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Analysis and Resemblance of Seismic Effect on High Rise Building with & without Shear Wall using STAAD Pro

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ABSTRACT

In present age one of the most volatile natural disaster is earthquake, in which all procedure applied for earthquake resistant in multi storied structures any where shear walls are the most preferred process. In RC plates (shear wall) have properties of inelastic & stiffened member. It is a part of structure which is provided for resisting horizontal forces (like wind force, earthquake force, etc). It is very essential to determine capable, and ideal location of shear wall. In this paper we study of G+10 Storey building in Zone IV is conferred. In this article focuses on two different models with and without using shear walls in high rise building at different positions. This analysis is done by using STADD-pro Software by seismic analysis & wind effect.

KEYWORDS : STAAD Pro, shear wall, Seismic analysis, High Rise Building, lateral displacement

INTRODUCTION :- In the world Disasters are abrut, so life of people is in danger due to some natural disasters. the natural disasters, Earthquake causes maximum loss of life. In high rise building shear wall provides to bear lateral load, wind load, seismic effect & also give structure as much amount of stability. These types of walls are structurally combined with the roof or floor Buildings with shear walls have shown very good performance during earthquakes in high seismic area.

In this paper performance of shear wall in RCC building and simple RCC building have been studied with the help of two different models using STADD-pro in zone IV . The analysis is done static analysis method. The models treated for the analysis are as follows:-

Model 1 is RCC building without shear wall.

Model 2 is RCC building with shear wall.

OBJECTIVES OF THE PROJECT:-

This paper structure is based on, building with shear wall at corner. and without shear wall in G+10 Story building. To analyze the building using seismic & wind effect method in STAAD Pro software. With minimum structure properties & condition. First we Compare the lateral displacement of both structures at run by various loads in STAAD.PRO software's.

LITERATURE REVIEW :-

Mahendra Kumar. It's considered a five storey building which is subjected to Earthquake loading zone V to determine parameters like storey displacement, storey acceleration and base shear. Models were studied in V zone comparing lateral displacement, base shear and storey acceleration in X and Y direction for all structural models under consideration.

Ashok Thakur , Arvinder Singh. The principle objective of this paper is to analyse and design a multi-storied building [G + 4(3 dimensional frame)] using STAAD Pro. The design involves load calculations manually and analyzing the whole structure by STAAD Pro. STAAD. Pro features a user friendly interface, visualization tools, powerful analysis and design engines with advanced finite element and dynamic analysis.

K VenkateshT. Venkatdas. In this paper the analytical study on the lateral behaviour of the structure is mainly concentrated and how it is varying in the different zones of zone II and zone III wit heights of a 6storey, 11storey, and 16 storey structure. The study also involves the orientation of shear wall.

Akansha Dwivedi. B.S Tyagi. In this paper effectiveness of shear wall in RCC building and building with composite columns have been studied with the help of four different models using Etabs in zone IV . The analysis is done by response spectrum analysis method and static analysis method. The models considered for the analysis are as follows:

Model 1 is RCC building without shear wall,

Model 2 is RCC building with shear wall,

Model 3 is building with composite columns having no shear wall and

Model 4 is building with composite columns in presence of shear wall

Mr. Ankur vaidya, Mr. Shahayajali Sayyed. In this paper review of different researchers on the concept of multistoried building with and without shear wall is paraphrased. In India, most adopted type of earthquake resistant structures is with shear wall. These structural walls may differ based on their design and utility and their position in any building plays an important role for resisting lateral force.

Abhishek Mishra, Surjeet Verma, Kumar Vanshaj. A G+25 multistory frame with eight different locations of shear walls situated in seismic zone IV have been taken for the purpose of the study. The size of the building in plan is 18 m x 18m. Height of each story = 3m, Size of Column = 600mm x 500mm, Size of Beam = 500mm x 400mm, Shear wall thickness = 150mm, Concrete Mix Used = M30, steel=Fe 415 All the supports are assumed to be fixed in nature. All the structural properties of building and dimensions as shown in the table no.1. wall and with shear wall at corner. Damping ratio 5% and soil type is taken as medium for all the 2 different models are without shear

Amit Paul, G.D. Dhawle . The earthquake on high rise building in different position of shear wall using STAAD Pro to work out effective ,ideal location of shear wall, as much less economical in G+7 High rise building in Zone IV.

R.C .Bush, Anoop I. Shirkol. According to the Indian Code IS1893:2016, the dynamic method is a mandatory analysis procedure that needs to be performed in a structure if the height of the building exceeds 15 meters or if the structure is located in Zone IV [15]. Both the response spectrum method and the time history method are suitable for dynamic analysis.

METHODOLOGY :- Structural analysis was carried out by means of well-known computer program Staad-pro issued for structural analysis of building subjected to static loads document. In this paper the structure define has two part. In which Without shear wall building & shear wall building, In this paper many IS Codes like IS 1893:2016(Part 1) and IS 456:2000 was referred for this design purpose. The required architectural plan, sizes of beams and columns for analysis and design &define load are as follow in the table.

ANALYSE DESIGN DATA :- Following data used in the RCC building model.

Particular of items	Properties
Building storey	**(G+10)**
Total height of building	**35 meter**
Beam size	**200mm x 300mm**
Column size	**300mm x 300mm**
Shear wall thickness	**125 mm**
Slab thickness	**125 mm**
Live load	**3KN/m^2**
Dead load	**1KN/m^2**
Grade of Concrete	**M30**
Grade of reinforcing steel	**HYSD 415**
Grade steel	**Fe 415**
Density of Concrete	**25 KN/m^3**
Zone	**IV**
Zone Factor	**0.24**
Response reduction factor	**5.0**
Damping ratio	**5%**
Height of each story	**3.5 meter**
Type of soil consider	**Loose soil**

Table 1: Following data used in both RCC building model.

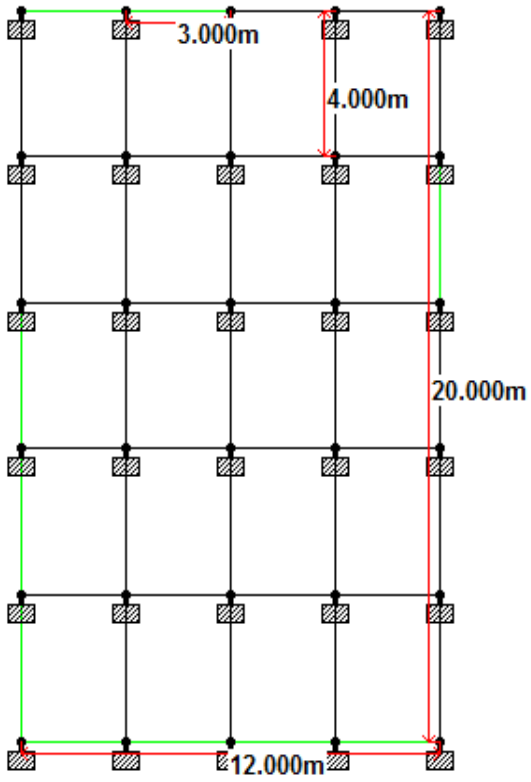


Fig 1: Plan view of building without shear wall

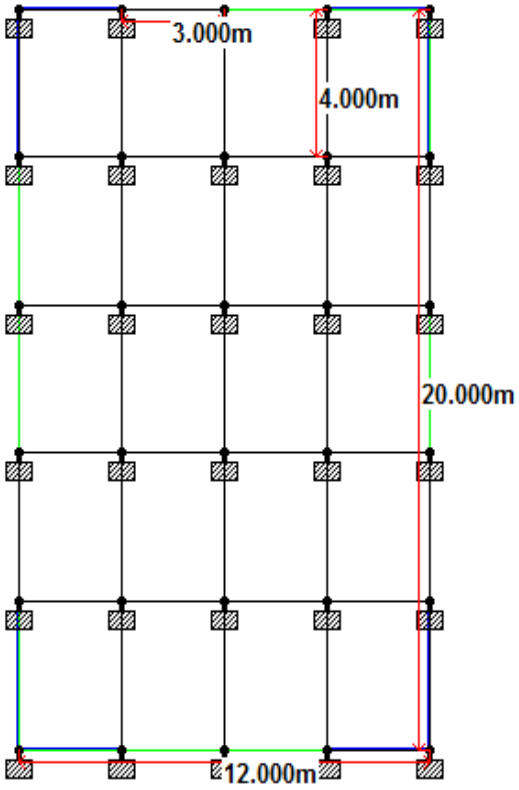


Fig 2: Plan view of building with shear wall

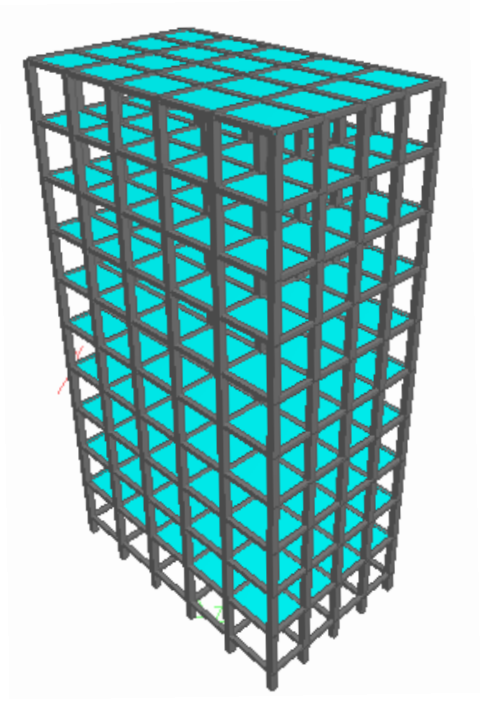


Fig 3: 3D view of building without shear wall

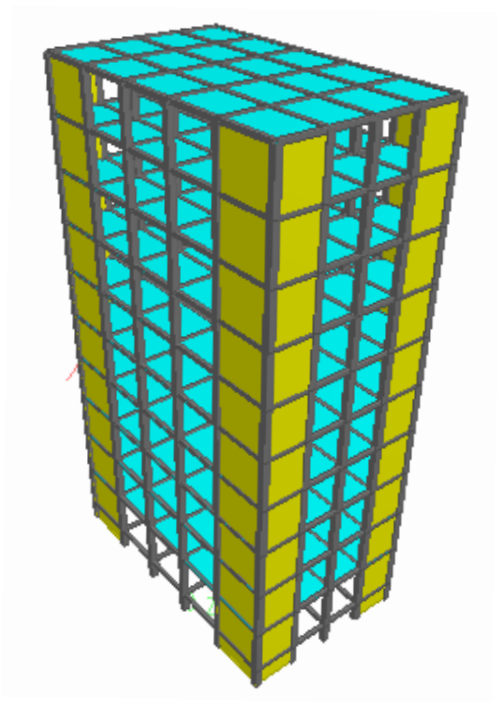
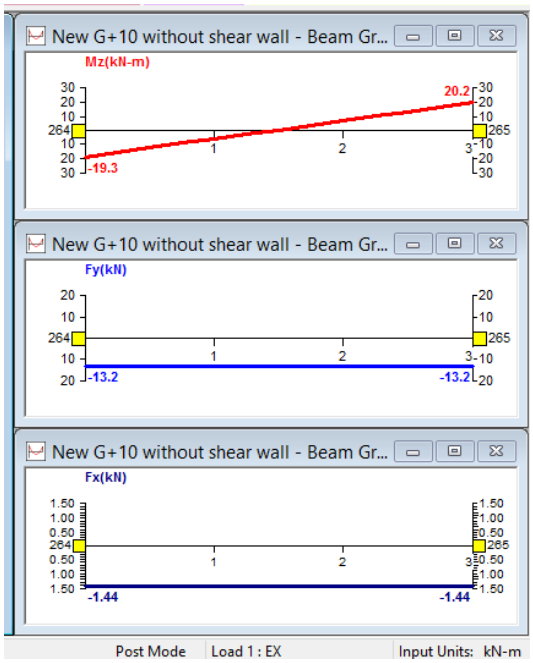


Fig 4: 3D view of building with shear wall

COMPARING ANALYSIS: Bending Moment , Shear Force & Axial Force

1.Earthquake Effect X-Z Directi



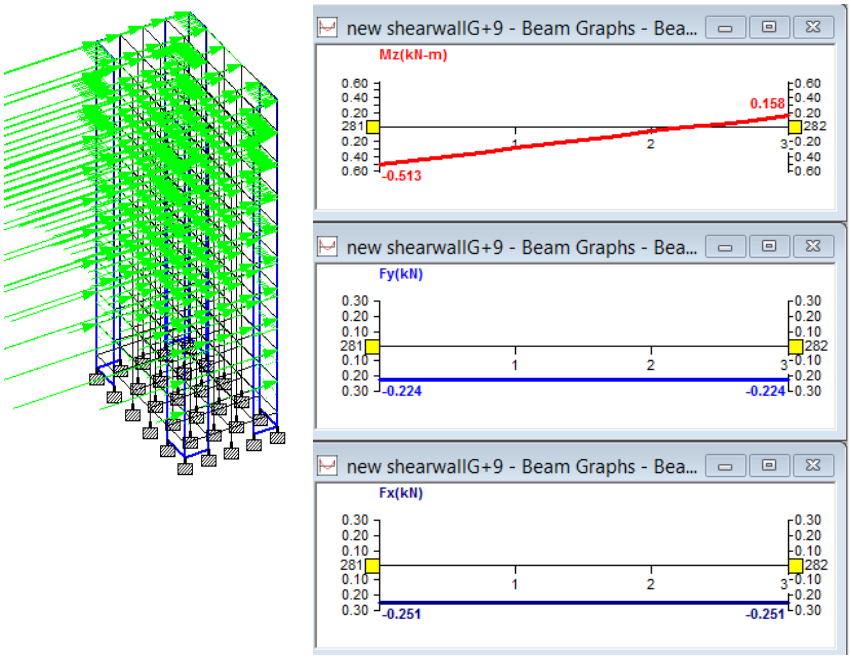
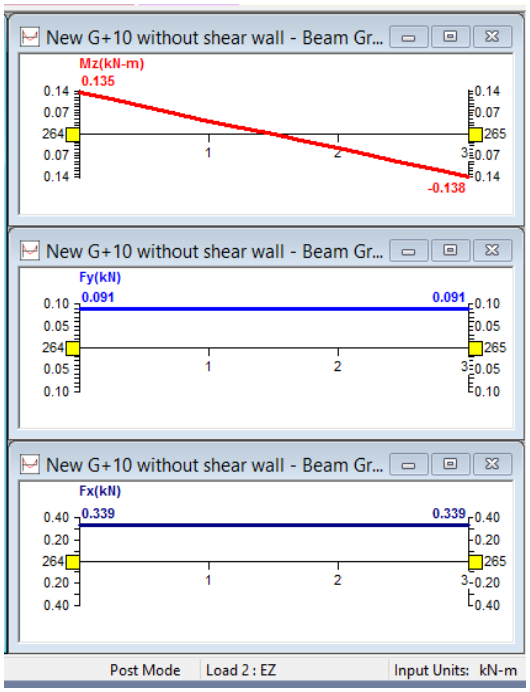


Fig 5:Earthquake effect in(X-direction)in without shear wall

Fig 6: Earthquake effect in(X-direction) in shear wall



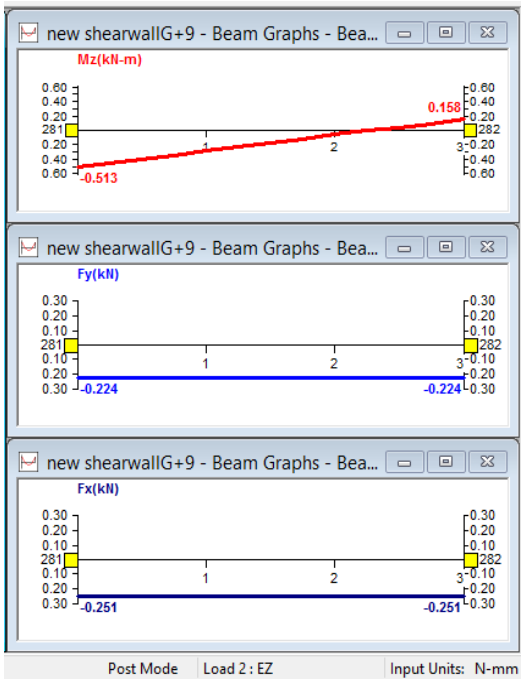


Fig 7:Earthquake effect in(Z-direction)in without shear wall

Fig 8: Earthquake effect in(Z-direction) in shear wall

2.Wind Effect In X-Z Direction

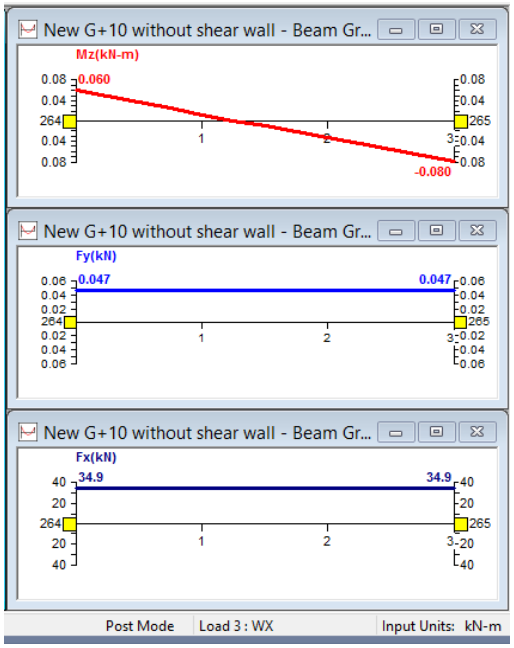


Fig 9:Wind effect in(X-direction)in without shear wall

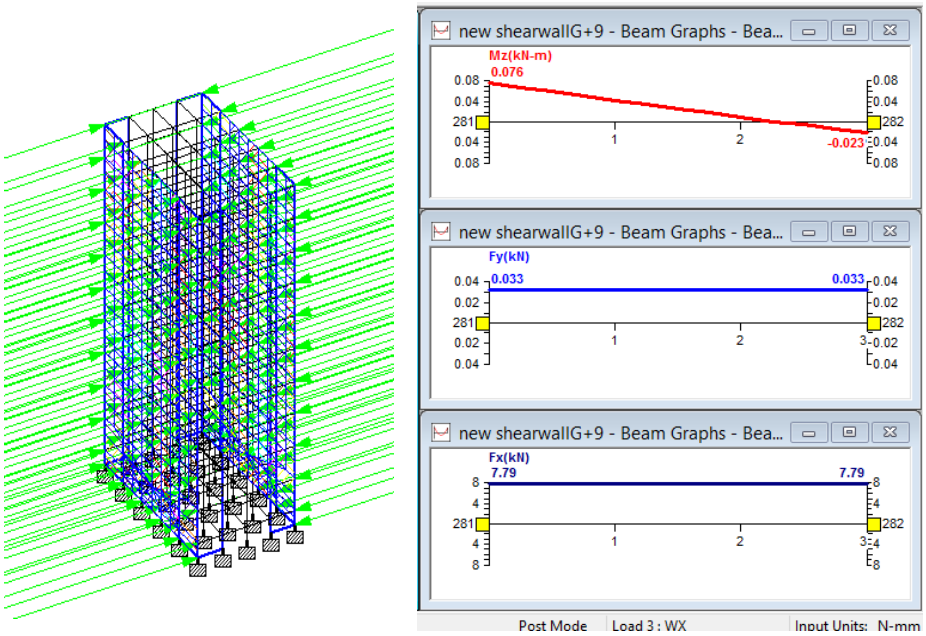


Fig 10: Wind effect in(X-direction) in shear wall

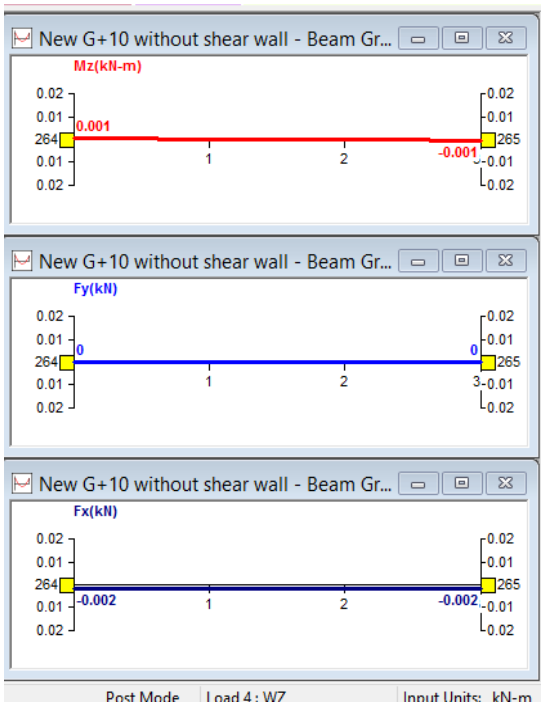


Fig 11:Wind effect in(Z-direction) in without shear wall

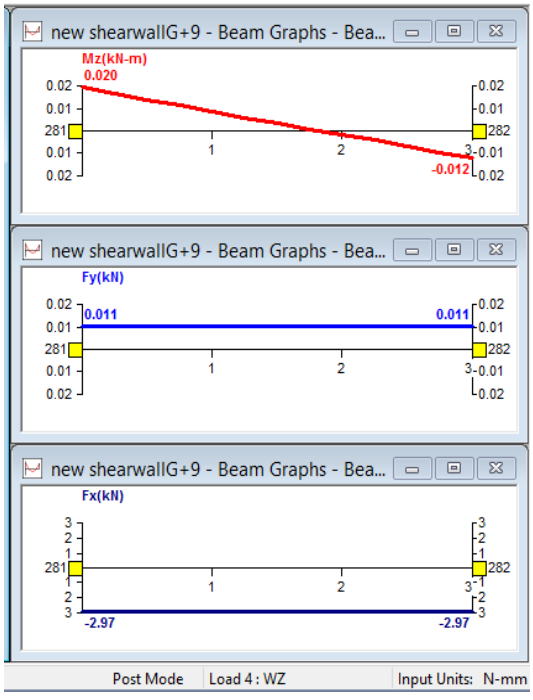
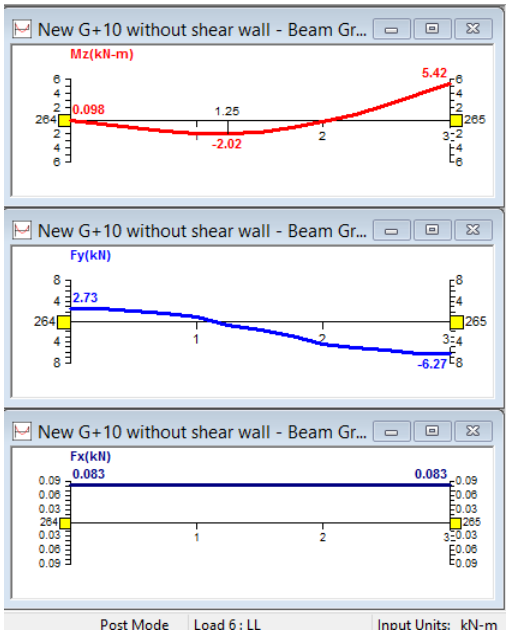
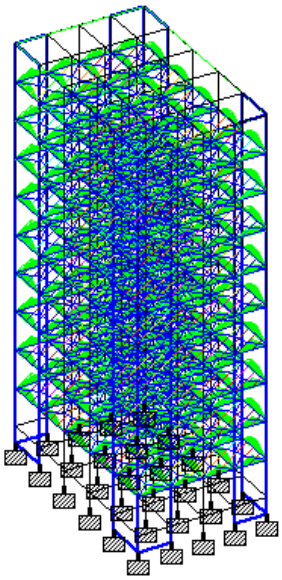


Fig 12: Wind effect in(Z-direction) in shear wall

3. Live Load In Y Direction





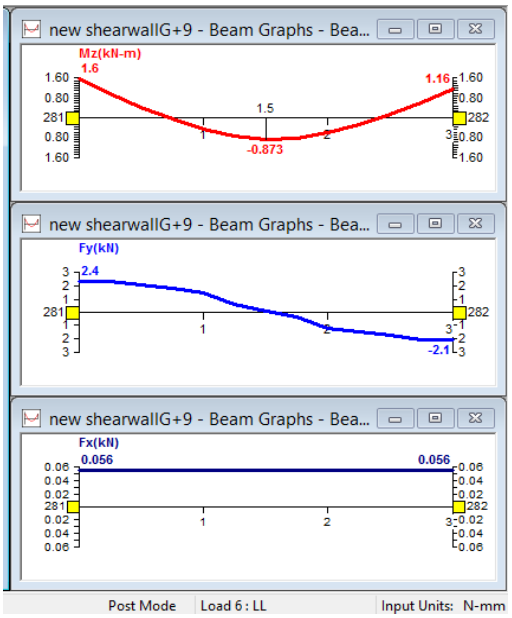
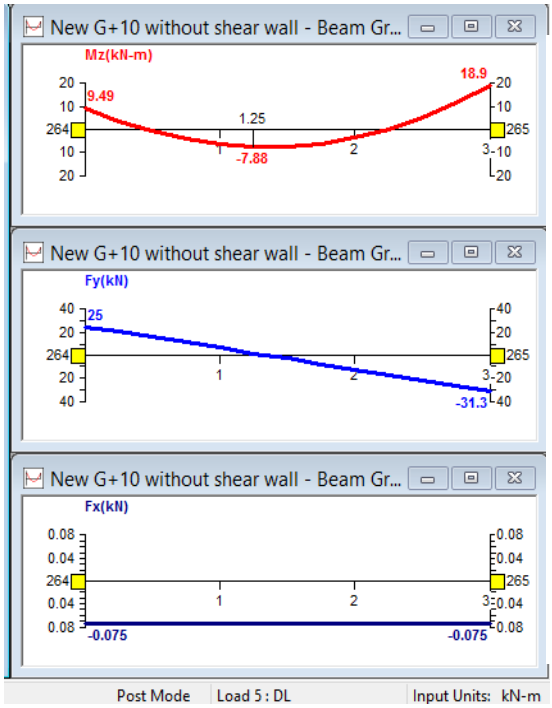
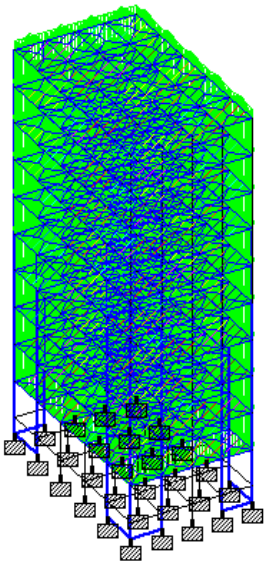


Fig 13:Live Load in(Y-direction) in without shear wall.

Fig 14: Live Load in(Y-direction) in without shear wall.

4. Dead Load In Y Direction





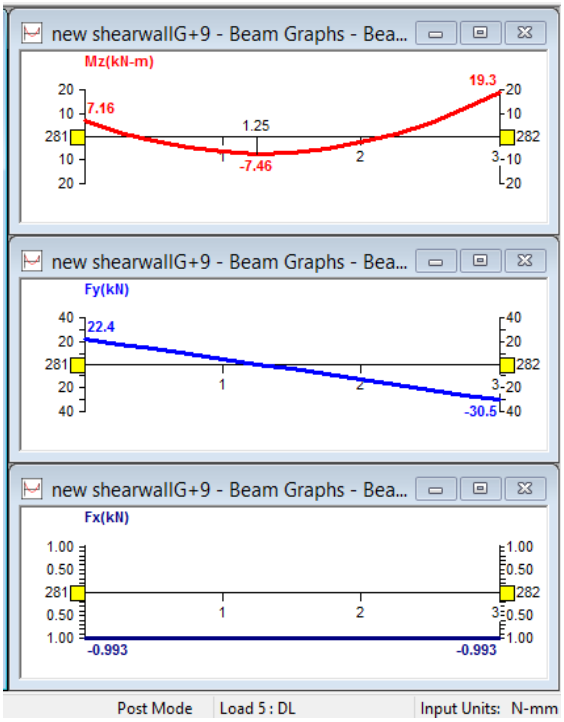


Fig 15:Dead Load in(Y-direction) in without shear wall.

Fig 16: Dead Load in(Y-direction) in shear wall.

RESULT & DISCUSSION

The displacement values obtained from analysis for both models and maximum displacement for shear wall structure & without shear wall structure is shown in Table2 & Figure 5. It can be noted in table & plotted in graphs that the provision of shear walls reduces the displacement in a building during an earthquake & wind effect. In the case of X & Y direction, the least displacement is found in the shrar wall which placing is in corner of structure in both direction

The both structure we run analyse in staad pro. Staad pro gives the out put result of boths structures .It shows maximum warning appear in without shear wall structure, instead of shear wall structure.it shows in figure given below.

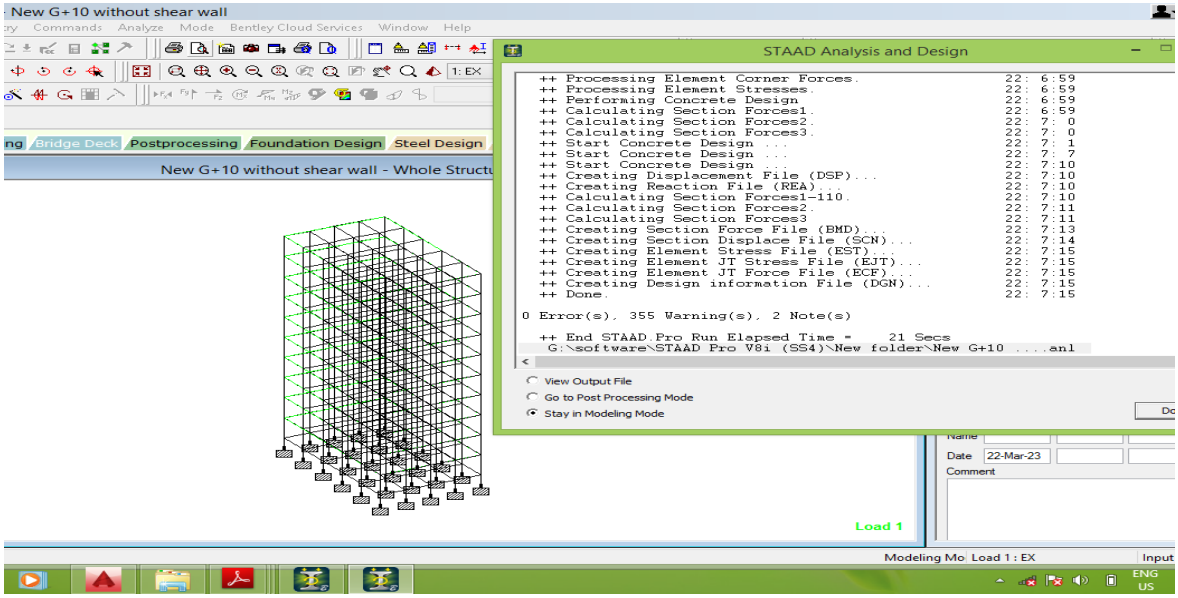


Fig 17:-Warning more shows in without shear wall structure.

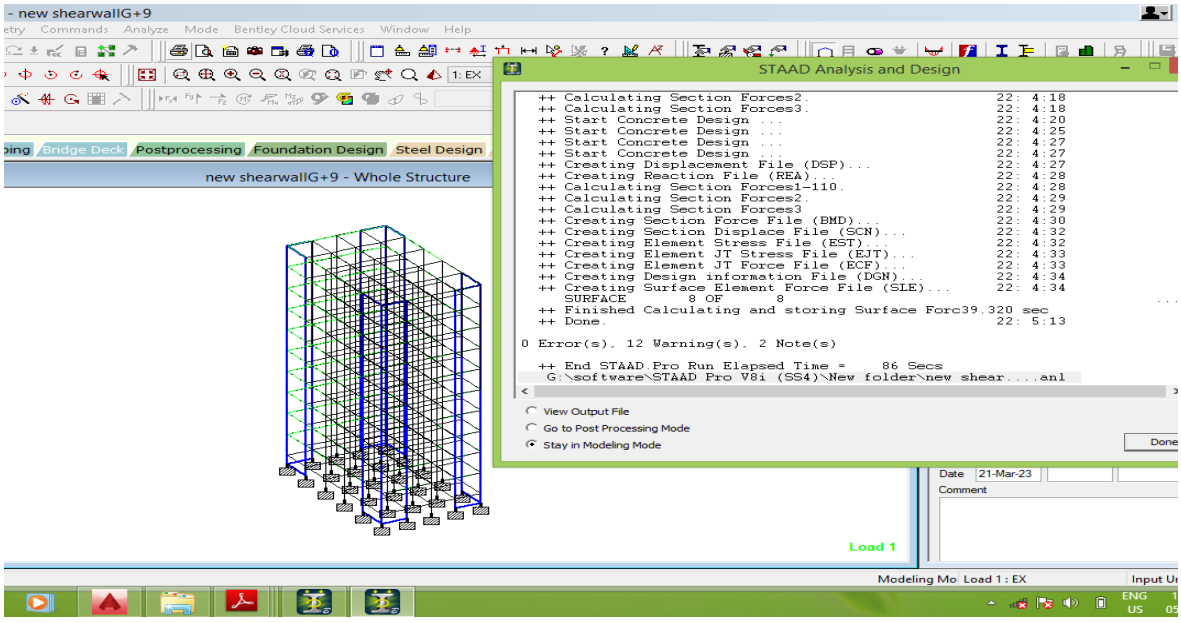


Fig 18:-Warning less shows in shear wall structure.

Lateral Displacement :- The observed results of lateral displacement was found that Without shear wall building with building in presence of shear wall showed minimum displacement. Also it is observed that the building on introduction of shear wall reduced displacement in the building substantially

Storey Displacement		
Story	Rcc(mm)	Rcc with shear wall(mm)
1	4.423	1.427
2	10.342	4.305
3	22.41	8.49
4	35.531	13.165
5	47.652	18.744
6	56.90	24.86
7	66.01	31.39
8	74.97	39.31
9	86.236	46.195
10	97.35	53.62

Table 2: Following comparing data of lateral displacement both RCC building model.

Fig 19: Graph plotted of Lateral displacement comparing both RCC building model

CONCLUSION & FUTURE SCOPE

This paper we performance analysis of shear wall & without shear wall building with the help of STAAD Pro. From all the above analysis, it is observed that for high rise building of 10 storey, building with shear wall & without shear wall. It is observed that displacement is reduced substantially shear walls. Hence it is concluded that shearwall structure counter seismic force& wind effect more as compared to without shear wall structure.

In new era of construction. shear wall building is a updated type of building in current time period instead of without shear wall building. Now a days there are many natural disaster happening ,we have to design building according to them that can reduce its effect.

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