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Literature Review on Wind Load Analysis and Wind Resistant Design of Structures

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ABSTRACT: Recently modern architecture means something regularity and irregularity in geometry. Everyone wants to win the race of designing beautiful and complex structures and with issue of scarcity of land it is today's necessity to go higher and higher vertical and construct high rise structures. But as we go higher wind excitation becomes one of the most precarious force acting on the surface of the structure and if the plan geometry is irregular it can induce torsion which can be life-threatening to the structure, so it is essential to analyze and understand such forces during designing. In this study the behavior of high rise building against the wind force in wind zone 2nd, L shape is studied and analyzed for specific heights. Also direction of wind plays very vital role in behavior of structure..

KEYWORDS: Wind pressure, High rise Structure, L shape geometry, Residential Building, Stress.

I. INTRODUCTION

In India residents are increasing gradually and the necessary land for living. It is a key requirement to survive anywhere. For that reason multi story building are best choice for construction in Metro cities where a smaller amount of property is presented. As designer knows multi story structure provides large floor area in small area and it is beneficial also. Hence, it is required to assemble high rise structure. If high rise structures are constructed than many structural troubles come to pass, such as lateral load effect, lateral displacement and stiffness etc. Normally for high rise structure wind and earth quake load effects are prevailing. Therefore for high rise structure it is essential to have knowledge of different loads and its effect on structure. There is many type of effect worked on structure and causes for failure. The effect of lateral load is very important to consider such as earthquake and wind loads. In some cases the wind load is important than earthquake load which depends on place and zone factor distinct by codes. Wind load or wind effect is as dangerous as earthquake as previous study say. Defining wind there are two aspects first one is helpful which is to produce power and gives relief in hot and humid environment and second one is parasitic which comes out to be factor believe for engineers. As a designer engineer wants to be safe his structure This wind effect will cause and produce wind induce movement in the structure. As high rise buildings move onward the envelope to larger heights, the structural designers are not only faced with difficulty to choosing a structural elements to take the lateral load such as wind load and earthquake load but also insuring the design criteria that meets reliability and serviceability requirement under difficult wind environment. Wind load take action as lateral weight on buildings which is act as along and across wind. In IS Code 875 (Part3)-1987, the basic wind speed are specified in map and categorized by zones. The shape and size of building is very significant in wind analysis, because the wind pressure is mainly depends on the exposed area of building in opposition to wind speed..

II. RELATED WORK

1. M. GU, Y. Quan (2004), In this paper, 15 typical tall building models of basic cross-sections and aspect ratios from 4 to 9 are tested with high-frequency force balance technique in a wind tunnel to obtain their first-mode generalized acrosswind dynamic forces. The effects of terrain condition, aspect ratio and side ratio of cross section and modified corner of the building models on the across-wind forces are investigated in detail.

2. Guoqing Huang, Xinzhong Chen (2007), The wind load effects of 20- and 50-story buildings in three primary directions were analyzed using detailed dynamic pressure data measured in a wind. The results of this study reconfirmed some of the findings of using simplified loading models and presented some new results that helped to better understand and quantify wind induced response of tall buildings.

3. Michael Kasperski (2009), In the design process, generally more than one design task has to be met, e.g. design values have to be specified for local loads, global loads and structural loads.
4. Aly Mousaad Aly and Srinivasa Abburu (2011),The paper presents practical procedure for the response prediction and reduction in high-rise buildings under wind loads. To show the applicability of the procedure, aerodynamic loads acting on a quasi-rectangular high-rise building based on an experimental approach are used with a mathematical model of the structure for the response prediction and reduction.
5. F. Cluni , M. Gioffrè, V. Gusella (2013),Two equivalent shear-beam models were proposed to estimate the dynamic response of tall buildings to wind loads. The two models differ in the global elastic stiffness: the bending and shear stiffness are coupled in the first case in series and in the second case in parallel.
6. K. Vishnu Haritha, Dr.I. Yamini Srivalli (2013), as the stiffness of the member increases the displacement of the frame decreases. The aspect ratio plays a major role in affecting the displacements up to certain height.
7. Ki-PyoYou, Jang-YoulYou andYoung-MoonKim (2014), the optimal control technique of LQG for obtaining the reduced a long-wind responses of a tall building with ATMD has been investigated. The fluctuating a long-wind loads, acting on a tall building, was simulated numerically and using this simulated along -wind load.
8. Umakant Arya, Aslam Hussain, Waseem Khan (2014), in this paper,The dynamic characteristics of an important structure under wind loading becomes a requirement in engineering design and in academic study. In the ongoing research project on tall buildings, the study of wind-induced demands is categorized as: along-wind and crosswind responses. These demands are caused by different mechanisms. Calculation of ground slope is fundamentals of many traditional Geographical Information Systems (GIS) applications. Various methods exist for calculating slope. Manual slope generation, based upon contour line information, is a long established and generally acceptable method.
9. Vikram.M.B, Chandradhara G. P, Keerthi Gowda B.S (2014), Effect of wind is obtained from analysis and compared with gravity loading. Variation of axial force with storey height in all the models for gravity and wind loads at bottom storey column for different aspect ratio and different storey height. It is observed that when the aspect ratio is 0.25, the axial force is increased by 10% in dynamic analysis compared to static analysis.
10. Aly Mousaad Aly and Srinivasa Abburu (2015), The main objective of the current study was to further the understanding of the impact of multihazard loading, brought by wind and earthquakes, on the behavior of high rise buildings.
11. Djamal Hissein Didane, Nurhayati Rosly, Mohd Fadhli Zulkafli, and Syariful Syafiq Shamsudin (2017), in this study, the monthly and yearly wind speed distribution and wind power density for thirteen meteorological stations in Chad were evaluated. The novel two-parameter Weibull distribution function was employed to analyze the five-year period data for each site.
12. Huili Xue, Kun Lin, Yin Luo, and Hongjun Liu (2017), In this study, an inverse approach based on minimum variance unbiased estimation is developed for identifying the time-varying wind load from structural acceleration responses.
13. Nicola Longarini, Luigi Cabras, Marco Zucca, Suvash Chapain and Aly Mousaad Aly (2017),In this paper, some limits of available design standards (Euro code & Italian design code) to evaluate wind actions on high-rise buildings (displacements and acceleration responses) are presented, pointing them out in a comparison to a more sophisticated methods (FEM of the building, HFFB technique).
14. Rabi Akhtar, Shree Prakash, Mirza Aamir Baig (2017), In this paper, The Designed wind load is defined as it can be designed with parameters of wind which are given in Indian standard codes IS (875-partIII) and in high rise structures there are gust factors and wind tunnel effects have been used to determine the actual behaviour of wind on structures and the designed wind pressure should be applied on the model.

15. A. Joseph Andrew, N Parthasarathi, S Selvi Rajan, Prakash (2018), Mean force coefficients for Level 8 are always higher than all the other levels due to edge effect at top levels. For all other levels, values are almost same which indicates that these values are mostly governed by buffeting characteristics of approaching windflow.
16. Ashish Sadh, Ankit Pal (2018), In this paper, the IS code IS 875 part III has provided certain guideline on the basis of which the building structures can be designed when subjected to wind loads. The literature survey in the performance and behaviour of building structures when subjected to wind loads suggests that the requirement of establishing a methodology for studying the response of building structure to wind loads has become essential.
17. Fatih Topaloglu and Huseyin Pehlivan (2018), in this study, average wind speed and wind direction data of Arapgir province measured at 10 m height and 10-minute intervals and taken from Automatic Meteorological Observation Station were analyzed by WAsP software.

III. CONCLUSION

On performing the extensive survey of the literature available on building structure it can be concluded that due to a wide variety of buildings, the in depth understanding in the field of wind Analysis and design of building structures is inadequate. The IS codes has provided certain guideline on the basis of which the building structures can be designed when subjected to wind loads. The literature survey in the performance and behavior of building structures when subjected to wind loads suggests that the requirement of establishing a methodology for studying the response of building structure to wind loads has become essential. Many researchers has performed work over various types of building. on the different types of buildings and find out the important parameter which is useful for understanding the behavior of wind forces.

REFERENCES

- [1] M. Gu, Y. Quan(2004),” Across-wind loads of typical tall buildings”, Wind Energy and Industrial Aerodynamics , doi:10.1016/j.jweia.2004.06.004
- [2] Guoqing Huang, Xinzhong Chen(2007),” Wind load effects and equivalent static wind loads of tall buildings”, Engineering Structure , doi:10.1016/j.engstruct.2007.01.011
- [3] Michael Kasperski (2009),” Specification of the design wind load”, Journal of Wind Engineering and Industrial Aerodynamic, doi:10.1016/j.jweia.2009.05.002
- [4] Aly Mousaad Aly and Srinivasa Abburu(2011),” Dynamics and Control of High-Rise Buildings under Multidirectional Wind Loads”, Smart Material Research, doi:10.1155/2011/549621
- [5] K. Vishnu Haritha, Dr.I. Yamini Srivalli(2013),” Effect of Wind on Tall Building Frames”, International Journal of Research in Civil Engineering, ISSN Online: 2347-2855, Print: 2347-8284
- [6] F. Cluni , M. Gioffrè, V. Gusella (2013),” Dynamic response of tall buildings to wind loads by reduced order equivalent shear-beam models”, Journal of Wind Engineering and Industrial Aerodynamics, <http://dx.doi.org/10.1016/j.jweia.2013.09.012>
- [7] Ki-Pyo You, Jang-Youl You and Young-Moon Kim(2014),” LQG Control of Along-Wind Response of a Tall Building with an ATMD”, Mathematical Problems in Engineering, <http://dx.doi.org/10.1155/2014/206786>
- [8] Vikram.M.B, Chandradhara G. P , Keerthi Gowda B.S.(2014),” A Study on Effect of Wind on the Static and Dynamic Analysis”, International Journal of Emerging Trends in Engineering and Development, ISSN 2249-6149
- [9] Umakant Arya, Aslam Hussain, Waseem Khan (2014),” Wind Analysis of Building Frames on Sloping Ground”, International Journal of Scientific and Research Publications, ISSN 2250-3153
- [10] Aly Mousaad Aly and Srinivasa Abburu (2015),” On the Design of High-Rise Buildings for Multihazard”, Shock and Vibration, <http://dx.doi.org/10.1155/2015/148681>
- [11] Djamal Hissein Didane, Nurhayati Rosly, Mohd Fadhli Zulkafli, and Syariful Syafiq Shamsudin(2017),” Evaluation of Wind Energy Potential as a Power Generation Source in Chad”, International journal of rotating machinery, <https://doi.org/10.1155/2017/3121875>
- [12] Nicola Longarini, Luigi Cabras, Marco Zucca, Suvash Chapain, Aly Mousaad Aly(2017),” structural Improvements for Tall Buildings under Wind Loads: Comparative Study”, Shock and Vibration, <https://doi.org/10.1155/2017/2031248>
- [13] Rabi Akhtar, Shree Prakash, Mirza Aamir Baig(2017),” Study of comparison between Static and Dynamic Analysis Subjected to Wind and Earthquake Load”, International Research Journal of Engineering and Technology, eISSN: 2395-0056 , p-ISSN: 2395-0072

- [14] Huili Xue, Kun Lin, Yin Luo, Hongjun Liu (2017),” Time-Varying Wind Load Identification Based on Minimum Variance Unbiased Estimation”, Shock and Vibration, <https://doi.org/10.1155/2017/9301876>
- [15] Ashish Sath, Ankit Pal (2018), “A Literature Study of Wind Analysis on High Rise Building”, International Journal of Advanced Engineering Research and Science ,ISSN: 2349-6495(P) | 2456-1908(O), <https://dx.doi.org/10.22161/ijaers.5.11.36>
- [16] A. Joseph Andrew, N Parthasarathi, S Selvi Rajan, Prakash(2018),” Dynamic response of tall buildings to wind loads by reduced order equivalent shear-beam models”, Materials Today, Materials Today: Proceeding: 5 (2018) 8923-8932
- [17] Fatih Topalog lu and Hu seyin Pehlivan(2018),” Analysis of Wind Data, Calculation of Energy Yield Potential, and Micrositing Application with WASP”, Advance in Meteorology, <https://doi.org/10.1155/2018/2716868>



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