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Accessing Suitability of High Rise Building using Transfer Slab Resting on Sloping Ground using Pile and Raft Foundation under Wind and Earthquake Load

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Abstract: *The Aim of present study "Analysis and design of high rise building by staad pro " is to define proper technique for creating Geometry, cross sections for column and beam etc, developing specification and supports conditions, types of Loads and load combinations. In this study a G+15- storey high rise structure is analyzed for seismic and wind load combination using staad pro and comparison is drawn. In this project analysis of accessing suitability of high rise building using transfer slab resting on sloping ground using pile and raft foundation under seismic and wind load behavior of buildings with transfer floor and.the behaviour of the piled raft foundation system considering the influence of the factors like raft thickness, pile length, diameter and number of piles. These parameters have been considered to develop an economical and effective design. Analyzing the high rise building parameters such as shear force, bending moment, story drift, deflection supported by pile and raft foundation rested on plane ground and sloping ground with the use of Microsoft Excel and Staad Pro. Our project also deals with Analysing the building by considering wind and earthquake loads.*

Keywords: High Rise Building, Wind and Earthquake Loads, Transfer Floor, Raft Foundation.

I. INTRODUCTION

Recently, innovative architectural design merged with the advanced and powerful structural numerical analysis stimulated a new generation of "super-tall" and "mega-tall" buildings. Furthermore, discontinued vertical elements (columns and shear walls) within high-rise buildings are no more considered as a sin. Consequently, architectural demands for high-rise buildings in which columns may have different arrangement in a certain level(s) become familiar. Many high-rise buildings are currently constructed with this kind of vertical irregularity where "transfer" floors are provided to account for the discontinuous vertical element (columns and/or shear walls) in order to accommodate the functions (Figures 1 and 2). Transfer floor is the floor system supporting the vertical and lateral load resisting elements and transfer their straining actions to a different underneath system. Different structural systems could be used for such buildings as the resisting system below the transfer floor may be moment-resisting frames and/or core walls while the floors above may be supported by structural walls. The transfer structures could be in form of transfer girders or slabs. In this project the aim is to analyze the response of a high-rise structure using Response Spectrum Analysis. Different models, that is a high rise building model supported by raft foundation rested on plane ground, model resting on plane ground under earthquake load and wind load, building model for various parameters with the use of transfer slab resting on plane ground, model for various parameters with the use of transfer slab resting on sloping ground. mentioned above various type of model are considered in Staad Pro.Software.

Analyze change in the for parameters (shear force, bending moment, story drift, deflection), of the building is observed and compared. Our project aim to complete a Multi-storey building is to ensure that the structure is safe against possible loading conditions and to full fill the function for which they have built. For the design of the structure, the dead load, live loads, seismic and wind load are considered. The analysis and design for the structure done by using a software package STAAD PRO.

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II. LITERATURE REVIEW

For the proper functioning of project, I have undergone various national and international papers published. The summary of some important papers gone through are as below

Arvind Y. Vyavahare1, Godbole. P.N2, Trupti Nikose3, 2012- As author study that Tall buildings are slender flexible structures in nature and require to be examine to settle on the significance of wind speed induced excitation along and across the path of wind in specific zone. The Indian codal provision of practice for wind load on any buildings and structures (code IS-875Part-3 1987) gives a procedure to determine along wind response of tall structures, while the across wind response and intervention effect are not included in the code at present. A article 'Review of Indian Wind Code IS 875 (Part 3) 1987' has been set by IIT Kanpur under generalize the above process from the limited available data, so that across wind response can be obtained for a building with given (h:b:d) ratio.

ShaikhMuffassir L.G. Kalurkar 2016, This study shows The high rise structure or building is the necessity of metro cities. The multi-story high rise RC building are more large and less elastic in nature as judge against to compound structures. This study investigates the similarity or comparison between RCC and composite structure under the effect of wind, additional to it compound structure also includes unlike plan configurations. this study has total 15 number of building model are arranged and analysis for wind load by using ETABS 2015software. The various software are work on wind and earthquake analysis but we goes for software ETABS 2015.The wind analysis is performed for unlike heights such 20m, 50m and 80m respectively. In adding together, the comparative study concludes that the compound structure are bigger elas tic in nature and more at risk as compare to RCC structure and the compound option is better than RCC for multi-story structure. Whole study is observed in software analysis. In addition, the comparison of unlike plan configuration shows that the response of parameter such as story displacement, story stiffness, base reaction and time period under effect of wind. The reason of this analysis is to conclude the most efficient shape of construction in horizontal zone.

N. Lakshmanan, S. Gomathinayagam, P. Harikrishna, A. Abraham and S. Chitra Ganapathi,2009, Long-term data on hourly wind speed from 70 meteorological centres of India Meteorological Department have been collected. The daily gust wind data have been processed for annual upper limit wind speed (in kmph) for each site. Using the Gumbel probability paper approach the intense value quantiles have been derived. A design basis wind speed for each site for a return period of 50 years has also been evaluated. The site specific changes in the design wind speeds in the contemporary wind zone map for the design of buildings/structures are highlighted and revision to the map is suggested.

Tharaka Gunawardena1, Shiromal Fernando, Priyan Mendis, Bhathiya Waduge, Dilina Hettiarachchi 2017-Urban habitats around the world are becoming more congested with rising populations and the need for tall buildings is as high as ever. Sri Lanka is experiencing this reality at present as Colombo's skyline expands rapidly with a large number of upcoming complex high-rise buildings. The response of tall buildings to wind forces is a critical design criterion and it requires both conventional force based designs as well as performance based solutions. This paper discusses these challenges and the engineering solutions that they require to successfully design a tall building which is not only stable, safe and strong under wind loads but also performs excellently providing usable and highly functional design.

Umakant Arya1, Aslam Hussain2, Waseem Khan3.(2014),In this study paper, the investigative result of wind speed and structural response of building frame on sloping ground has been studied and analyze. Considering various frame geometries and slope of grounds. Combination of static and wind loads are considered. There is many type of sloping ground. For combination, 60 cases in different wind zones and three different heights of building frames are analyzed. STAAD-Pro software has been used for analysis purpose. Results are collected in terms of Storey wise drift, Shear force, moment, axial force, support reaction, and Displacement which are critically analysed to count the effects of a variety of slope of ground.

K.R.C. Reddy1 (2015) In different type of high rise structure chimney has its own importance. Along wind analysis of tall reinforced concrete chimneys by casual vibration approach and Codal methods of India (IS 4998(part 1)), America (ACI 307) and Australia (AS/NZS1170.2) are offered in this paper. For the analysis basedon casual.ibration approach, the RC chimney is model as multi-degree-of freedom system subjected to static loaddue to mean constituent of wind pace and dynamic load due to changeable component of speed. The changeable component of wind speed at a point is careful as temporal random process. Subsequently, the codal procedures for a long-wind analysis of tall RC chimneys from Indian, American and Australian codes are reviewed. Four RC chimneys are analyzed using these methods to achieve their responses. It is found that the codal methods of a long-wind analysis are basic, are not prepared to estimation the deflection of the chimneys and producing mixed results. The simplifying assumptions used in these codes are discussed.

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III. CONCLUSION

Current literature survey includes earthquake response of multi storey buildings. Some of the literatures emphasized on strengthening of the existing buildings in seismic prone regions. Seismic behaviour of buildings resting on sloping ground Authors: R.B. Khadiranaikar, Arif Masali 2015Conclusion drawn: Short columns attracts more forces and are worst affected during seismic excitation. Presence of infill wall and shear wall influences the behaviour of structure by reducing storey displacement and storey drifts considerably. But may increase the base shear. 2.2Earthquake behaviour of reinforced concrete framed buildings on Authors: Ajay Kumar Sreerama, Pradeep Kumar Ramancharla 2013Conclusion drawn: As the slope angle increases, the short column resist almost all the storey shear since other columns are flexible and tend to oscillate. A hinge mechanism is formed near the shorter column zone and is damaged earlier as the slope angle increases. The study clearly helps us to understand the significant difference between the seismic behaviours of building on slopes to building on flat surface. In summary, the natural period of building depends on the distribution of mass and stiffness along the building.2.3 Seismic performance of buildings resting on sloping ground−review Authors: Dr. R. B. Khadiranaikar and ArifMasali2014 Conclusion drawn: The greater number of bays are found to be better under seismic condition. Number of bays increases time period and top storey displacement decreases. Seismic analysis of buildings Authors: B.G. Birajdar, S.S. Nalawade 2004

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