The 2024 World Congress on
Advances in Civil, Environmental, & Materials Research (ACEM24)
19-22, August, 2024, The K hotel, Seoul, Korea

Research on coupling vibration characteristics and wind-induced responses of large-span transmission lines

* Zhen-hua Li[1)], Xing Fu[2)] and Wen-ping Xie [3)]

[1), 2)] *School of Civil Engineering, Dalian University of Technology, Dalian 116024, China*
[3)]*Electric Power Research Institute of Guangdong Power Grid Co., Ltd Guangzhou 510080,P.R.China*
[1)] *hh888@dlut.edu.cn*

ABSTRACT

A finite element model encompassing three spans and two towers was devised to investigate wind-induced responses of a large-span Chinese transmission line. Modal analyses of a single tower and the tower-line system are conducted, followed by comparing their vibration characteristics under one- and three-dimensional wind loads, generated via harmonic superposition methods. Time-history analyses of wind-induced responses and gust response factors reveal the effects of wind velocity, ground roughness, and wind attack angle on tower-line systems under three-dimensional wind loads, incorporating aerodynamic damping. The results revealed that transmission lines have a non-negligible effect on towers. Three-dimensional wind loads substantially amplified the wind-induced responses compared to one-dimensional loads. And wind speed, ground roughness, and wind attack angle significantly influence the structural response of transmission towers, providing critical insights for their design.

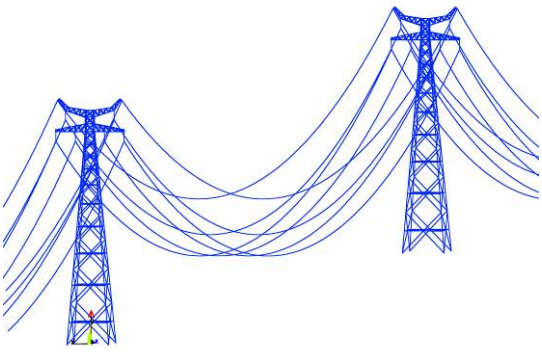

Fig. 1 Finite element model of the tower-line system

[1)] Graduate Student
[2)] Associate Professor
[3)]Master

REFERENCES

Battista R C, Rodrigues R S, Pfeil M S. Dynamic behavior and stability of transmission line towers under wind forces[J]. Journal of Wind Engineering and Industrial Aerodynamics, 2003, 91(8): 1051-1067.