DYNAMIC ANALYSIS FOR MEDIUM RISE MULTI STOREY R.C.C. FRAME BUILDING WITH VERTICAL IRREGULARITIES ALONG WITH WIND EFFECT.

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Abstract: Structural designers are facing the demanding of conation for the utmost able and efficient design solution while assure that the ultimate design of a frame must be utile for its predetermined function, livable for its occupier and safe over its design life-time. As the our country is the fastest growing countrified across the globe and need of shed with higher land cost in major cities like Mumbai, Delhi, Ahmadabad where further regular expansion is not much possible due to land shortage, we are left with the solution of upward expansion. Engineers, designers and builders are trying to use different materials to their best advantage keeping in view the unique properties of each material Structurally robust and aesthetically pleasing building are being constructed by combining the best properties at individual material & at the same time meeting specific requirements of large span, building load, soil condition, time, flexibility & economy high rise buildings are best suited solution. Also Wind & Earthquake (EQ) engineering should be extended to the design of wind & earthquake sensitive tall buildings. This project work discusses the analysis & design procedure adopted for the evaluation of medium rise multi-storey frames (G+7, G+12 and G+15) under effect of Air and Earth Quake forces.

This work checks (G+7, G+12 and G+15) stories frames are analyzed and design under effect of wind and earthquake using ETABS. Total 06 numbers of various frames are analyzed & designed & it provide results which concludes that which RCC frame is good option. Analytical results are in comparison to attain the most suitable opposing system & monetary building frames against the horizontal forces.

KEYWORDS: **RCC frame, Plan and vertical irregularity, Displacement, Seismic force.**

I. `INTRODUCTION

Structural design of buildings for seismic loading is primarily concerned with structural safety during major earthquakes, but serviceability and the potential for economic loss are also of concern. Seismic loading requires an understanding of the structural behavior under large inelastic deformations. Behavior under this loading is fundamentally different from wind or gravity loading, requiring much more detailed analysis to assure acceptable seismic performance beyond the elastic range. Some structural damage can be expected when the building experiences design ground motions because almost all building codes allow inelastic energy dissipation in structural systems.

METHODS OF SEISMIC ANALYSIS OF STRUCTURES

Various methods of differing complexity have been developed for the seismic analysis of structures. They can be classified as follows.

1. Linear and Nonlinear Static Analysis
2. Linear and Nonlinear Dynamic Analysis.

Methods of Dynamic Analysis

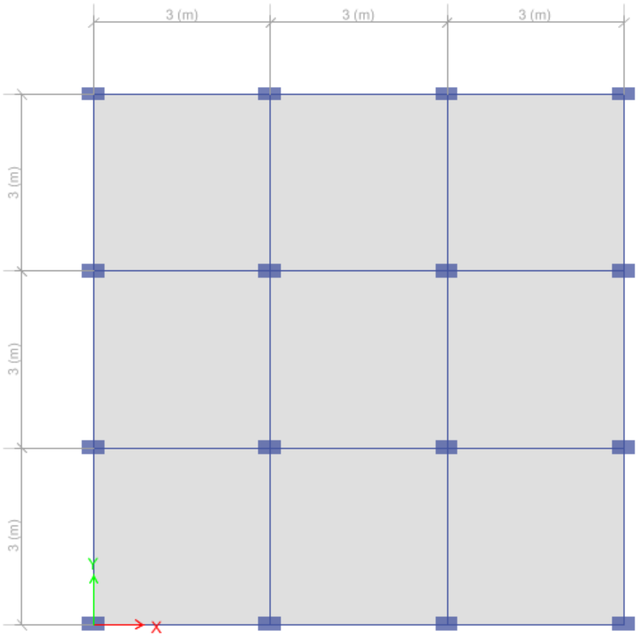
The methods of dynamic analysis used here are Time History Method and Response Spectrum Method.

Response Spectrum Method

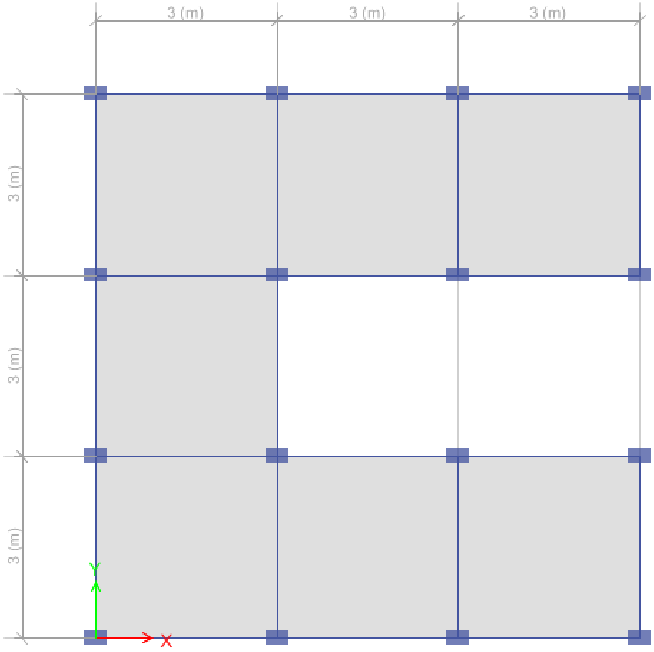
The word spectrum in seismic engineering conveys the idea that the response of buildings having a broad range of periods.

Details of the Models

The models which have been adopted for study are symmetric and irregular eight storey (G+7) and thirteen storey (G+12) and sixteen story (G+15) buildings. The buildings are consisting of square columns with dimension 230mm x 380mm, all beams with dimension 230mm x 380mm. The floor slabs are taken as 150mm thick. The foundation height is 1.5m and the height of the all stories is 3.2m. The modulus of elasticity and shear modulus of concrete have been taken as E = 2.48×10 and G = 1.03 ×107 kN/m



(a) Plan without irregularity



(b) Plan with irregularity

Objectives of the present study

The main objective of this project is to study the behavior of structures with wind effects and seismic effects. To compare analysis results of regular and irregular RCC frames of G+7, G+12 and G+15 building due to seismic effects with ETABS. To compare analysis results of regular and irregular RCC frames of G+7, G+12 and G+15 building due to wind effects with ETABS. To compare various results of analysis under zone V using ETABS software. Different values of zone factor and wind speeds are taken and their corresponding effects are interpreted in the results. To study the behavior of a building with and without plan irregularity.

II. RESEARCH METHODOLOGY

This work is based on the wind and seimic analysis of regular and irregular building frames by using Etabs softwere. For seismic analysis Response spectrum method is used. Following are the detailed summarized results of different buildings of G+7, G+12 and G+15 stories with and without plan irreguralty. For seismic analysis Indian standard code is referred i.e, IS 1893-2002, IS 456-2000.

Table 01 Maximum story displacement: for G+7

Load case	Zone 5		
	Without plan irregularity	**With plan irregularity**	**% decrease**
WIND X	30.48	28.36	6.95
WIND Y	29.97	29.91	0.20
EQ X	32.60	30.50	6.45
EQ Y	41.60	41.50	0.24

Table 02 Maximum story displacement: for G+12

Load case	Zone 5		
	Without plan irregularity	**With plan irregularity**	**% increase**
WIND X	55.10	51.34	-6.82
WIND Y	52.60	56.88	+8.13
EQ X	58.90	55.2	-6.28
EQ Y	73	78.9	+8.08

Table 03 Maximum story displacement: for G+15

Load case	Zone 5		
	Without plan irregularity	With plan irregularity	% decrease
WIND X	72.69	67.80	6.72
WIND Y	68.09	76.56	-12.40
EQ X	77.70	72.90	2.30
EQ Y	94.50	106.20	-12.38

Table 04 Story moments: for G+7

Load case	Zone 5		
	Without plan irregularity	With plan irregularity	% decrease
WIND X	287.13	243.67	15.13
WIND Y	160.55	135.03	15.89
EQ X	300.442	271.783	9.54
EQ Y	220.791	192.932	12.61

Table 05 Story moments: for G+12

Load case	Zone 5		
	Without plan irregularity	With plan irregularity	% decrease
WIND X	177.87	151.20	14.99
WIND Y	102.80	84.05	17.80
EQ X	186.612	168.643	10.65
EQ Y	141.366	120.0825	15.05

Table 06 Story moments: for G+15

Load case	Zone 5		
	Without plan irregularity	With plan irregularity	% decrease
WIND X	141.44	120.247	14.98
WIND Y	83.28	67.10	19.42
EQ X	148.399	134.119	9.622
EQ Y	114.529	95.864	16.297

Base Shear:

Table 07 Base shear due to EQX

Model	Zone 5		
	Without plan irregularity	With plan irregularity	% decrease
G+7	314.294	287.588	8.49
G+12	297.401	272.513	8.36
G+15	284.471	216.78	23.79

For G+7,G+12 and G+15 building models there is approximately 6%, of decrease in displacements ,story moments and axial forces when we include Plan irregularity in analysis respectively. Decrease in percentage of displacements, moments and axial forces values in zone V with and without plan irregularity is approximately similar of same structure. There is about 8 to 9% variation in base shear values with and without plan irregularity in analysis.

III. RESULTS AND DISCUSSION

GRAPHICAL REPRESENTATION

A. Graphs of Displacement

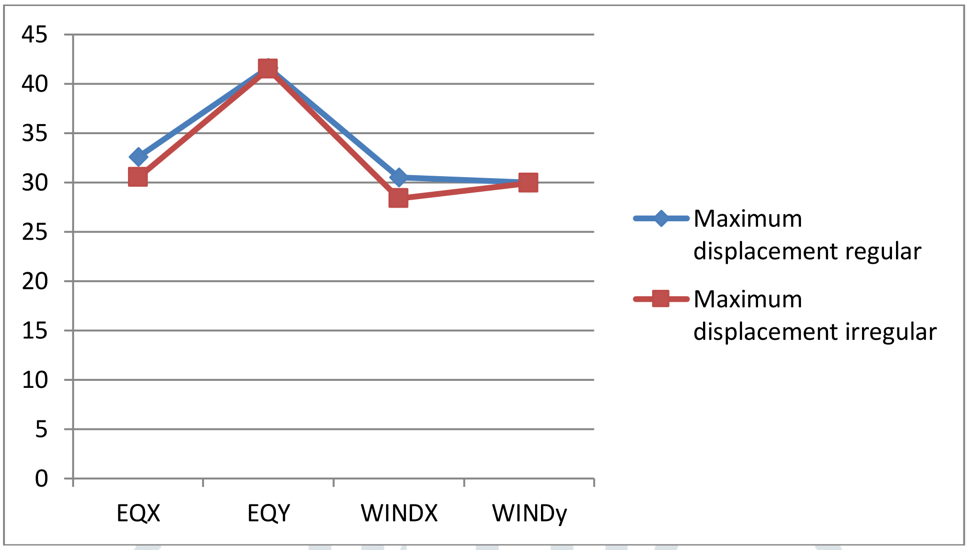


Fig 01 Displacement of G+7 RCC frame building

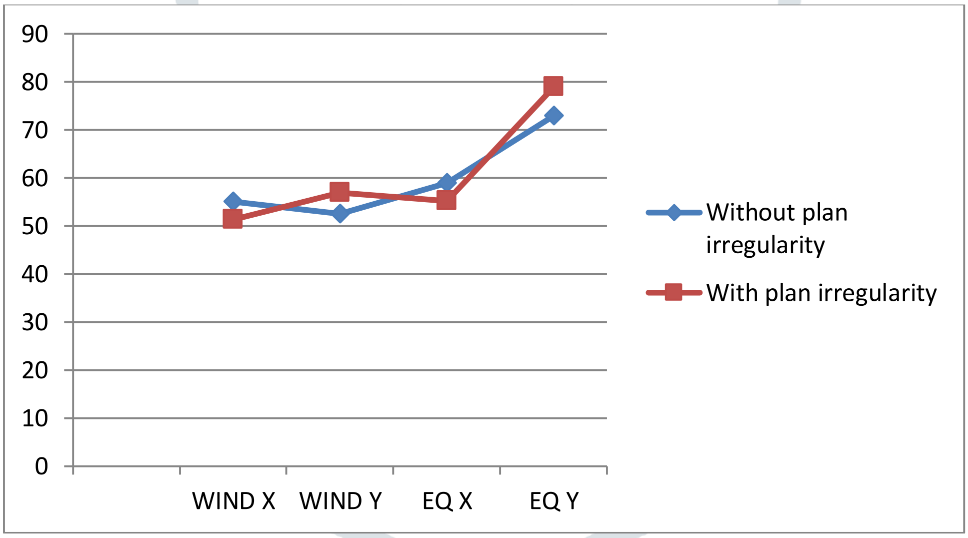


Fig 02 Displacement of G+12 RCC frame building

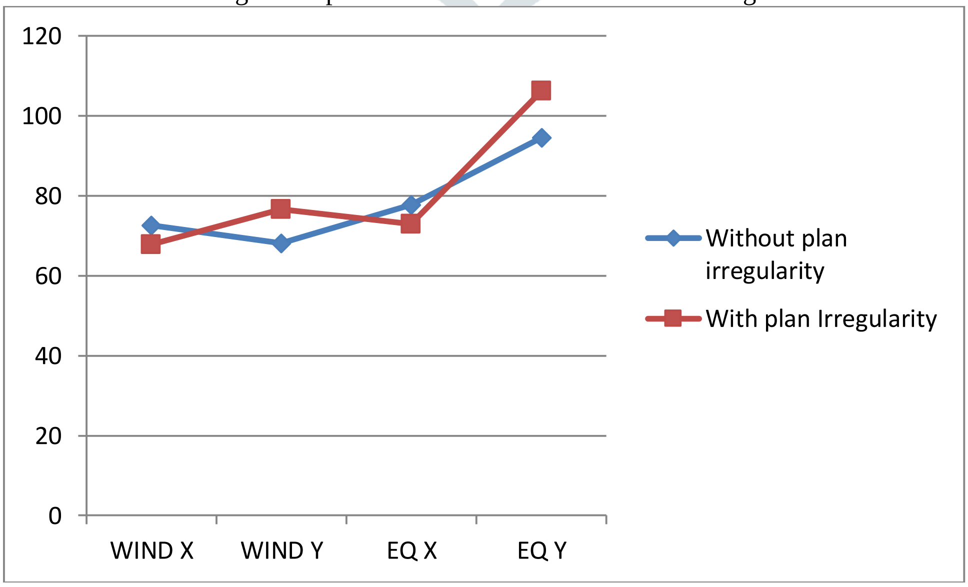


Fig 03 Displacement of G+15 RCC frame building

B. Graphs of story moment

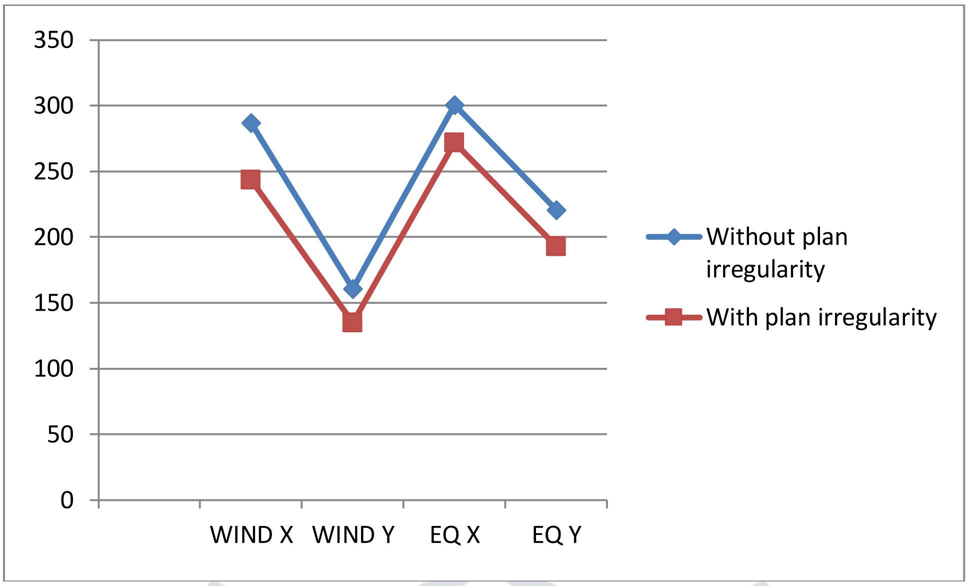


Fig 04 Story moment of G+7 RCC frame building

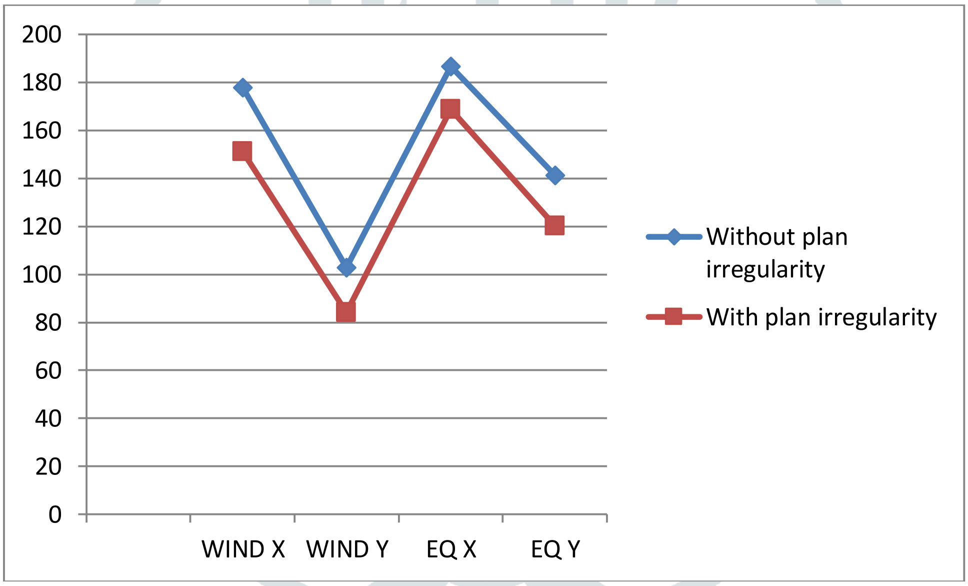


Fig 05 Story moment of G+12 RCC frame building

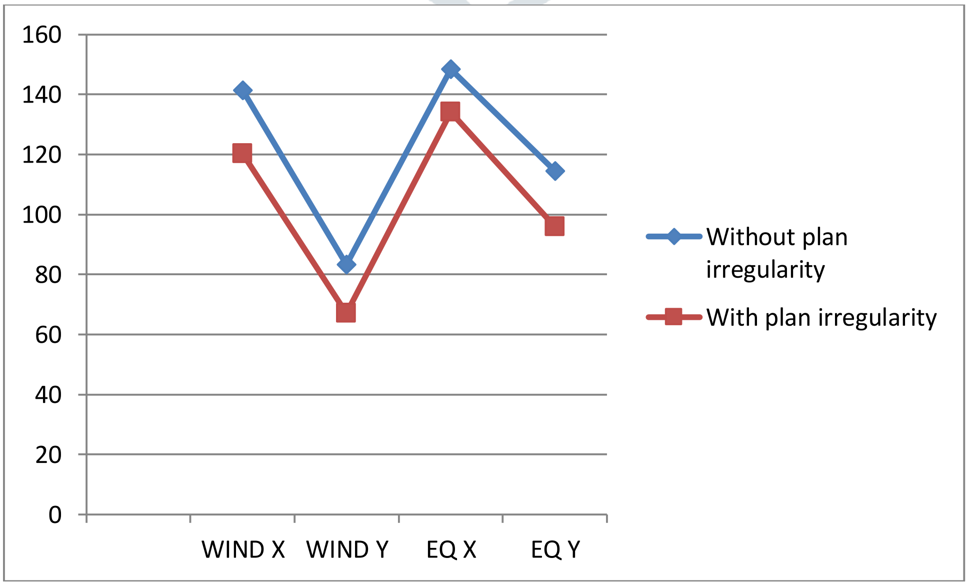


Fig 06 Story moment of G+15 RCC frame building

IV CONCLUSION

A. As the seismic zone V is considered changes the regular building to irregular one, displacement and moment of the structure increases.
B. As the height of the model increases displacement of storey increases.
C. As we go to plan irregularity base shear of structures decreases.
D. As the height of the model increases wind effect increases.

E. If the change in bending moments, shear forces and displacements is more than 05%, wind effect effect should be considered in design.
F. Increase in percentage of displacement, moment and axial force values of story buildings with and without wind effect and seismic effect is different of same story structure.
G. These Wind effects, and seismic effects on the structure can be reduced by constructing a shear wall to the structure.
H. This conclusion is applicable for regular RCC residential buildings

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