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Dynamic Analysis Of Multistoried Building Using Staad Pro

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ABSTRACT

As an engineer, we should be responsible for designing and constructing a structure to minimise structural damage and its components during the earthquake. The most sensitive questions that each engineer faces are the choice of the correct technique for assessing the structure's seismic performance. Thus, here we introduce the 'dynamic analysis' approach, one of the effective seismic efficiency assessment processes. The dynamic analysis can be done by using the software Staad Pro. The multistorey building with ground floor + 3 floor in zone v and zone 2 is analysed manually. After that the same buildings are analysed using the Staad pro and a comparison is done in between.

INTRODUCTION

We all know that from the day of existence of earthquake, it has well proven that it is a threat to human being destroying the human lives, property and their structures. It leads to a great destruction to the country also we cannot predict when would it occur, so we have to take measures to prevent or to protect building from it. Several Research has been going to find out an effective technique that has to be incorporated in our structure for its safety.

Majority of cities in India is located along highly active seismic zones. So, such high rise building has to be analysed so it is well understood that to ensure our safety, analysis of structures, especially high rise structure is

Essential. One of the easiest way for carrying out this process is through softwares. Main advantage of using computers is that it can perform any complicated computations at a higher sped, that is very effective than manual computations.. Main advantage of using software is that 3D analysis is possible. Staad pro v8i is preferred for carrying out our project.

Table1: zone factors for different zones in India

Zone factors for different zones in India	Seismic coefficient	Seismic zone factor
5	0.08	0.36
4	0.05	0.24
3	0.04	0.16
2	0.02	0.1

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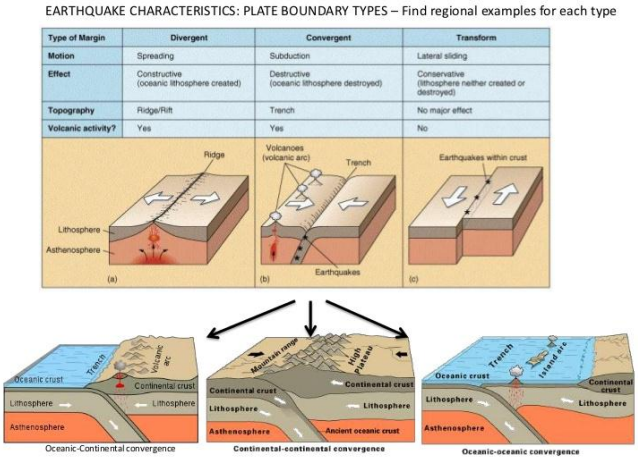

Fig 1: Graphical representation of earthquake movement in nature

Objectives Of The Project

The goal of this project is the to investigate and determining the various structural response of multistoried building

- To find the appropriate methods for dynamic analysis
- Check the seismic response of building using Software
- To analyze lateral displacement, storey drift under loads
- To find the relationship between earthquake intensities and response
- To find the earthquake intensities and comparing with the manual calculations

PROCEDURE

As a part of my project, required to study the effect of earthquake .so here I took a building having g+3storey. A computer aided designing software namely Staad pro v8i has been adopted. Earthquake intensities of zone 5 and zone 2 is analysed and a comparison is carried out between two zones and also comparing with the manual calculation. Procedure which include in the project is given below

Problem undertaken

Properties of the site

- Construction details: structure G+3
- Thickness of the external and internal wall: 200 mm.
- Height of the floor: 4.2 m downstream and 3.6 m upstream.
- Construction height: 15
- Seismic area: v
- Factor area: 0.36
- Factor of Importance:
- Factor of response decrease:5

Load properties

- Live load =12 KN/m^2
- Dead load =4 Kn/M^2

Isometric view of building

To carry out the analysis ,we have taken a multi-storeyed building having 4 number of bays in length direction each bays having 5m .Also 3 number of bays in width direction each 5 m length. First Floor height is 4.2 m and 3.6 for remaining floors.

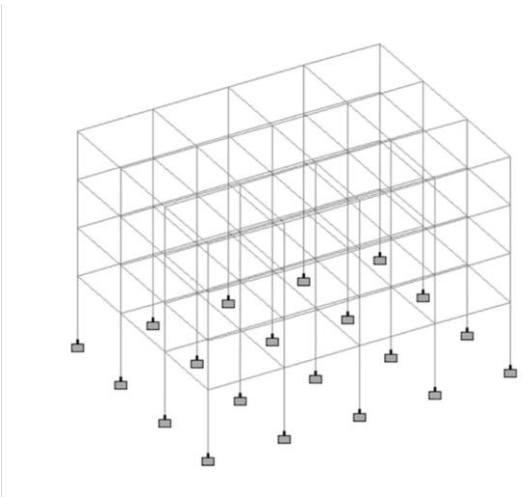

Fig 2: isometric view

RESULTS AND DISCUSSON

Results obtained under manual calculation

$\mathbf{V_B = A_h \times W}$

$\mathbf{V_B}$= design base shear=Lateral force

$\mathbf{A_h}$= design horizontal acceleration coefficient

W= seismic weight of building

$\mathbf{A_h}$= 0.09(for zone 5)

$\mathbf{A_h}$=0.025(for zone 2)

W=seismic weight due to dead load+ seismic weight due to live load =15600

$\mathbf{V_B}$**= 0.09X15600=1404(**zone 5)

$\mathbf{V_B}$**=0.025X15600=390(**zone 2)

Table 2 : manual calculation of zone 5

Storey level	W_i	h_i	$W_ih_i^2$	$K_i= W_ih_i 2/ \Sigma W_i h_i2$	Lateral force X direction	Z direction
4th	3000	13.8	571320	42%	595.36	595.36
3rd	4200	10.6	471912	35%	491.77	491.77
2nd	4200	7.4	229992	17%	239.67	239.67
1th	4200	4.2	74088	6%	77.21	77.21
		total	1347312	100%	1404	1404

As per manual calculation zone 5 have lateral force of total =1404

Table 3: manual calculation of zone 2

Story level	W_i	h_i	$W_ih_i^2$	$K_i = W_ih_i^2/$	Lateral force x direction	Z direction
4th	3000	13.8	571320	42%	163.8	163.8
3rd	4200	10.6	471912	35%	136.5	136.5
2nd	4200	7.4	229992	17%	66.3	66.3
1st	4200	4.2	74088	6%	23.4	23.4
		total	1347312	100%	390	390

In zone 2 total lateral force=390

ANALYSIS USING STAAD PRO

Analysis in zone v

Earthquake load acting on the building is given below. Earthquake is the horizontal force acting on the building, in that predominant force act on the x and z direction of building

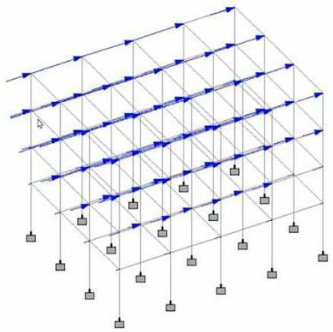

Fig 3: Lateral force acting on building

Total load acting on each nodes of first floor is given below.

The value obtained is (1.608x4)+(3.217x10)+(6.434x6)=77.206 .The value obtained from the manual calculation is equal to 77.21. So from the result obtained it is well clear that both the values are same. So we can do calculations with Staad pro having high degree of precision and time also time consuming. Another result obtained from the analysis is that as the floor height increase the load also increases

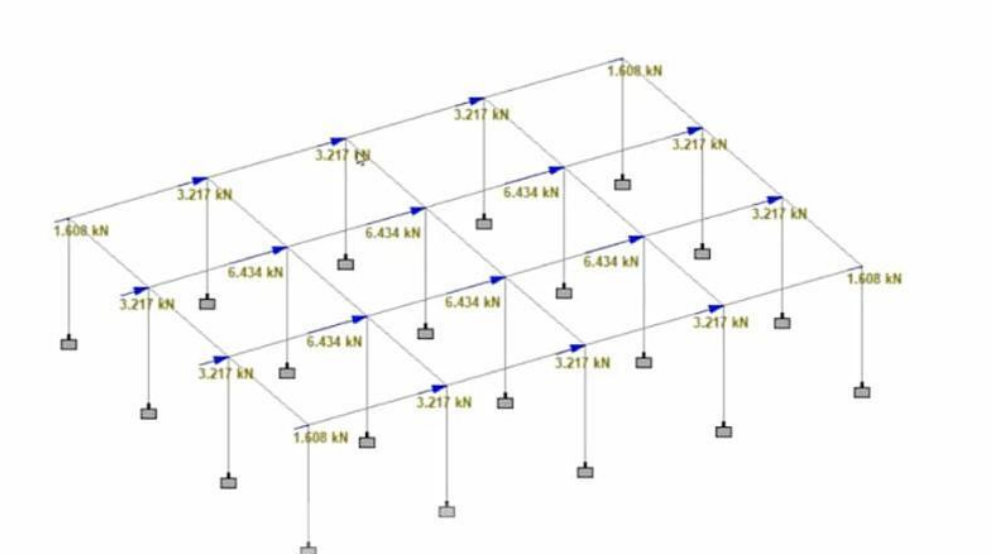

Fig 4: Load acting on each node of first floor

Analysis in zone 2

Total load acting on each nodes of first floor is given below.

The value obtained is (0.804x4)+(1.608x10)+(0.684x6)=23.35.The value obtained from the manual calculation is equal to . And it is clear that the values are equal to the manual calculation which is provided in the table no and also total load acting on the building is lesser compared to zone 5

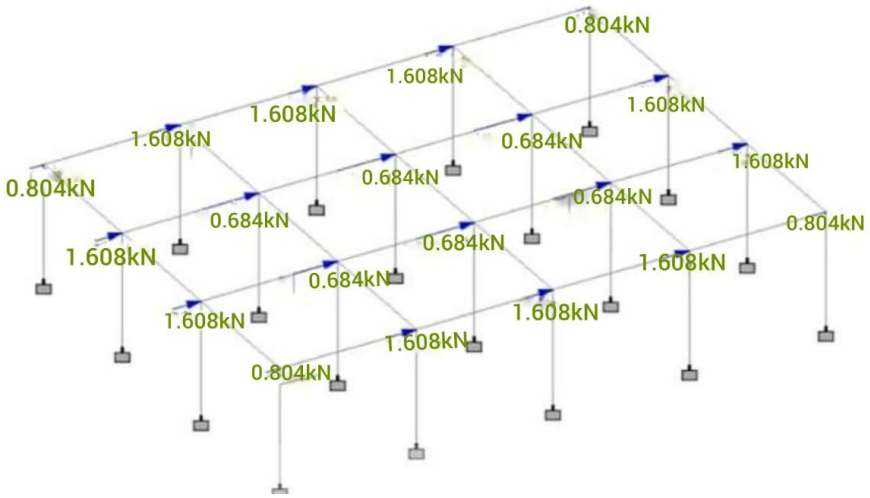

Fig 5 :Load acting on each node of first floor

CONCLUSION

As a part of the project, dynamic analysis is carried out using the software and from results obtained we can conclude that:

- The results obtained using the software have high degree of precision compared to the manual calculation and also it can save time in design and analysis work
- Value of lateral force increases when move from first floor to another
- From the analysis it is concluded that earthquake intensity in zone 5 is higher than the zone 2

- For high rise building static analysis is proved to be insufficient and dynamic analysis proves to be significant.
- Software seems to be helpful for engineers to build earthquake resist building by considering all seismic factors on the building and thereby distruction can be reduced to an extent

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