Static and Dynamic Analysis of Transmission Line Tower

D.Leela, Dasarathy, A. K., Leshmi mohan, S.Kabileshwar

Abstract: The towers of the to the most powerful life-line buildings that support electrical transmission line are peculiar transmission. Transmission towers are essential for providing energy to various parts of the nation. The transmission line should be stable and carefully structured with the objective that they do not fizzle in the midst of a catastrophic event and adapt to the national and universal standard. This present paper manages the investigation of static and dynamic examination of transmission line tower. A run of the mill sort of transmission line tower is picked as contextual analysis. The examination and displaying of pinnacle is done utilizing FE based ANSYS programming. The heaps following up on the pinnacle reflected are numb burden, live burden and dynamic burdens. In this Paper the most extreme twisting joined anxieties and characteristic frequencies, bowing minute shear constrain are gotten.

Key words ; static analysis, dynamic analysis, ANSYS, transmission tower

I. INTRODUCTION

The want of electric power utilization has kept on expanding in each nation, the speed of interest being more prominent in the creating nations. The towers of the transmission line are some of the most powerful life-line buildings that assist spread electrical power. Transmission towers are essential for providing authority to the country's various districts. In the current scenario, the structure of intensity stations increments and consequently increases the power transmission lines from the generating stations to the distinguishing angles. Interconnections between frameworks are likewise expanding to upgrade dependability and economy. The present examination manages normal frequencies, methods of vibration, diversion design exposed to live load and wind load following up on pinnacle And static and dynamic investigation of transmission line tower.

II. NECESSITY OF TRANSMISSION LINE TOWER

The transmission line tower is progressively fundamental now daily since entire world utilizing most extreme measure of power. Without power no any organization will run. Every single MNC need the power to run their work.

The reason for a transmission line tower is to assist conveyors transmitting electrical power and a few ground cables at suitable separations above ground level and from each other. The transmission line towers cost about 35 to 45% of the transmission line's total price. A tower for transmission is a space aid and an unclear structure. The transmission line tower provides high present voltage. We need a transmission line tower to offer elevated present voltage. A high-voltage transmission line tower is the most perfect method to supplying high present voltage.

Objective of this paper
➢ To determine Deflection profile and member forces
➢ Arrive Natural frequency, Bending moment and Deformation

Input geometric data
➢ Height—40m(base level)
➢ Length—20m(base level)
➢ L-type bracing system

Properties of stainless steel
➢ L-type of cross section
➢ Width of L section= 0.1m
➢ Thickness of L section= 0.01m

Loads apply on tower
UDL(uniformly distributed load)= -500N
Wind loads = -50N

About ANSYS

ANSYS V.18.1 is a coordinated pre-and post-processor plan investigation device based on the FEM created by ANSYS. The ANSYS item documentation is beautiful and includes reference instructions; guiding, displaying and fitting aid operations; controlling vital research strategies; managing driven exams; component reference; hypothesis reference; auxiliary examination manage; warm investigation direct; electromagnetic fields investigation manage; liquid elements manage; and coupled field investigation direct.

Taken together, these manuals describe the techniques, instructions, elements and hypothetical subtleties that the ANSYS program is supposed to use. ANSYS is used to check the transmission line tower.

Apart from the ANSYS hypothesis reference, most of the above manuals are available online via the ANSYS help framework, which can be accessed either as an independent framework or from within the ANSYS program. ANSYS is a completed programming set of FEA reproduction produced by ANSYS Inc-USA. Dr. JOHN SWANSON founded the organisation in 1970 and originally named Swanson Analysis Frameworks; Inc.
ANSYS is the company’s first name. ANSYS has a large group of products that are developed to handle unusual problems of reason.

III. METHODOLOGY, PROCEDURE AND DATA OBSERVATION

All were presented in figurative way

Step 1 Geometry part

Step 2 Modelling

Step 3: Meshing
Step 4: Static structure

Step 5: Solution

Step 6: Result

IV. STATIC STRUCTURE

A static structural analysis fixes the shear force, bending moment & displacements in structures or constituents affected by loads that do not prompt major inertia and damping things. UDL and wind load are anticipated; that is, the loads and the structure's retort are presumed to fluctuate gently with respect to time. A static structural load can be executed using the ANSYS. The following tables shows the result of Shear force, Bending moment & displacement of tower

Table 1 Sample of Result of Shear force, Bending moment & Total displacement)
Figure 1 show Shear force, Bending moment & Displacement of tower

Minimum = 1.0837 N @ 14.142 m
Maximum = 64.217 N @ 0 m
Bending moment value Minimum value = 44.425 N-m @ 23.895 m
Maximum value = 240.52 N-m @ 0 m
Displacement Minimum value = 5.7026e-8 @ 28.284 m
Maximum value = 1.1803e-6 @ 2.4383 m

Vibration analysis:
Vibration scrutiny is a method of eyeing for glitches and checking change from the customary vibration signature of a system. The vibration of every piece in motion is described by deviations of amplitude, intensity, and frequency. All are represented in Table and figures.

Table 2 show Total deformation 1,2 and 3

<table>
<thead>
<tr>
<th>Mode</th>
<th>Frequencies (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1.</td>
<td>1.398</td>
</tr>
<tr>
<td>2.</td>
<td>4.0215</td>
</tr>
<tr>
<td>3.</td>
<td>4.6728</td>
</tr>
<tr>
<td>4.</td>
<td>5.6113</td>
</tr>
<tr>
<td>5.</td>
<td>5.8862</td>
</tr>
<tr>
<td>6.</td>
<td>6.0139</td>
</tr>
<tr>
<td>7.</td>
<td>6.027</td>
</tr>
<tr>
<td>8.</td>
<td>6.0859</td>
</tr>
<tr>
<td>9.</td>
<td>6.2165</td>
</tr>
<tr>
<td>10.</td>
<td>6.3765</td>
</tr>
</tbody>
</table>

Figure 3 Corresponding Frequency
Table 3 Results of deformation

<table>
<thead>
<tr>
<th>Object Name</th>
<th>Total Deformation</th>
<th>Total Deformation 2</th>
<th>Total Deformation 3</th>
<th>Total Deformation 4</th>
<th>Total Deformation 5</th>
<th>Total Deformation 6</th>
<th>Total Deformation 7</th>
<th>Total Deformation 8</th>
<th>Total Deformation 9</th>
<th>Total Deformation 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scoping</td>
<td>Scope</td>
<td>Geometry Selection</td>
<td>All Bodies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Type</td>
<td>Mode Identifier</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geometric</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geometry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Min Value</td>
<td>2.1614e-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
</tr>
<tr>
<td>Max Value</td>
<td>7.2749e-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
<td>-003 m</td>
</tr>
<tr>
<td>Std Deviation</td>
<td>1.98</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
</tr>
</tbody>
</table>

V. SUMMARY AND CONCLUSION
The static and dynamic examination of transmission line tower (L-kind of cross area) An endeavor has been made in investigation and demonstrating of transmission line tower utilizing limited component and on based ANSYS programming. The models made by utilizing ANSYS workbench programming. The connection component is utilized for the displaying. In the present investigation the social changes because of diversion and worries of transmission line tower against static and dynamic loadings is completed. Following are the ends drawn from the examination.

- The Value of Maximum miss happening got on account of static investigation is 7.2749e-003 (m)
- In free vibration investigation of existing transmission line tower of L-kind of cross area.
- As the quantity of mode is expanded, the estimation of normal frequencies progressively increments. For initial three modes, the regular recurrence remains practically steady and from that point increments in higher modes.

The investigation completed utilizing limited component examination (ANSYS programming) gives fitting arrangements including nodal, component, and part arrangements.

REFERENCES
19. IS 802Part(1/Secion 1)-1995, Bureau of Indian Standards Use of structural steel in over head transmission line towers – code of practice (materials, loads and permissible stresses), Sec.1 Materials and Loads.

Published By: Blue Eyes Intelligence Engineering & Sciences Publication

Retrieval Number: A10441091519/2019@BEIESP
DOI:10.35940/ijeat.A1044.1091519
AUTHORS PROFILE

Dr. Dasarathy A K is a Professor in the Vel Tech Multi Tech Dr. Rangarajan Dr. Sakunthala Engineering College Department Of Civil Engineering where he has been a faculty member since 2016. Currently he is the department Head of the department. He is professor with more than 26 years of experience teaching at the college level and in industry. Distinguished record of publication in academic journals, international & national conferences all over the world. His research interests lie in the area of transportation ranging from theory to design to implementation. He has collaborated actively with researchers in other disciplines of civil engineering.


Lekshmi Mohan, born in the year 1980 at Thiruvananthapuram District, Kerala. Graduated in Civil Engineering from TKM College of Engineering, Kollam, University of Kerala. Post Graduation in Mtech Construction Engineering and Management from Dr. M. G. R Educational and Research Institute, Chennai. Pursuing PhD from the same University. Started career in the field of civil engineering at the maintenance division, VSSC, Dept. Of space, Thumba, for two years. Joined the profession of teaching in 2008 and continuing till date at Dr. M.G.R Educational and Research Institute.