



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 9, Issue 9, September 2020

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com

Study of Acceleration of Tall Building for Wind Loadhaving Cracked Sectional Properties

Rajesh C Ratkalkar¹, Abhijeet Galatage²

P.G. Student, Department of Computer Engineering, Flora Institute of Technology, Pune, Maharashtra, India¹

Professor, Department of Civil Engineering, Flora Institute of Technology, Pune, Maharashtra, India²

ABSTRACT:As India experienced a quick turn of events, urban areas will keep on observing a gigantic spray in the interest of residential and business land. Not at all like low ascent structures, the design of taller structures are driven not by gravity alone, horizontal burden, for example, wind and seismic loads plays a characterizing function in conceptualizing the plan.

Because of the shortage of land in enormous urban areas, designers regularly propose tall structures to expand the usage of accessible floor space Index (FSI). The tall structure with a perspective proportion of more than 5 should be checked for the dynamic wind reaction. The structure that falls into this class is exposed to crosswind influencing and ovalling sway, also, close by wind sway.

An examination of the proposed construction (Ground + 20 upper Floors + 1 Floor arrangement), situated at Hinjewadi Phase 3, Pune is finished. In the proposed examination, 3 cases are considered specifically, Case I - with no property modifiers, Case II - with SLS property modifiers, and Case III - with ULS property modifiers. An investigation is completed in, financially accessible FEA bundle ETABS, utilizing static and dynamic examination for wind loads. The rules laid by Indian Standard Code IS 875 (Part 3):2015, IS 1893 (Part 1):2016 and IS 16700:2017 will be utilized to think about the outcomes. The outcomes will be looked at for boundaries like acceleration, deflection, alongside the wind, and over the wind.

KEYWORDS:Cracked sectional properties, Gust factor, Peak acceleration, base shear, Deflection.

I. INTRODUCTION

As India experienced a quick turn of events, urban areas will keep on observing an enormous spray in the interest of residential and business land. Dissimilar to low ascent structures, the plan of taller structures is driven not by gravity stacks alone, parallel burden, for example, wind and tremor assume a characterizing part in conceptualizing the plan. In metropolitan urban communities, the land is scant, to augment the use of accessible land the engineers frequently propose tall structures.

The air moving comparatively with the outside of the earth is wind. Which shifts concerning reality. Due to the flighty thought of wind, it is imperative to design the tall structures by considering the fundamental effects of wind on the structure. Wind power relies on the uncovered territory of the structure which incorporates the shape and size of the structure likewise it relies on the landscape and geography of the area where the structure exists, just as the idea of wind and dynamic properties of the structure.

II. MODELING

The design of tall structures is driven not by gravity alone, horizontal burden, for example, wind and tremor assume a characterizing part in conceptualizing the plan. In this part different relevant clauses of IS 875(Part 3):2015, IS1893(Part 1):2016 and IS 16700:2017 for the wind loading are given. Subtleties of the re-enactment model in ETABS programming bundle, inputs required for the readiness of the model are given and data with respect to gravity loads, wind loads, and so on are given.



III. METHODOLOGY

In the proposed investigation 3 cases are considered in particular;

- Case I -With no modifiers
- Case II -With SLS firmness modifiers.
- Case III -With ULS firmness modifiers

ETABS investigation model is ready for each case. The investigation is done, and a torsional abnormality is checked. On the off chance that there is a twist in the structure, the basic arrangement is changed to guarantee that the characteristic time of the basic torsional method of wavering, will be littler than those of the initial two translational modes. At last, the serviceability and strength checks are carried out and the results are compared as required.

IV. DESCRIPTION OF BUILDING

The proposed building is in Hinjewadi phase 3, Pune, and is being developed by M/s Sansa developers, Pune. The proposed building will be used for residential purposes. The description of the building is given in table 1.

Table -1: Description of building

Total No. of floors	Parking floor + 20 floors + 1 floor provision + Terrace floor
Numbers of parking floor	1 Parking floor (at Ground level)
Height of the parking floor	7.3 m
Numbers of residential floor	21 no's (1st to 21st floor)
Height of residential floor	2.9 m
The total height of the building	71.1 m (From natural ground level to terrace Level)

V. CRACKED SECTION PROPERTIES

As the structural members are designed as per limit state method the concrete member is considered as a cracked member. To consider the effect of cracking stiffness modifiers are used. The stiffness modifiers used are given in table 2.

Table -2: Cracked sectional properties

Sr No	Structural Elements	Un-Factored loads		Factored loads	
		For Serviceability		For Strength	
		Area	Moment of Inertia	Area	Moment of Inertia
1	Slabs	1.0 Ag	0.35 Ig	1.0 Ag	0.25 Ig
2	Beams	1.0 Ag	0.70 Ig	1.0 Ag	0.35 Ig
3	Columns	1.0 Ag	0.90 Ig	1.0 Ag	0.70 Ig
4	Walls	1.0 Ag	0.90 Ig	1.0 Ag	0.70 Ig

VI. EXPERIMENTAL RESULTS

For the proposed study, the following results will be examined and will be compared to come to the conclusions,

1. Displacement for gust wind loads
2. Gust Factor

3. Acceleration of building

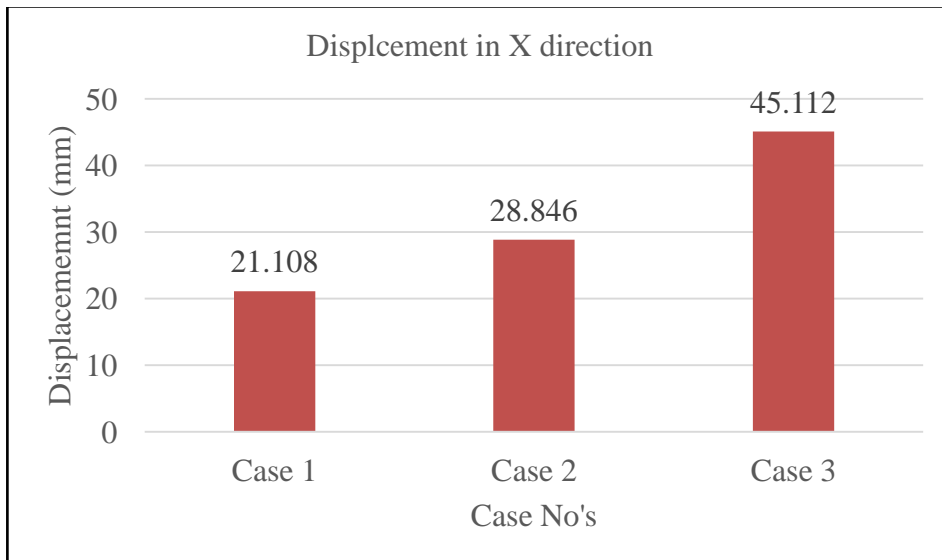


Chart -1: Displacement in X direction

From chart 1 it has been observed that maximum displacement in X direction at terrace level is 21.108mm, 28.846mm, and 45.112mm for Case I, II, and Case III, respectively.

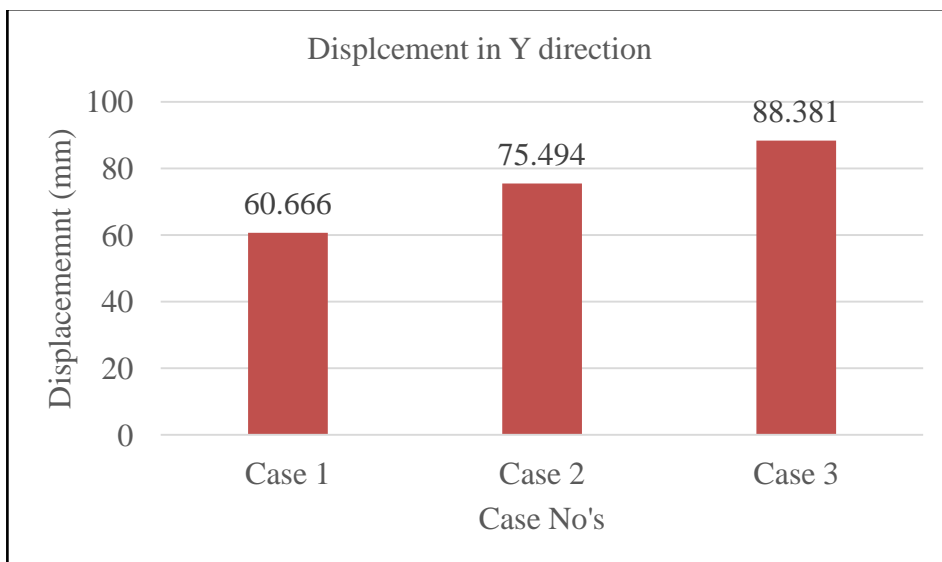


Chart -2: Displacement in X direction

From chart 2 it has been observed that maximum displacement in X direction at terrace level is 50.661mm, 61.947mm, and 71.694mm for Case I, II, and Case III, respectively.

The Gust factor is calculated as per IS 875 part 3, chapter 10, the time period for calculation of gust factor is extracted for ETABS The Gust factor for each case is given in Table 4.13 below,

Table 3: Gust Factor

Sr. No	Case No	X-direction	Y-direction
1	Case I	3.054	2.978
2	Case II	3.134	3.03
3	Case III	3.268	3.064

From table 3 it has been observed that the scale factor is increased in two-principal direction.

Table 4: Acceleration of building (m/s²)

Sr. No	Case No	X-direction	Y-direction
1	Case I	11.12	23.14
2	Case II	13.26	25.9
3	Case III	16.42	28.55

From table 4 it has been observed that the building acceleration is increased in two-principal direction.

VII. CONCLUSION

This study presents a response analysis of the tall structure to wind loading with cracked sectional properties. The conclusion is summarized below.

1. Gust factor increases in both directions with the use of stiffness modifiers.
2. Displacement is increased in both directions with the use of stiffness modifiers. The displacement values for all the cases are with codal limit.
3. Building acceleration is increased in both directions with the use of stiffness modifiers, acceleration exceeds the codal requirement for all the cases.

REFERENCES

- [1] Gawali, S., and Wakchaure, M. R. (2015). Effects of shape on wind forces of high rise. International Journal of Science, Engineering and Technology Research, 2979-2987
- [2] Irwin, P. (1978). A wind tunnel study of the interaction between along wind and across wind. 315-341.
- [3] Patil, S. J., Mali, M. Z., and Talikoti, R. S. (2015). Effect of wind load on high rise structure. International Journal of Engineering and Technical Research, 384-386.
- [4] Raju, K., Shereef, M. I., Iyer, N. R., and Gopalkrishnan, S. (2013). Analysis and design of RC tall building subjected to wind and earthquake load. The Eighth Asia-Pacific Conference on Wind Engineering, (pp. 10-14). Chennai.
- [5] Shobha, B., Sudarsanarao, H., and Ghorpade, V. G. (2018). Effect of wind load on low, medium, high rise buildings in different terrain category. International Journal of Technical Innovation in Modern, 105-116.
- [6] BIS, IS 456:2000; Plain and Reinforced concrete - Code of Practice, Bureau of Indian Standards, Fourth Revision.
- [7] BIS, IS 875(part 1): 1987; Code of practice for design loads (other than earthquake) for buildings and structures, Part 1 Dead loads - Unit weights of building material and stored materials, Bureau of Indian Standards, Second Revision.
- [8] BIS, IS 875(part 2): 1987; Code of practice for design loads (other than earthquake) for buildings and structures: Part 2 Imposed loads, Bureau of Indian Standards, Second Revision.
- [9] BIS, IS 875(part 3): 2015; Design Loads (Other than Earthquake) for Buildings and Structures - Code of Practice Part 3 Wind Loads, Bureau of Indian Standards, Third Revision.
- [10] BIS, IS 875(part 5): 2015; Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures Part 5 Special Loads and Combinations, Bureau of Indian Standards, Second Revision.
- [11] BIS, IS1893 (part 1): 2016; Criteria for Earthquake Resistant Design of Structures; General Provisions and Buildings, Bureau of Indian Standards, Sixth Revision.
- [12] BIS, IS 16700:2017; Criteria for structural safety of tall concrete buildings, Bureau of Indian Standards.



INNO  **SPACE**
SJIF Scientific Journal Impact Factor

**Impact Factor:
7.512**

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details