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# ANALYSIS AND DESIGN OF TRANSMISSION LINE TOWER USING STAAD PRO A REVIEW

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## ABSTRACT

The design of the electric power transmission tower is written in consideration of the confrontation between the high-voltage transmission line and the insulator that require height from the ground. For the same purpose, a transmission pylon with a similar context of 49 m height, 220 kV dual-circuit conductors and a flight control with STAAD PRO is recreated. Both structural and electrical considerations are taken into account when designing transmission line towers for safety and economy. According to IS 800-2007, in addition to its own weight, wind forces on towers, ladders and insulation are very noticeable. This work focuses on optimizing transmission pylons by using "X" and "K" braces and by modifying sections studied in static analysis. The upshots of using 'X' bracing to 'K' bracing are the appraisable reduction in the weight of the structure by 6% and having the displacement values supplemented.

**Keywords-** Analysis and Design, Conductors and Insulators, Double circuit conductors, STAAD Pro., Angle and Bracing system, Static Analysis.

## I. INTRODUCTION

India has a large population abiding each over the country and the electricity force need of this population creates demand of a large transmission and distribution system. Also, the disposition of the primary resources for electrical power generation viz., coal, hydro eventuality is relatively uneven, therefore again adding to the transmission conditions. Transmission line is an intertwined system conforming of conductor subsystem, ground line subsystem and one subsystem for each order of support structure. Mechanical supports of transmission line represent a significant portion of the cost of the line and they play an important part in the dependable power transmission. They're designed and constructed in wide variety of shapes, types, sizes, configurations and accoutrements. The supporting structure types used in transmission lines generally fall into one of the three orders lattice, pole and guyed. Transmission towers are built to evacuate electric strength generated in electricity stations over long distances across the use to substations for similarly transmission and distribution to diverse load centres. Energy transmission towers are widely divided into categories, viz. Alternating current (A.C.) and Direct current (D.C.) provided in Low tension (L.T.) i.e., inside the range of 0.4 KV to 33KV and in more high tension (E.H.T.) in the variety of 132KV to 400KV and past as much as 800KV. Extra high Voltage (E.H.V) is essential to lessen electricity losses for transmission over lengthy distances. The electricity is carried in three phase supply through three separate conductors for each of the circuit subsequently the towers are required to be designed for single circuit, double circuit and or multi circuit as in line with the required technical specifications of clients. The tower configuration and geometry depend upon the requirement of the technical specification energy is transmitted through flexible metal conductors strung at secure heights over towers. Towers are commonly self-supported four-legged cantilever metal structures holding the energy conductors with using insulators at required positions on cross hands. The strength conductors are clamped to the erected towers and carried forward aerially with using stringing system warding off dragging of conductor at the ground.The thing of every designer is to design the stylish(optimum) systems. But, because of the practical restrictions this has been achieved through suspicion, experience and repeated trials, a process that has worked well. Power Grid pots of India Limited has specified the following way to. Optimized the Design of Power Transmission Lines-

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- Selection of clearances.
- Insulator and insulator string design.
- Bundle Conductor studies.
- Tower configuration analysis.
- Tower weight estimation.
- Line cost analysis and span optimization.
- Economic evaluation of line.

## II. METHODOLOGY

A Double Circuit Transmission line palace carrying 220KV power capacity is anatomized and designed inSTAAD.PRO. The total height of palace is 49m which is determined according to IS 5613(part 2/ sec 1) 1995. Two halls are modelled by using' X' and' K' Bracings by using Indian angle sections with different sectional parcels in the palace rudiments. In order to design optimistic transmission palace with varying sections, IS 802(Part 1/ Sec 1) 1995 has been followed. The design of steel transmission tower is done in phases. The first phase comported of accumulating and organizing soil disquisition and geotechnical data, environmental data i.e., wind speed, geomorphology and terrain factors. The alternate phase comported of performing design computations to make the structure compatible to various forces and loads. After then the tower was designed usingSTAAD.pro CONNECT. The tower was analysed for being compatible with various loads. Eventually the tower design was considered for optimum safety consideration on utmost provident cost. Data Input for Design withSTAAD.pro CONNECT.

## III. LITERATURE REVIEW

[1] Gopi SudamPunse (Analysis and Design of Transmission Tower) In this thesis, the analysis and design of a narrow-based Transmission Tower (using Multi Voltage Multi Circuit) is carried out in India, with the goal of maximizing the use of electrical supply with limited ROW and an increasing population. Transmission Line Towers contribute to 28 to 42 percent of the total cable cost. The increased demand for power is frequently handled more cost-effectively by designing various light-weight transmission tower layouts. In this project, a battle has been waged to make the cable more cost-effective while keeping in mind the goal of providing the best possible electric supply for the defined area by identifying a unique transmission tower structure. The goal of this study is to increase the current geometry by using a 220KV and 110KV Multi Voltage Multi Circuit with narrow based Self-Supporting Lattice Towers. STAAD PRO v8i was used to accomplish the analysis and design.

[2] Vikas Gahlawat (Analysis and Design of a 25-Metre-Tall Steel Transmission Tower) The analysis and design of a steel lattice tower used for electricity transmission systems is done in this paper under various categories of gravity and lateral loads. The tower is analyzed under a variety of load conditions before being designed according to IS 800:1984. In order to plan the design process most correctly, proper site research data as well as environmental impact assessment data are collected prior to the design process using appropriate electronic and paper media. During the design, relevant safety design aspects are considered, taking into account the hilly slope terrain of the location (Shimla). During the design process, non-linear imperfections in both the surroundings and the structural material are taken into account. The steel angles that were riveted together were chosen for their various purposes and load impacts. The geotechnical investigation data is used to determine the foundation details. STAAD.Pro. CONNECT was the software tool utilized in the process. The load calculations were performed manually, however STAAD.Pro. CONNECT was used to acquire the analysis and design outputs. At all times, the goal is to create the safest design possible while keeping cost in mind.

[3] Lakshmi1, A. Rajagopala Rao "EFFECT OF MEDIUM WIND INTENSITY ON 21M 132kV TRANSMISSION TOWER" In this paper the performance of medium wind intensity is observed. The Recommendations of IS 875-1987, Effect of height above ground terrain and Basic wind speeds, , Design wind pressure, Design wind force, Design wind speed, is clarified in detailed. A study is administered for the tower and therefore the reform the performance of the tower and the member forces altogether the vertical, horizontal and diagonal members are

evaluated. The critical elements among each of three groups are identified. In following chapters, the performance of tower under abnormal conditions like localized failures are evaluated. The small print of load calculation, modeling and analysis are discussed. The wind intensity converted into point loads and loads are applied at panel joints.

[4]Tanvi G. Londhe, Prof. M.S.Kakamare(Comparative Study of Dynamic Analysis of Transmission Towers) This paper describes the estimation of possible solutions to optimize transmission line towers for weight parameters. The value of transmission line towers is about 35% to 40% of the entire cost of the transmission tower, but the lesser study is administered within the field of minimizing the weight of transmission line towers, also less literature is out there on transmission towers with cold form sections. Analysis of cable tower administered as per standard codes, also comparative study is carried on the idea of various sorts of bracing systems (warren, horizontal, diagonal and diamond) and materials like hot rolled and cold form sections. By designing a cable tower with hot rolled sections using STAAD pro, hot rolled sections give a lightweight design.

[5] Y. M. Ghugal, U. S. Salunkhe [1] "Analysis and Design of Three and Four Legged 400KV Steel Transmission Line Towers: Comparative Study" H.O.D. Applied Mechanics Department, Govt. College of Engineering, Aurangabad Maharashtra (India), Post Graduate Student of M.E. (Structural Engineering), Applied Mechanics Department, Govt. College of Engineering, Aurangabad. International Journal of Earth Sciences and Engineering 691 ISSN 0974-5904, Volume 04, No 06 SPL, October 2011, pp 691-694

## IV. CONCLUSIONS

At the complete, this has a look at has attempted to provide a perception into the soilproperties, design of foundation and STAAD analysis. The study yielded thefollowing conclusions based totally on the laboratory experimentation executed inthis investigation.

1. We located that the properties of soil after determination of laboratory tests, the sol is red clay and its miles comes under moist clay soil.

2. After knowing the type of soil, we selected moist form of foundation.

3. We found at some stage in the design manner, all the design criteria satisfied as according to IS code provisions.

4. After designing the foundation, then we're going to design seismic and wind evaluation with the aid of using STAADPro.

5. After gazing HUDHUD cyclone, we are assigning 220kmph in wind analysis.

6. We found in analysis of seismic the transmission tower turned into stable.

## V. FUTURE SCOPE OF THE WORK

The world will need significantly extended electricity supply in the coming 20 years.The demand of electricity is adding doubly as presto as overall energy use and is likely to rise by further than two- thirds till 2035. In 2012, 42 of primary energy used was converted into electricity. With the United Nations prognosticating world population growth from6.7 billion in 2011 to8.7 billion by 2035, demand for energy must increase mainly over that period. Both population growth and adding norms of living for numerouspeople in developing countries will beget strong growth in energy demand, as outlined over. Over 70 of the increased energy demand is from developing countries, led by China and India – China caught the USA as top CO2 emitter in 2007. Growth of Power Sector structure in India since its Independence has been noteworthy making India the third largest patron of electricity in Asia. Generating capacity has grown manifold. The distance between generating stations and cargo centres is adding day by day. The quota of power to be handled is gained from 11kV to 765 kV in India. This need is the introductory cause behind emergence of EHV. EHV transmission has surfaced from various advantages like decresed in line drop and increase in transmission effectiveness.

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