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"ANALYZE THE BENDING MOMENT IN THE REGION OF GRID SLABS AS COMPARED TO FLAT SLABS"

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Abstract: To design, the analogous static method is employed. Assess the buildings using Indian Standard classification Building codes for quake resistance. So, in this present study, to investigate Storey drift, Bending moment, Shear Force ,Storey Displacement, Stiffness by ETABS and specially find Reinforcement for grid slab and flat slab. It has been noticed that the grid slab structure's earthquake performance was better because in contrast to a flat slab structure.

Keywords – **Storey drift, Bending moment, Shear Force, Storey Displacement, Stiffness, Reinforcement**.

I. INTRODUCTION

Bridge Since the dawn of civilization, shelter has been a crucial human requirement. Different structure types are built to improve living conditions. Research is being done to make the building cosy, secure, and cost-effective. In order to accommodate the population, which is increasing exponentially, tall constructions are currently more frequently needed in urban areas. Efficiency in handling the seismic forces, which are unpredictable and random in nature, is a problem that urban planners must address in order to achieve vertical growth of cities. As a result, rigorous seismic modelling is required. Different vibrations and damage are brought on by seismic forces in various locations. To comprehend the impact of seismic force, factors like vibration intensity, duration, etc., are crucial. Therefore, it is crucial to understand how structures behave during earthquakes, including lateral displacements, story drift, storey shear, and base shear. The Reaction Spectrum Method and the Time History Method are two of the different seismic analysis techniques used to determine a structure's seismic response. When a structure is weak during an earthquake, it is when it fails. When an earthquake happens in inhabited regions, it often results in significant loss of life and property due to the geotechnical nature of the Earth's subsurface. Earthquakes frequently result in significant destruction.

An RCC framed structure is basically an assembly of slabs, beams, columns and foundation inter-connected to each other as a unit. The load transfer, in such a structure takes place from the slabs to the beams, from the beams to the columns and then to the lower columns and finally to the foundation which in turn transfers it to the soil. The floor area of a R.C.C framed structure building is 10 to 12 percent more than that of a load bearing walled building. Monolithic construction is possible with R.C.C framed structures and they can resist vibrations, earthquakes and shocks more effectively than load bearing walled buildings. Reinforced concrete is a composite material in which concrete's relatively low tensile strength and ductility are counteracted by the inclusion of reinforcement having higher tensile strength and ductility. The reinforcement is usually embedded passively in the concrete before the concrete sets.
The reinforcement needs to have the following properties at least for the strong and durable.

II .OBJECTIVES OF THE PRESENT STUDY

- To analyze the bending moment in the region of grid slabs as compared to flat slabs.
- To find maximum displacement in grid slabs and flat slabs.
- To analyze Stress on flat slab as compared to grid slab.
- To find storey shear due to earthquake along x-axes any y-axes.
- To find overturning moment s maximum at base and at top

III. LITERATURE SURVEY

Sethia et al. (2017) Compared to different types of Flat slab. Concrete and steel required is less in Flat with Drop panel. Drops are important criteria in increasing the shear strength of slab. For high rise structure, in order to increase rigidity of slab, column heads are incorporated. Drop panel increase negative moment capacity of slab. It stiffens the slab and therefore reduces deflection. Compared to different grids of grid Slab, Concrete and steel required is less in (1.5*2.0 m) grid panel. Rate of shuttering of grid slab is almost double the rate of Flat slab. Grid slab requires special or proprietary formwork, due to which flat slab with drop is preferred.

Patel and Padamwar (2017) Analysed that in all the systems, the storey drift is within the permissible limits as per IS:1893 (Part 1). However grid floor system show better results when compared to other slab systems. When it is compared to Flat Slabs there is an increase of 163.57 % in the cost of Grid Slabs and increase of 45.97 % in the cost of Conventional slabs. This results in a reduction of 66.12 % in the amount of storey drift in Flat Slabs. There is a huge increase in the quantity of steel and concrete in Grid Slabs system when compared to Conventional Slabs or Flat Slabs.It is because of the increase in the number of beams in the Grid Slabs system. In Flat Slab system the lateral loading is most effectively resisted. Grid floor systems have longer service life. Due to the earthquake hazards flat slabs with shear walls are provided. Variation of cost is affected by the response reduction factor. Earthquake resisting techniques like base isolation, shear walls can be used to increase the effectiveness of the structure.

Indrani (2018) It studies the Dynamic Analysis of Multistory RCC Building Frame with Grid Slab and Flat Slab. It is revealed from the study that base shear of grid slab building is more than the base shear of flat slab in building in both directions. Drift in grid slab building and flat slab building is within limit in both X and Y-directions. Axial force in intermediate columns of grid slab building is less as compared to flat slab building. Building drift in flat slab building is more as compared to grid slab building in each story and in both X and Y-directions. Axial force in end columns of flat slab building is less as compared to grid slab building.

Waghule et al. (2018) reviewed on bubble deck slab and concluded that the usage is reduced by replacing the concrete by recycled plastic and reduces production of cement. Which will help in reduction of global CO2 emissions. Hence this technology is environmentally green and sustainable. Reducing material consumption made it possible to make the construction time faster and reduces the overall cost of construction. By using this technology dead weight of slab is reduced up to 18%. Foundation sizes become smaller due to the reduced dead weight. The Bubble Deck configuration gives much improved shear capacity, flexural capacity and stiffness when the same amount of reinforcement and the concrete is used as in the solid slab. Waste plastic material is utilized in construction as it gives same strength or load carrying capacity as that of conventional slab. This type of slab is advantageously utilized for longer spans halls such as auditorium and theatre halls.

IV. STRUCTURAL DESIGNING

Structural engineers have proper technical knowledge for structural detailing and their analysis. So, they are more experienced to design structures. The structural designing procedures carried out by the structural engineers include calculating the loads and the stresses acting on the building, analysis results for the applied loading, design of sections of structures to sustain the loads, so that the structure designed will withstand the loads predicted safely.The structural engineers are also involved in the selection of materials best suited for the structure. This will hence ask for good knowledge about the different materials that are used in the construction at the current condition like their economic factors, strength factors and durability factors.The quality factors of different building materials can be analysed by a structural engineer to finalize their suitability in the design of the beams, columns or the foundations.

Another skill of a structural designer is the analysis of structures. This is presently carried out by the software like ETABS, STAAD PRO, SAP etc. As years pass new software are being developed for the analysis of structures at different conditions of loads like wind, earthquake etc.Most of the structural engineers have to study and work with this software with knowledge of both the technical details and the programming details. In some organizations, the analysis

is carried out by a programmer who may not have the civil engineering graduation but is assisted by a structural engineer.

V.DESCRIPTION OF MODEL TYPE

The model consists of RCC frame with concrete as a base material. This present research mainly consists of Grid Slab and Flat slab in building at each level. Flat slab is being used at front portion of building to make beamless area for aesthetic purpose whereas inner side of building is having grid slab to resist loads easily and to increase rigidity of the structure. This consideration of both flat slab and grid slab helps us to minimize use of closely spaced columns. The various parameters taken for analysis and design process are mentioned below

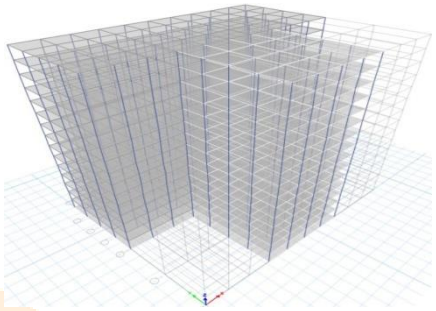

Fig.1: Isometric view of structure.

No. of Floors = G+14 Height of each Floor = 3m

Beam Size = 300 mm X 250 mm

Column Size's taken = 500mm X 400mm, 350mmX300mm, 450mmX350mm and 550mmX500mm.

Flat Slab Thickness = 150 mm

Grid Slab Thickness (Waffle Slab) = 450 (Overall) Live load on each floor = 3 KN /m^2

Load due to Floor Finish = 0.75 KN/m^2

Type of Soil = Medium

Zone = V

Zone factor of 0.36 for Zone 5

Several megacities like Jammu and Kashmir, some parts of Ladakh, Himachal Pradesh, Uttarakhand, Rann of Kutch in Gujarat, some parts of North Bihar and Andaman & Nicobar Islands.

Grade of Concrete used = M25

Grade of Steel = Fe-415

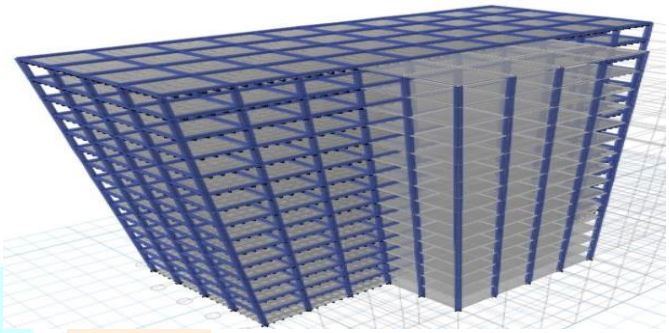

Fig.2: 3D Rendered view of building.

The structure composes of both flat and grid slabs. Above diagram makes it clear by showing rendered view of structure. When slabs are used without beams, they are called flat slabs. That means load coming on slab is resisted by slabs itself but not transferred to beams. In case of flat slab load is directly transferred from slab to columns. In this configuration of slabs, load is not distributed in one way or two way phenomenon. Drop panels were used to prevent the structure from punching failure. The Plan decided to complete this research was of greater importance.

VI.CONCLUSIONS

- Here it is clear that stress will be maximum at mid span of slab .Stress is found to be maximum on flat slab as compared to grid slab. So, chances of cracks will be more in flat slabs.
- As found in analysis result stress is minimum at column joints in both the cases but in case of flat slab drop panels are used to minimize stress on columns. Drop panels transfer loading uniformly from all sides.
- It is clear that storey shear due to earthquake along x-axes will be maximum as loading will be in that direction and shear will be zero along y direction in this case as shown clearly in graph. In addition to this it can be found that shear will be maximum always at base as magnitude of earthquake increases from top to bottom. It will be minimum at top of structure.
- It is found from graph below that overturning moment s maximum at base and goes on decreasing when we move upwards. Similarly shear is also found maximum at base and minimum at top.
- Story stiffness values are minimum along Y direction whereas it is found maximum in X direction. This is the configuration of building, longer span shows greater value for stiffness whereas shorter span shows minimum magnitude for stiffness.
- Deflection is always found more in case of flat slabs as they are not supported by beams whereas grid slabs show good resistance for deflection.
- By this present research work came to conclusion that if it is any important building like public building then it is necessary to use grid slabs to make frame as rigid as possible. On the other hand, it will cost more but will be durable and safe as compared to flat slabs.

- It can be clearly seen that area of reinforcement needed for Grid slabs is more than Flat slabs in present research.
- Flat slabs are mostly used in the cases where we prioritize aesthetic look of building and where we want to provide any different architectural look in building.

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