Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01
DOI URL: http://dx.doi.org/10.21474/IJAR01

RESEARCH ARTICLE

National Conference on Innovation in Science, Engineering and Management (NCISEM-2022)
Date of Conference 11-12 March 2022

ACCESING SUITABILITY OF HIGH RISE BUILDING USING TRANSFER SLAB RESTING ON SLOPING GROUND USING PILE AND RAFT FOUNDATION UNDER WIND AND EARTHQUAKE LOAD– A REVIEW

Manjusha S. Thool[1], Prof. M. R. Nikhar[2] and Prof. M. M. Lohe[3]

1. PG Scholar,Dept.of Civil Engineering, BDCOE, Sevagram, Wardha, Maharashtra, India.
2. Guide, Asst. Prof.,Dept of Civil Engineering, BDCOE, Sevagram, Wardha, Maharashtra,India.
3. Co-Guide ,Asst.Prof.,Dept of Civil Engineering, BDCOE, Sevagram, Wardha, Maharashtra, India.

Manuscript Info

Key words:-
Transfer Slab Pile And Raft Foundation Earthquake

Abstract

In many high-ris In many high-rise buildings, architectural requirements may result in a variable configuration for the vertical structural elements between the stories of the building. To accommodate such vertical elements' discontinuity, a transfe floor conveying vertical and lateral loads between upper and lower stories must be introduced. A drawback buildings, architectural requirements may result in a variable configuration for the vertical structural elements between the stories of the building. To accommodate such vertical elements' discontinuity, a transfe floor conveying vertical and lateral loads between upper and lower stories must be introduced. A drawback of the transfer floor is the sudden change in the building's lateral stiffness at its level: the structure becomes susceptible to the formation of a soft-storey mechanism under moderate to severe earth-quakes. In this project 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 high rise buildings with transfer floor.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 The field of Analysis of High Rise Building encompasses the analysis of high rise building subjected to seismic loads and wind loads. Our project analysis of high rise building using transfer slab resting on sloping ground using pile and raft foundation. Designing of the high rise building consist of designing of beams, columns, foundation, slab on Microsoft Excel and Staad Pro. Our project also deals with designing the building by considering wind and earthquake loads.

Corresponding Author:- Manjusha S. Thool
Address**:-** PG Scholar,Dept.of Civil Engineering, BDCOE, Sevagram, Wardha, Maharashtra, India.

Introduction:-

Recently, innovative architectural design merged with the advanced and powerful structural numerical analysis stimulated a new generation of super-tall and mega-tal 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 transfe floors are provided to account for the discontinuous vertical element 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 theresisting 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.The multistoryrccbuilding are constructed on plane level or ground level. In the mountainous area having sloping ground it is hard to build the multistory building rcc structure. It is very complex circumstances to dig in such region. The construction of inclined region are in progress now day due to the lack of plane level.this mountainous area are the most hazardous sometime due to some natural climatic like land slide and seismic activity the earthquake is the one of the major factor on the sloppy an dmountanious area. Thus, due to growing level of population the biggest region construction on mountainous areas.earthquake causes due to the shaking of ground plates.to avoid such damages it is necessary to observe the seismic behaviour and the stability of structure and ground. Different type of method is used to for analysing the situation. The one of the method using for analysis the structure spectrum method.

Fig. 1: High-rise building with a transfer slab.

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 inspecific 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 theabove process from the limited available data, so thatacross wind response can be obtained for a building withgiven (h:b:d) ratio.

ShaikhMuffassir L.G. Kalurkar 2016, This studyshows The high rise structure or building is the necessityof metro cities. The multi story high rise RC building aremore large and less elastic in nature as judge against tocompound structures. This study investigates the similarity or comparison between RCC and compositestructure under the effect of wind, additional to itcompound structure also includes unlike planconfigurations. this study has total 15 number of buildingmodel are arranged and analysis for wind load by usingETABS 2015software. The various software are work onwind and earthquake analysis but we goes for softwareETABS 2015.The wind analysis is performed for unlikeheights such 20m, 50m and 80m respectively. In addingtogether, the comparative study concludes that thecompound structure are bigger elas tic in nature and moreat risk as compare to RCC structure and the compoundoption is better than RCC for multi story structure. Wholestudy is observed in software analysis.In addition, thecomparison of unlike plan configuration shows that theresponse of parameter such as story displacement, storystiffness, base reaction and time period under effect ofwind. The reason of this analysis is to conclude the mostefficient shape of construction in horizontal zone.

N. Lakshmanan, S. GomathinayagamP.Harikrishna, A. Abraham and S. ChitraGanapathi,2009, Long-term data on hourly wind speed from 70meteorological centres of India MeteorologicalDepartment have been collected. The daily gust wind datahave been processed for annual upper limit wind speed (inkmph) for each site. Using the Gumbel probability paperapproach the intense value quantiles have been derived. Adesign basis wind speed for each site for a return periodof 50 years has also been evaluated. The sitespecificchanges in the design wind speeds in the contemporarywind zone map for the design of buildings/structures arehighlighted and revision to the map issuggested..

Tharaka Gunawardena1, Shiromal Fernando ,PriyanMendis , BhathiyaWaduge 2, DilinaHettiarachchi 2 2017-Urban habitats around the worldare becoming more congested with rising populations andthe need for tall buildings is as high as ever. Sri Lanka isexperiencing this reality at present as Colombo's skylineexpands rapidly with a large number of upcomingcomplex high-rise buildings. The response of tallbuildings to wind forces is a critical design criterion and itrequires both conventional force based designs as well asperformance based solutions. This paper discusses thesechallenges and the engineering solutions that they requireto successfully design a tall building which is not only stable, safe and strong under wind loads but also performsexcellently providing usable and highly functional design.

Umakant Arya1, Aslam Hussain2, Waseem Khan3.(2014),In this study paper, the nvestigative result of wind speedand structural response of building frame on slopingground has been studied and analyze. Considering variousframe geometries and slope of grounds. Combination ofstatic and wind loads are considered. There is many typeof sloping ground. For combination, 60 cases in differentwind zones and three different heights of building framesare analyzed. STAAD-Pro software has been used foranalysis purpose. Results are collected in terms of Storeywisedrift ,Shear force, moment, axial force, supportreaction, 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 risestructure chimney has its ownimportance. Along windanalysis of tall reinforced concrete chimneys by casualvibration 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.ibrationapproach, the RC chimney is model asmulti-degree-of freedom system subjected to static loaddue to mean constituent of wind pace and dynamic loaddue to changeable component of speed. The changeablecomponent of wind speed at a point is careful as temporalrandom process. subsequently, the codal procedures foralong-wind analysis of tall RC chimneys from Indian,American and Australian codes are reviewed. Four RCchimneys are analyzed using these methods to achievetheir responses. It is found that the codal methods ofalong-wind analysis are basic, are not prepared toestimation the deflection of the chimneys and producingmixed results. The simplifying assumptions used in thesecodes are discussed.

Conclusion On Literature Review:-

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 groundAuthors: R.B. Khadiranaikar, ArifMasali 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 onAuthors: 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 performanceof buildings resting on sloping ground−reviewAuthors: 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 buildingsAuthors: B.G. Birajdar, S.S. Nalawade 2004

References:-

1. Yoshimura M., Nonlinear Analysis of a Reinforced Concrete Building with a Soft First Storey Collapsed by the 1995 Hyogoken-Nanbu Earthquak ,Cement and Concrete Composites, Vol. 19, No. 3, 1997, pp. 213- 221.
2. ALI A. K., and Krawinkler H., "Effect of vertical irregularities on seismic behaviour on building structures", The John A. Blume Earthquake Engineering Center, Department of Civil Engineering, Stanford University, Report no. 130 December 1998
3. Russo, G. (1998) "Numerical analysis of piled rafts. International Journal for Numerical and Analytical Methods in Geomechanics, 22(6), pp. 477-493.
4. Yong L., Tassios T.P., Zhang G.F., and Vintzileou E., "Seismic Response of Reinforced Concrete Frames with Strength and Stiffness Irregularities", ACI Structural Journal, Vol. 96, No. 2, 1999, Title no. 96-S24
5. Prakoso, W. A. and Kulhawy, F.H. (2001) "Contribution to piled raft foundation design". Journal of Geotechnical and Geoenvironmental Engineering, ASCE, 127(1), pp.17-24.
6. Reul, O., and Randolph, M.F. (2004) "Design strategies for piled rafts subjected to nonuniform vertical loading" J. Geotech. Geoenviron. Eng, 130, Issues 1, pp 1–13.
7. Sanctis, L. D. and Mandolini, A. (2006) "Bearing capacity of the piled rafts on soft clays". Journal of Geotechnical and Geoenvironmental Engineering, ASCE, 132(12), pp. 1600-1610.
8. Arvind Y. Vyavahare1, Godbole. P.N2, Trupti Nikose3, 2012
9. Gahlot, R and John, R.J. (2015) "Approximate analysis of piled raft". International Journal of Scientific & Engineering Research, Volume 6, Issue 12, December-2015.
10. Y. M. Abdelbasset and SherifMourad , "Seismic analysis of high rise building with transfer floor: state of art of review", Electronic journal of structural engineering Jan2016
11. Chopra A. K., "Dynamics of Structures: Theory and Applications to Earthquake Engineering", 2nd Ed., Prentice Hall, Englewood Cliffs, New Jersey, USA. 2001 6. Elnashai A.S.,DO We Really Need Inelastic Dynamic Analysis" Journal of Earthquake Engineering, Vol.
12. IS-875(PART-1) : 1987 Indian Std. Code Of Practice For Design Loads 2. IS-1893(Part 1): Earthquake Resisting Design of Structures". 3. IS: 875 (Part 2): 1987 "Imposed Loads". 4. STAADPRO manual.