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BEHAVIOR OF ELECTRICITY PYLON STRUCTURES OF DIFFERENT HEIGHTS WITH SEISMIC CONSIDERATION

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Abstract: Electric pylon is used to transmit and distribute electric energy from it source of production, the generating station, to the load centers for further transmission and distribution. Transmission towers are constructed using angle section members which are eccentrically connected .It is strong enough to withstand a number of forces namely; its own weight, the pull of conductors wires at the top of the tower, the effect of seismic on the conductors and earth wires and the effect of seismic on the tower itself. In practice, proper planning and preparation must be adhered to when working near to or on the structure. The structure must also be adequately designed to not only support the weight of the wires and structure but also to safely transfers forces and moments from the structure to its foundation. The experience of past earthquakes shows that, although damages of the Electrical network installation are very extensive in length and area, they are infrequent. But the significance of these installations makes their protection and stability more important. In my study I increase the height of tower with respect to base width and top width for more safety. I select four different zone of earthquake in India as per Is code 1893-2002. Considering the load combination acting on the tower (DL, LL, WL, EL). Calculate maximum deflection, maximum support reaction, maximum support moment, axial stress and bending stress for all different height towers manually and by using software for different zone.

***KEYWORDS*– Electric pylon, Seismic force, Bending moment, Shear force**

I. INTRODUCTION

Electric pylon is used to transmit and distribute electric energy from it source of production, the generating station, to the load centers for further transmission and distribution. Transmission towers are constructed using angle section members which are eccentrically connected .It is strong enough to withstand a number of forces namely; its own weight, the pull of conductors wires at the top of the tower, the effect of seismic on the conductors and earth wires and the effect of seismic on the tower itself. In practice, proper planning and preparation must be adhered to when working near to or on the structure. The structure must also be adequately designed to not only support the weight of the wires and structure but also to safely transfers forces and moments from the structure to its foundation .Before the construction of electric transmission lines, structural analysis should be done to ensure the safety of the verify by experimental methods. In theoretical and computer analysis, several assumptions and idealization as well as some basic calculations need to be considered. However, in experiment method, the physical model of the structure needs to be made available and data gathering set-up is the basic requirement for the anticipated good experimental results. This paper focused on loading aspects on a typical electric overhead transmission structures. It mainly concerns on loading behavior and its magnitude onto the structure as well as it basic response related to that particular loading. Under maximum loading conditions of the structure, related critical elements are also be highlighted.

II. REVIEW OF LITERATURE

These literature reviews are experimental work carried out by researchers on skew angles.

1. **Kamran Fallahi 2004** The following items should be considered in design process by designers Prevention of transmission line passing from the paths which are in land sliding, turnover, cutting, liquefaction hazard area. Applying light weight material and mitigation structure mass. Using of resisting systems against lateral force.
2. **K. D. Pitilakis, T. D. Xenos, K. G. Kakderi, M. N Alexoudi, 2007** , Reliability assessment of power supply systems needs the identification of critical equipment along with their vulnerability assessment under different seismic scenarios. Given the availability of sufficient number of damage input data, a very high level of reliability of predictionscan be achieved at the level of substation
3. **Jonathan Z. Liang And Hong Hao 2008.,** The displacement along the height of tower subjected to seismic loading is far smaller than that due to the design loads, indicating wind load governs the design of the towers in PMA. However, there are still some seismic loading dominated elements at some sites. The investigation of the effect of seismic loading dominated elements on the reliability of transmission tower should be carried out in the future.
4. **Yusuke Sato And Tomomi Ishikawa 2012**, The peak axial forces remained below the buckling strength of main leg members in the seismic analysis while buckling occurred on the lowest main leg member in the wind response analysis.
5. **Sourabh Rajoriya, K.K. Pathak Vivekanand Vyas, 2016,** The 60m high tower is critical than 40m and 50m high tower in case of deflection, support reaction, support moment and also in the case of axial stress in seismic zone V, but for bending stress, 50m high tower is critical than 40m and 60m high tower in all seismic zones. This paper will help in understanding the effect of seismic load on tower structure by considering different seismic zones.
6. **I Jusoh, H. A. Ghulman, T. S. Mandourah, C. C. Tan 2017**, The influence of various loading conditions on the structure is investigated and the critical elements of the tower structure are determined. From the result obtained, it shows that the most critical element is bracing member situated on the lowest level of the pylon structure. The result of this study also shows that the safety level in the entire structure is acceptable under all the most severe loading conditions.
7. **Alaa C. Galeb And Ahmed Mohammed Khayoon, , 2013,** The study of different loading conditions on structures is very important to recognize the case that will cause the larger deflection in tower model and exceed the yield stress to decide which case will be optimized..
8. **Jithesh Rajasekharan, And S Vijaya, 2014,** In this dissertation, studies are been carried out on models of varying heights with different bracing for seismic along with the wind effect. The wind effect on the structure is studied by using the gust factor method and the seismic effect on the structure is studied by carrying out the modal analysis and response **spectrum analysis.**
9. **Shivam Panwar, Yogesh Kaushik, Anubhav Singh , Nikhil Sharma 2016,** In this paper an attempt has been made to compare the same transmission towers with same bracing system at different wind zones viz. zone II and IV but same seismic zone
10. **Siddu Karthik And G.V Sowjanya,2014.** Study of different load cases on structure is very important to recognize the case that will cause larger deflection in tower model and to say which case will be optimized. The towers are provided with angle sections of x and k type bracings where k type bracing tower gives lesserdeflections when compared with x type bracing tower
11. **Srikanth L. Neelima Satyam 2014**. In this present study, the analysis is carried out considering all the different loads such as vertical loads, lateral loads and longitudinal loads with the combinations specified as per Indian standards, resulting breaking load as the critical combination among the forces developed in the structure.
12. **Yash N. Patel, Jasmin Gadhiya, Hitesh K. Dhameliya, Kosha S. Pachchigar,2014** This paper describes about an analytical comparative study on 1S2 transmission tower under wind and earthquake loads considering optimization technique. The optimization of wind and earthquake load is carried out by plotting graphs between earthquake forces with height, wind forces with height and tower with X and K bracing under wind and seismic load.
13. Yash N. Patel, Jasmin Gadhiya, Hitesh K. Dhameliya, Kosha S. Pachchigar,2015. The cost of transmission tower is 28 to 42 percent so economical design is necessary. The design and consumption of steel is depended on the base width if the tower. The load carrying capacity of hollow steel section is more than convectional section and it is also economical. In all shaped of tower triangular shaped tower is more economical than others
14. **Yusuf Mansur Hashim 2015.** In this paper, the behavior of a three models of Transmission Towers subjected to both static and dynamic analysis was investigated in detail. A reliability assessment was performed using the "first Order Reliability Method, (FORM 5) to obtain the safest possible angle sections and their respective safety indices. This angle sections were then used to model the 1st transmission tower and the analysis was performed to observe its behavior
15. **Anand Praksh Dwivedi, Hrishikesh Dubey 2016** In this study, four legged square type transmission tower has been analyzed for various earthquake zones under consideration of three different heights Results are obtained in terms of deflection, support reaction, support moment, axial stress and bending stress criteria

III. CONCLUSION

The following conclusions were carried out by researchers

1. Consistently higher inelastic displacements have been observed for multiple earthquakes than the case of a single event.
2. It is also demonstrated that the predominant period of the aftershock significantly influences the post-main shock response.
3. It is found that peak responses of structure due to the aftershock are comparable with the corresponding values due to the main shock.
4. Aftershock may increase or decrease the residual displacement of structure with respect to main shock alone, and the change of residual displacement can reflect the damage accumulation (e.g. additional damage) of structures due to the aftershock.

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7. "Optimum Design Of Transmission Towers Subjected To Wind And Earthquake Loading" By Alaa C. Galeb And Ahmed Mohammed Khayoon, Jordan Journal Of Civil Engineering, Volume 7, No. 1, 2013
8. "Analysis Of Telecommunication Tower Subjected To Seismic & Wind Loading" By Jithesh Rajasekharan, And S Vijaya, International Journal Of Advancement In Engineering Technology, Management And Applied Science 2 July 2014.
9. "Structural Analysis And Design Of Steel Transmission Tower In Wind Zones Ii And Iv- A Comparative Study" By Shivam Panwar, Yogesh Kaushik, Anubhav Singh , Nikhil Sharma , International Journal Of Advancement In Engineering Technology, Management And Applied Science May 2016.
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