

Analysis of Static and Dynamic forces on Irregular Reinforced Residential Building Under Seismic Exertion Using the ETABS System

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Abstract: This is a preview paper presents a study of Residential Building under Earthquake and normal condition because we know that earthquake is one of the major disaster which may lead to both human and economic loss. In past we saw their different effects on humankind by destroying economy and placing countries back many years. In these research new and preferable techniques is disused used in residential building structures under seismic implementation. So that the building can resist normal (static) and seismic forces (dynamic) conditions. This type of structure has a higher cost of construction as compared to normal, but they have an ability to withstand such tensions during seismic. In this study, computer aided study of reinforced residential building is taken under (static) and seismic forces (dynamic) conditions developed using technique called ETABS (Extended Three dimensional Analysis of Building System) software which provides a 3D results. Primarily, the study is done under normal condition and secondary, under seismic condition both study is compared on different parameters like displacement of building, storey moment storey shear, storey drift.

Keywords: Area, Study, ETABS, Seismic, 3D, Moment, Cost, Reinforced.

1. Introduction

Earthquake is one of the major disasters that can be take place naturally or by human fault cause both human and economic loss. There were near around 226 earthquakes in 2017, 203 in 2018, and 309 earthquakes in 2019. Earthquakes of magnitude 4 and above nearly doubled from 78 in 2018 to 159 in 2019, the response is taken from the Union Earth Sciences Ministry revealed. India has been grouped into four seismic zones, that is, Zone II, III, IV and V. In such surprising disaster, so this study helps to design such types of residential buildings to withstand under seismic forces.

In present most of the advanced economies still uses the irregular buildings. Now both advance and developing economies started constructing reinforced concrete building.

There are different types of techniques are developed by the countries to construct such building which helps out to in lower cost of construction and ability to resist such types of forces by use of reinforced concrete. India is divided in five seismic zones. Zone 5 is considered as one of the most dangerous earthquake zone. In this zone regions like Kashmir

valley, Western and Central Himalayas, North & Middle part of Bihar state, North-East states of Indian region, In Gujrat, the Rann of Kutch and the Andaman & Nicobar islands. Therefore, a study is done on residential building in static and dynamic condition to rectify such effects and try to compress the effects of earthquakes. In paper only the horizontal component of ground motion taken to dynamic study as we know that structures is more stiffer & strong during vertical loads with respect to horizontal loads. The aim is to study seismic response of irregular reinforced building to resist seismic forces and they are design accordingly to that, so they prevent the construction to collapse in earthquake. So, residential building is designed to withstand during earthquake by using ETABS software.

2. Preparation

For the study of the Residential building under such circumstances there are many parameters which should be considered properly, these parameters results are compared to define the how much the specified reinforced concrete building can resist the seismic forces as normal structure can't here are such important parameters are discussed.

A. Site Location

First of all, a site location is also called retail location. It is a method by which the field location, making estimate and identifying the best possibility for the people, information and use of the materials. The site Location plays a important role in doing the study of location by giving a specific, right and reliable plain which fulfill the requirement. The residential building is designed as dual system containing special moment resisting frame (SMRF) and also in static conditions, the structure is analyzed by using the ETABS software.

B. Structural System

The structural system defines the ability of high residential structure to withstand to the vertical gravity loads and lateral loads produced due to wind or static force and dynamic force or seismic force. Mainly the structural systems include only the constituent plan of different loads, and other different parameters are taken non-structural.

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Analysis of structural system based on the high-rise which was carried out to get more information and also include interior and exterior structures of the residential building. The primary lateral load-resisting system defines if a structural system is an interior or exterior one. In this paper we study and taken only the interior structures includes hinged frame, rigid frame, braced frame, Shear-walled frame, outrigger structures (supporting overhangs).

C. Loading Consideration

The residential building Structural loads plays a specific role to during planning of buildings. For this building codes are required, so that designed structure to be constructed withstand and resist the static and dynamic actions which they can have during their life. The disused actions are considered by using building codes for residential building, its geographic site, building materials. By considering actual load than the dead or live loading are same, it very helpful to study in the complex models.

To fulfill the desired seismic strength, the structure strength should be higher enough than then maximum load on the residential building so that the building codes are considered for structural design. These load factors are defined as a rough ratio of the theoretical design strength to the maximum load expected in service of the structure. It provides to achieve the desired level of reliability of a structure based on probabilistic studies that take into account the load's originating cause, recurrence, distribution and static or dynamic conditions.

1) Dead loads (DL)

Dead load defines as constant or linear or permanent loads, in dead load the following factors are considered like overall structure weight, and also fixed structure such as walls of the building, plasterboard, carpet area of each floor and roof. While before the construction the material, components and parts used in building are not considered as a dead load.

2) Live loads (LL)

The live loads are also called imposed loads this loads are considered as temporary loads or probabilistic loads, which are occurs due to the dynamic factors that includes impact of environmental effects on the building, vibration produced by humans or earth and material fatigue is also considered.

All these factors are occurring due to the live loads during maintenance of building, equipment and materials, by movable objects used by the people living in the building

3) Earthquake Load (EL)

The earthquake load is considered as an environmental Loads, it also consists the different environmental effects like wind, rain, snow, earthquake or extreme temperatures. The earthquake load is taken as EL_x vertical direction and EL_y is horizontal direction of the structure.

D. Material Properties of the Structure

The properties of the material are also concerned which includes the concrete unit weight, elasticity, considering Poisson's ratio, concrete strength, yield strength reinforcement of residential building, yield strength of shear reinforcement residential building structure is analyzed by using the ETABS

software.

3. Design Model

A seven floor design of residential building is proposed in ETABS as shown in figure 1. It is a 3D model which is designed to define different factors related to the structure of the residential building. In this site location and structural system, Material properties used, loading consideration like dead loads, live loads, environmental loads are taken in account by combing them all.

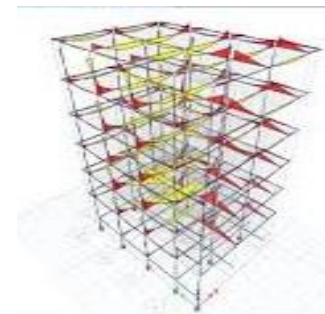


Fig. 1. Seismic analysis on ETBA

4. Conclusion

A study is done on the residential building under seismic effect using ETABS, this will enhance the performance of the residential building during environmental loads and have the ability to withstand which save as economically and loss of lives. Shape use and orientation of residential building in given area study is done. In this displacement, floor, moment for both static and dynamic analysis in horizontal and vertical direction is studied. Because during the construction of high residential building the static analysis is inadequate, so the dynamic analysis is required.

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