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COMPARISION OF PLAN IRREGULARITY OF MULTISTORIED SHEAR WALL STRUCTURE FOR WIND ANALYSIS

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ABSTRACT

In this new era of structural advancement there is scope to go for betterment in terms of utility, feasibility and economy of structure.As we know India is the most populous country by 2022 keeping behind China. So there is need to grow in verticality due to scarcity of space in urban areas For the multistory structure the challenge is to make it feasible in terms of lateral load due to wind and earthquake which prominently dominates the structure .However in this study we decided to focus on shear wall structures ,because it is widely known that shear walls help in improving the performance of structure when it is subjected to lateral loads by enhancing the strength and stiffness to study performance of structure we are comparing plan regularity and irregularity for the same configuration of its Area, Height, and Topography for drift and displacement.

Keywords: E-TABS, Plan irregularity, Story displacement, Story drift, Shear wall.

I INTRODUCTION

In India due to variability of topography which comes in different zones for wind which is most important parameter while considering the high rise building. A large portion of India approximately 60% of land is susceptible for cyclones, floods, earthquakes and landslides etc.Due to industrial policy most of the industries are situated near by the urban areas, hence much of the population is concentrating in this area. Because of this occurrence of scarcity of space is big issue.Keeping these issues in consideration concept of multi-storied structure comes into the picture. The response of wind effect becomes critical issue to find effective disaster mitigation technique, so that building remains in acceptable function during disaster.

As height increases the effect of lateral load due to wind increases, Inpresent study building with different plans are modeled for same height and area with shear wall in it. To know to effect of wind for irregular plan so as to check the performance of high rise building under wind forces.

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1.1 Wind

Wind loads is considered as per IS 875-1987 (Part 3). In this paper wind speed varies with location and depends on several factors such as density of observation in terrain, size of gust, return period, and probable life of structure. In Wind load cause dynamic action whose fundamental frequency of vibration will be less than 1 Hz. Wind speed in general influenced by a local topography.

1.2 Shear Wall

Various studies over world have proved shear wall one of the most preferred lateral load resisting system. Considering mass center and centroid is ideal configuration, to avoid torsional effect there should be symmetrical placement of shear wall. Shear wall of varying cross section i.e. rectangle shape to more irregular core such as channel ,T,L, Barbell shape etc. although past researcher studied different configuration of shear walls but there is still a scope to improve drawbacks in multistory structure for wind effect.

1.3 Literature review

Md. Rashduel , DebasishSen(1)Presented the work on regular and irregular shape building of identical weight under static and dynamic loading .They have studied various shapes and they found that maintain the total mass content ,it is possible to construct an irregular shaped building which might have irregular shape building which might behave more like rectangular building .

AbhayGuleria (2) presented the earthquake lateral load effect on high rise building system as per (IS 1893: part 1:2002). The modelling and analysis carried out by ETABS and different plan configuration found that, L-shape and I-shape structure perform same in overturning moment, story drift and story displacement in earthquake analysis, study also involves the shape importance in effect of earthquake prone zone.

Aneeket T. patil ,Sachin B. Kadam (3) They have studied Behavior of multistoried building under effect of wind and earthquake for different combination of shear wall .They have observed that after G+10 structure wind is more prone for the drift in structure

M. Pavini, G. Nagesh Kumar ,Dr.Sandeeppingale (4)Presented the study on shear wall analysis and design optimization in case of high rise building .They have studied the story stiffness ,Base shear and displacement and analysis is compared.

1.4 Objective of Studies

a. To study the behavior of structure for regular plan and irregular plan for wind loads
b. To evaluate response of RC building with shear wall at periphery of structure
c. To know the story drift of symmetric building with respect to unsymmetrical building for same area and height.

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II SYSTEM DEVLOPMENT

In this analysis RCC G+15 J shaped and rectangular shaped structure have analysed .The shear wall location is adopted in L shape at all corners .The total building system of J shaped and rectangular shape is analysed using Etabs 2015 software.

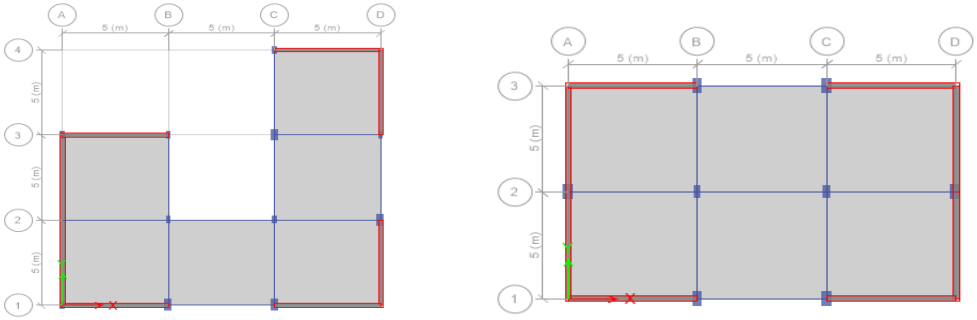

Fig.1-Plan View of buildings

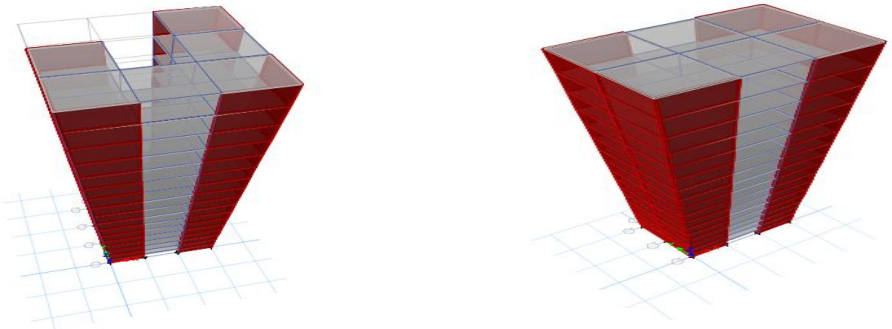

Fig2-3D view of J shape and Rectangular shape

Wind load are considered using provision made by IS 875:1987 (part 3) in addition to this load envolops are considered by IS 875 (part5).Building section and shear wall section is desinged by IS456:2000 and IS13920:1993 and checked for failures in ETab . After analysing the G+15 model following results are obtained.

Table 1:General Specification

Sr. no.	General specification	Values/sizes
1	Plan dimension	150m^2
2	(G+15)	52.1
3	Floor to floor height	3.1m
4	Bottom storey height	2.5m
5	Thickness of wall	230mm

Table 2: Material Specification

Sr no.	Material properties	Value
1	Grade of concrete	M30
2	Grade of steel	Fe425
3	Density of concrete	25KN/m^3
4	Density of brick	20KN/m^3
5	Damping ratio	5%

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Table 3: Loading Specification

Sr. no	Loading specification	Values
1	Live load	4kN/m^2
2	Floor load	1KN/m^2
3	Wall load	12KN/m^2
4	Structural class	B
5	Basic wind speed	50m/s
6	Risk coefficient (K1)	1
7	Topography factor(K3)	1
8	Wind design code	IS 875:1987(part3)
9	RCC design code	IS 456:2000
10	Shear wall design code	IS 456:2000& IS 13920:1993

Table 4: Shear wall specification

Sr. no	Shear wall specification	Values/sizes
1	Design of shear wall	General R/f
2	Thickness of shear wall	230mm
3	Corner bar size	16mm
4	General bar size	6mm
5	Spacing between bar	300mm

Table 5: RCC Rectangular specification

Sr no.	RCC	section
1	Beam	300X530
Column up to 8 story		
2	Column1	500X900
3	Column2	300X700
4	Column3	500X700
Column from 8 story to 17 story		
5	Column4	450X800
6	Column5	400X700
7	Column6	300X600

Table 6: RCC J shape section

Sr no.	RCC	section
1	Beam	300X600
Column up to 8 story		
2	Column1	230X450
3	Column2	300X600
4	Column3	350X700
Column from 8 story to 17 story		
5	Column4	400X800
6	Column5	500X700
7	Column6	500X900

III RESULT AND DISCUSSION

The story displacement in X direction is found to be maximum and particular in case of RCC J shaped G+15 structure .Both the model have corner L shape shear wall provision ,though the displacement in RCC rectangular G+15 structure is minimum. Rectangular structure has regular geometry that's why its surface is resistive in nature and found out to be stable in wind prone zone.

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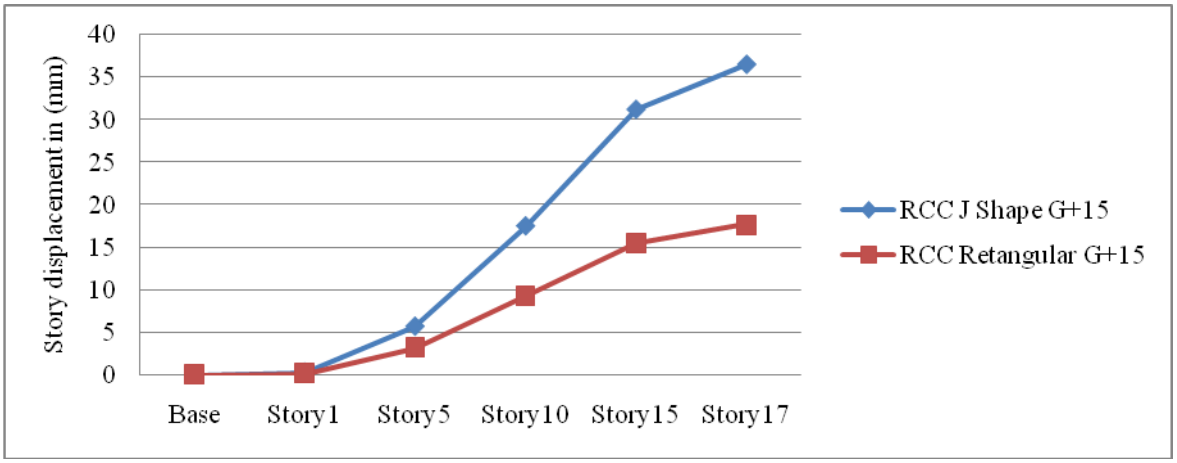

Fig.3- Story displacement in X direction for G+15 Structure

After comparing the story drift for G+ 15 RCC Rectangular and J shape, Rectangle shape has less story drift than J shape. The story drift is calculated in X direction for both the structure. Therelativestory displacement is greater in J shape that's why story drift in J shape is greater.

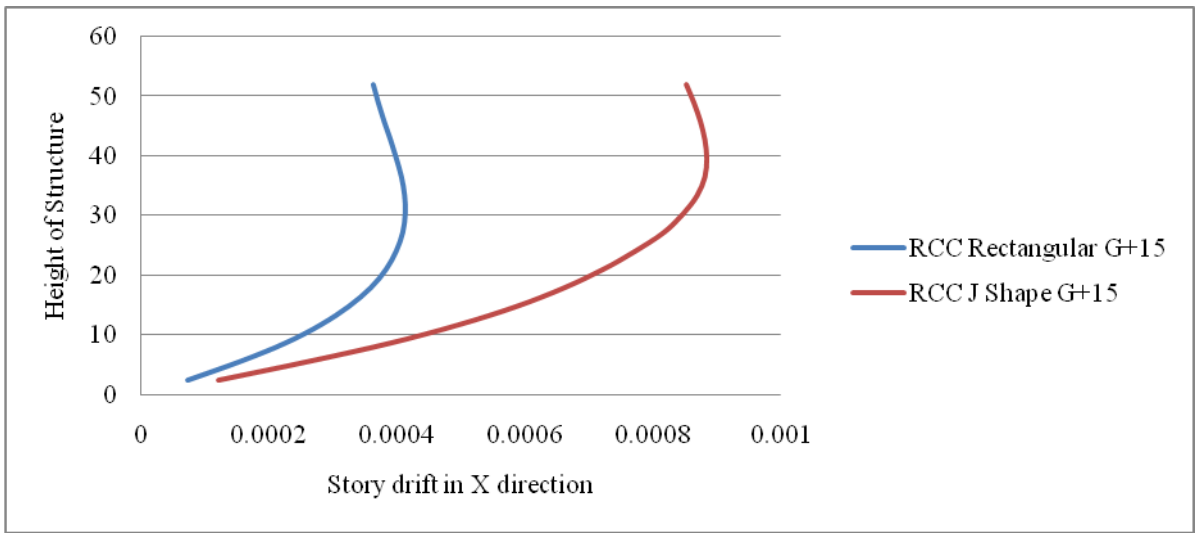

Fig.4- Story drift in X direction for G+15 Structure

IV CONCLUSION

1] In RCC structure shear wall is provided for optimizing the section, Displacement, Drift.

2] The study result shows two same plan area structures having different parametric change in which rectangular structure in wind prone zone is preferred.

3] As the story height of both J shape and rectangular shape is same but still the displacement and drift in J shape is more.

4] As we see the J shape is irregular structure hence need to be analysed for special provision for windlateral load to be minimized.

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