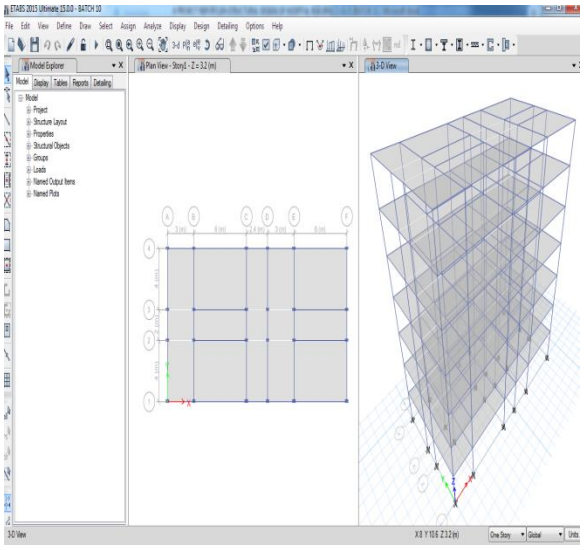

Fig: Bending moment Diagram

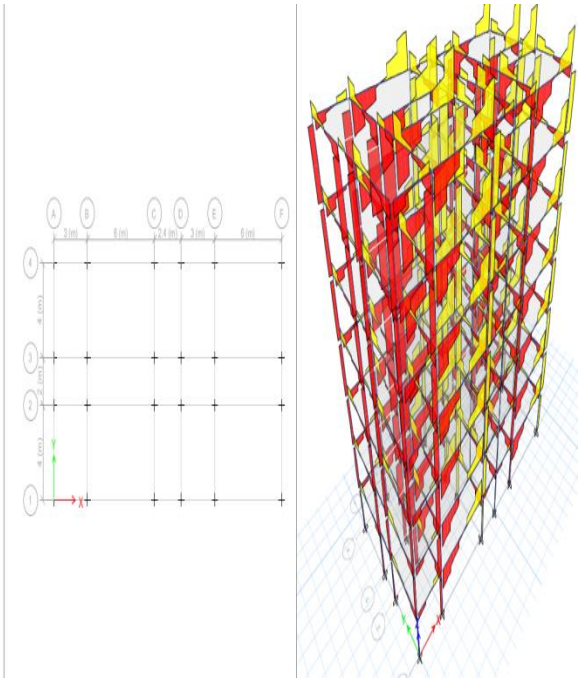

Fig: 3D view of the structure

ANALYSIS AND RESULTS

The present structure is modelled and analysed and analysis using ETABS. For the analysis of gravity load and seismic loads. The live load of the structure is considered 2 kN/m^2. For the lateral load analysis (earthquake) parameter are considered as per Indian code basis.

SUPPORT REACTIONS

If a support prevents translation of a body in a given direction, a force is developed on the body in that direction. Fixed support the support prevents translation in vertical and horizontal directions and also rotation, Hence a couple moments is developed on the body in that direction as well.

BIBLIOGRAPHY

We have used a number of books and code as a reference for carrying out this project work. Some of the books that we refer are mentioned below. **INDIAN STANDARD CODE**

- IS CODE 456-2000
- IS CODE 875-1987 PART I

ISSN: 2320-1363

- IS CODE 875-1987 PART II
- IS CODE 875-1987 PART III
- DESIGN AIDS TO IS -456-2000 (SP 16)
- ARRANGEMENT OF REINFORCEMENT USING SP 34

Authors Profile

- **G. VISHNU VARDHAN GOUD B.Tech** student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.
- **MEENIGE HARSHITHA B.Tech** student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.
- **KOSGI RAVI B.Tech** student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.
- **S. ARUNACHALAM GOUD B.Tech** student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.
- **G. CHANDRASHEKAR B.Tech** student in the Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.
- **Dr. AFTAB TANVEER Professor & HOD** Civil Engineering from Sri Visvesvaraya Institute of Technology and Science, MBNR.