LITERATURE REVIEW ON TRANSMISSION TOWER IN DIFFERENT SEIMIC ZONE BY USING STAAD. PRO SOFTWARE.

SHUBHAM KUMAR SAHU
Post Graduate Student (Structural Engineering),
Department of Civil Engineering,
Bhilai Institute of Technology, Durg

MR. TUSHAR SAXENA
Assistant Professor,
Department of Civil Engineering,
Bhilai Institute of Technology, Durg

ABSTRACT

High-voltage transmission technology has advanced quickly with the overall development and increased use of renewable energy. More demands on the insulating system are made when high-voltage power systems evolve. One of the significant factors is the sharp rise in population density, which led to the high demand for electricity. Right-of-way infringement is a problem that frequently occurs these days. Transmission is done over a rated capacity; as a result, the transmission line heats up, the insulation ages, and the electric field becomes distorted. The insulating system is prone to fail too soon when the operating voltage inverses or when there is a significant temperature Differential. Recently, there has been a lot of interest in eco-friendly insulation materials. A synergistic efficiency of heat resistance properties, mechanical properties, and electrical characteristics must also be accomplished before these materials can be used in high-voltage transmission systems. They must also withstand harsh electrical and thermal shocks such as overvoltage and short-circuit faults. One of the developments that has become a popular research topic is the constantly evolving tower design. This review article presents advancements in cross-arm technology in high-voltage transmission systems to elaborate on the limitations and contributions of different research work.

Key Words: *steel lattice towers, Earthquake zone, wind zone, STAAD.proV8i….*

1. INTRODUCTION

In each country, the need for electricity consumption has continued to increase, with a higher rate of demand in developing countries. The use of electricity has become an increasingly important part of the economy of industrial countries. India has a large resident population across the country and the electricity needs of this population create the requirement for a large transmission and distribution system. Transmission line towers are needed to supply electricity to various regions of the nation. These towers are used to support very high voltage (EHV) transmission lines. Transmission tower lines play an important role in the lifeline of structures. These lines must be stable and carefully designed so as not to fail during the natural disaster. The analysis and design are carried out in accordance with the recommendations given in IS: 800-2007 and IS: 802 (Part 1 / Set 1). This study is performed in accordance with the requirements and recommendations of the administration for the validation of the results according to the IS codes to verify if the same structure can be safe for both places.

APPLICATION OF PROPOSED METHODOLOGY

The present problem can solve by using Finite Element Analysis Software. In this problem we have used STAAD Pro V8i software to analyze and calculations of member forces and reactions (stresses).

The following procedure is described:-

- The software tool used in the design and analysis of¬ the tower is STAAD.ProV8i. In today's world, analysis tools allow engineers to refine designs to an unprecedented point, and as a result, many utility companies believe that testing is not guaranteed. However, although great strides have been made in the analysis and design of selfsupporting steel transmission towers, there are still differences between the results of the analysis and large-scale tests.
- Manual calculation is important for IS code recommendations, but validation of these results and study of the effects of these loads on structure are also important.
- The analysis of the activity carried out is the key to success for the safe and lasting maintenance of the structure in various load combinations.
- Now based on the validation of results throughSTAAD.ProV8i, the important conclusions are made.

2. LITERATURE REVIEW

1) **Gopi Sudan Punse** attempted to **design and analyze transmission line towers to optimize geometry with STAAD.ProV8i.** The geometric parameters of the tower can be efficiently treated as design variables, and often considerable weight reduction can be achieved as a result of geometric changes.

2) **Anuja Keshav Jadhav** In their paper **design of Transmission tower using staad pro for Indian condition** Performed The structural planning and design process includes not only creativity and logic, but also a solid understanding of structural engineering science, as well as practical knowledge of modern design codes and bye laws, as well as a wealth of experience, intuition, and judgement. The purpose of standards is to ensure and improve people's and the environment's safety.
3) **Sandesh B. Bhilawe** In their paper **Structural Weight Optimization of Transmission Line Tower** Performed Transmission Line Towers represent approximately 28 to 42 percent of the cost of the transmission line. The growing demand for electrical energy can be met more economically through developing exceptional mild weight configurations of transmission line towers.
4) **Praful P. Gujjewar** has **Static and Dynamic Analysis of Transmission Tower To Wind And Seismic Loads** Performed The self-supporting three or four legged transmission towers are being used for transmitting electricity supply and for other purposes all over the world. Including the self-weight, transmission tower carries all the forces like wind, earthquake, and snow load.
5) **Milind Nataraj Shyamenahalli** In their paper **Determination of Economic Base Width of Transmission Tower for Different Wind Zones** Performed The present study deals with the calculation of optimum base width for transmission tower. The tower geometry having the height 34.120m and base width 6.307m. which is obtained from A.P.S.E.B (Andhra Pradesh State Electricity Board) substation, the analysis was performed for a 220kV transmission tower using STADD Pro.
6) **Satalaj Utekar , Rohit Vedpathak** In their paper **Analysis and Design of Transmission Tower** Performed Transmission Tower carry electrical transmission conductor from ground at safe height. The objective of paper is to find most economical section of tower and it configuration as per Indian Standard Code.
7) **Akshay S. Thakare** In their paper **Comparative Structural Analysis and Design of Transmission Tower and Monopole by using STAAD.Pro Software(manual calculation)** Performed The monopole of 18m height and transmission tower of 20m height are designed by manually calculated terms and the analysis is done by using structural analysis software. For the point of design, a 4-legged transmission tower of double circuited structure with 132KV power and a 16 sided polygonal-shaped of double circuited structure of monopole with 132KV power are considered.
8) **Prachi P. Bagmare** In their paper **Seismic Forces on Transmission Line Tower** Performed the present area, the telecommunication industry plays a great role in human societies and thus much more attention is now being paid to telecommunication towers than it was in the past. Many towers were failed for seismic load. Due to earthquake the transmission line may collapse, and it will cause economic loss as well as the secondary disasters such as fire.
9) **Tanvi G. Londhe** In their paper **Comparative Study of Dynamic Analysis of Transmission Towers** Performed This paper describes the estimation of feasible solution to optimize transmission line tower for weight parameter. The cost of transmission line towers is about 35% to 40% of the total cost of the transmission tower. But lesser study is carried out in the field of minimizing weight of transmission line tower, also less literature is available on transmission line tower with cold form sections.

10) **Sharma K.** In their paper **Comparative analysis of the different heights of the towers** using different types of reinforcement systems for different wind zones and seismic forces with the gust factor method for the analysis of wind loads, Analysis of response spectrum model and analysis, used for seismic loads.

11) **R.A Kravitz** In their paper the design and analysis of transmission line towers to compare the results using different types of towers according to some criteria of the ASCE 52 manual "**Guide for the design of towers for steel transmission lines"** for stimulate further research on the development of coherent project loading criteria; analysis and design method; Tower detail and test practice.

12) **Y.M Ghugal, U.S Salunkhe** have made **3 legged and 4legged Transmission line tower models using common parameters such as constant height, bracing system with an angle system** Performed The analysis is carried out to slenderness effect, critical sections, forces and deflection of both towers. A saving of steel weight up to 21.2% resulted to comparison of both 3 legged and 4 legged tower.

13) **Lakshmi, A. Rajagopala Rao** In their paper **The effect on the 21k 132kv tower with medium wind intensity** Performed A tower analysis is performed and the performance of tower members and forces is evaluated on all horizontal and vertical diagonal members. The intensity of the wind converted into point loads and applied in panel joints.

14) **Preeti, K.J Mohan** attempted to **Compare The Analysis of the three towers by changing the geometry and behavior of the structure** Performed A saving of 9.23% in weight of steel in the self-supporting triangular tower.

15) **Vinay R.B, Ranjith A., Bharath A.** made a **400kv Dual circuit tower that was modeled of angular and tubular sections using STAAD.ProV8i for wind loading by static linear and P-delta analysis** Performed After analysis, steel weight savings of up to 20.9% were obtained by comparing the tubular section with the angle section.

16) **G. Vishweswera Rao** has **Optimal transmission line tower designs for high voltage transmission lines. Optimization refers to both the weight of the tower and the geometry.** Performed The program incorporates a nonlinear non-linear optimization method developed specifically for the configuration, analysis, and design of transmission line towers.

17) **S. Christian Johnson** carried out an **Experimental study on the corrosion of the transmission line tower foundations and their rehabilitation**.Performed The physical, chemical and electrochemical parameters were presented, studied in the centers of the transmission line towers excavated in coastal and inland areas. A methodology for the rehabilitation of the transmission tower centers was discussed.

18) **Rahul Dhama** carried out **the analysis of transmission tower of 132 KVA under different wind loads (as per IS:875-2015 Part-III) by using STAAD Pro.** Performed The different wind load and same seismic zone parameters were presented, studies in the transmission line towers excavated in coastal area and mountainous areas.

3. OBJECTIVE

1. To analysis and design of transmission tower in different seismic zone by using staad.pro v8i.

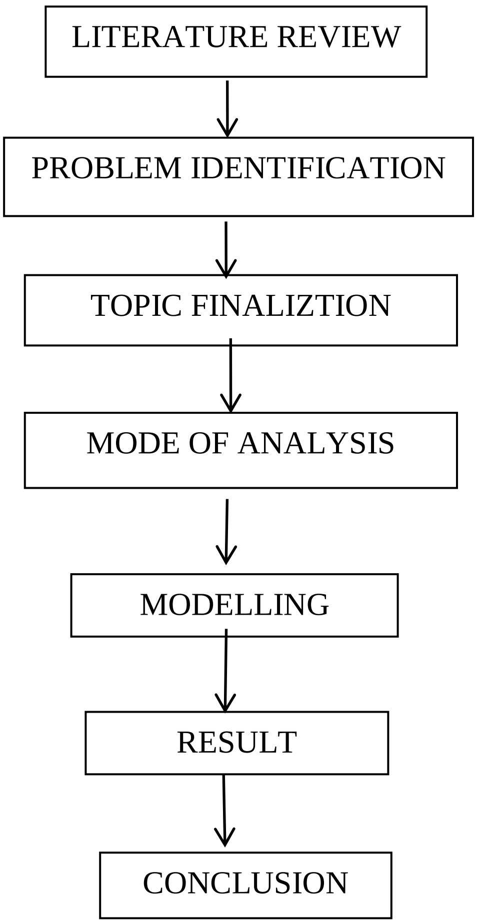
2. To validate software results with manual calculations.

3. To compare design of transmission tower different seismic zone and wind load with respect to Displacement, Reactions, Axial forces, Weight.

4. METHODOLOGY

1. Static Analysis – Dead Load or Self-Weight and live load.
2. Dynamic Analysis – Seismic Analysis, wind analysis.
3. Modelling is carried out.
4. IS 875 Part III- 1987- Code of practice for design loads (Other than earthquake) for buildings and other structure.
5. IS 802 (Part 1)-1995 section I - Use of Structural steel in Overhead transmission line towers-Code of Practice.
6. IS 1893 (Part 1) – 2016 – Criteria For Earthquake Resistant Design Of Structures, Part 1: General Provisions and Buildings
7. IS 1893 (Part 4) – 2005 – Criteria for Earthquake Resistant Design of Structures, Part 4: Industries Structures.

5. FLOW CHART



6. LITERATURE GAP

- Design of Model is Double Circuit Structure.
- Design of Transmission Tower Voltage is 400KV.
- Height of Transmission Tower is 50m, and Width is 7.5m.

7. CONCLUSION

Here, a variety of studies on measuring the sag of electricity transmission lines have been examined and contrasted using various performance indicators. The following approaches have been briefly discussed for monitoring the sag of overhead power lines: temperature-based, tension-based, specific time periods, GPS-based, image processing-based, technology, and optical techniques. These methods can be applied to smart electricity networks for efficient electrical power transmission. Yet, as this study points out, there are still many opportunities for further advancements in sag measurement methodologies. Challenges and restrictions related to sag measurement methodologies have been noted in this area. Several suggestions, including combining Technology with machine learning algorithms and deploying helpful.

8. REFERENCE

1. G.Visweswara Rao " Optimum Designs For Transmission Line Towers" Computer & Structures vol.57.No.1.pp.81-92, 1995
2. Y. M. Ghugal, U. S. Salunkhe "Analysis and Design of Three and Four Legged 400KV Steel Transmission Line Towers: Comparative Study " International Journal of Earth Sciences and Engineering 691 ISSN 0974-5904, Volume 04, No 06 SPL, October 2011, pp 691-694
3. M.Selvaraj, S.M.Kulkarni, R.Ramesh Babu "Behavioral Analysis of built up transmission line tower from FRP pultruded sections" ISSN 2250-2459, Volume 2, Issue 9, september (2012)
4. Gopi Sundam Punse. "ANALYSIS AND DESIGN OF TRANSMISSION TOWER". International Journal of Modern Engineering Research (IJMER), ISSN: 2249–6645, Volume 4, Issue 1, Jan. 2014
5. Vikas Gahlawat, Er. Sumit Kumar, & Yogesh Kaushik. (2015). Analysis and Design of a 25-Metre-Tall Steel Transmission Tower. *International Journal of Engineering Technology, Management and Applied Sciences*, 32-35
6. Heera Lal Bhardwaj, Ajit, & Yogesh Kaushik. (2015). Analysis and Design of Four Leg Steel Transmission Tower using Staad.Pro. *International Journal of Advanced Engineering, Management and Science (IJAEMS)* , 7-13
7. B. Bharath Kumar Reddy, K. Rasagnya, & V. Sanjay Gokul. (2016). A Study on Analysis of Transmission Line Tower and Design of Foundation. *International Journal of Engineering Development and Research* , 2214-2224
8. Yasaswini, S. V. N. L. Lalitha, & Shefali Talati. (2016). Multi Voltage Multi Circuit Transmission Tower Design to Reduce Right Of Way. *Indian Journal of Science and Technology*, 1-7.

9. N. Mahesh, & V. Ranga Rao. (2017). DESIGN & ESTIMATION OF ELECTRIC STEEL TOWER. International Journal of Civil Engineering and Technology (IJCIET), 646-652.
10. Trishit Chandra, & Sanjay Sengupta. (2019). Dynamic Analysis of Telecommunication Tower for Optimum Model Combination and Elemental Discretization. International Journal of Engineering and Advanced Technology (IJEAT), 2229-2237
11. Anshu Kumar Pal, M. Suneel, & P V Rambabu. (2019). Comparative Analysis of Transmission Tower using XX and XBX Bracing Systems in Different Wind Zones. International Journal of Recent Technology and Engineering (IJRTE), 56-61
12. Arya, S., & Er. Sindhu, A. R. (2020). Analysis and Design of Transmission Tower with Isolated Footing. Journal of Science and Technology, 35-42
13. Patil B.Y, Prof. Upase K.S., & Prof. Hamne A. A. (2020). Design and Analysis of Transmission Line Tower using Staad-Pro. International Journal for Scientific Research & Development, 11-13
14. CH. Prasad Babu, & N. Vikram. (2020). DESIGN OF TRANSMISSION TOWER AND ITS FOUNDATION. IJARIIE, 364-375.
15. Julius O Onyeka, & Ochonogor Hycent Ifechukwudeni. (n.d.). Towards Sustainability in Infrastructure developementStructural Design of a 330kV Transmission Line Tower in Warri, Nigeria.(2020)
16. N, B. B., & Banavekar, S. M. (2020). ANALYSIS AND DESIGN OF TRANSMISSION. JETIR December 2020, Volume 7, Issue 12, 8.
17. Sujeeth M Banavekar, & Bhavyashree B N. (2020). ANALYSIS AND DESIGN OF TRANSMISSION TOWER USING STAAD.Pro V8i. Journal of Emerging Technologies and Innovative Research (JETIR), 572-579.
18. IS 875 (part-3):2015 code of practice for design loads (other than earthquake) for buildings and structures. Part-3: wind loads.
19. IS 802(part 1/sec 1) code of practice for use of structural steel in overhead transmission line towers, part 1 materials, loads and permissible stresses, section 1: materials and loads