

Improved fragility analysis of transmission tower subjected to strong winds

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ABSTRACT

Transmission towers are wind-sensitive structures and many were damaged and even collapsed by strong winds. The evaluation of the fragility of the transmission tower has its significance from many practical perspectives. It can be used as a reference by civil engineers for tower design and construction. It also provides a basis for government's damage mitigation decisions. This paper addresses the fragility analysis of the transmission tower under strong winds. In this paper, the uncertainties regarding material properties and section dimensions are taken into account, the wind-induced response and anti-collapse capacity of transmission tower under wind load are numerically simulated. At first, the spectral representation method is used to simulate the fluctuating wind, and random samples of material properties and section dimensions are generated based on the Latin Hypercube Sampling technique and used to establish uncertain finite element models for transmission towers. Then the static non-linear buckling analysis and incremental dynamic analysis for each sample structure subjected to wind loads under different wind attack angles is conducted using ANSYS software. Accordingly, the threshold displacement values of damage and collapse of the structure are determined and the maximum top tower displacement and basic wind speed curves are obtained. Finally, the fragility analysis of transmission tower under different wind attack angles can be carried out. The improvement of this paper is to better consider the influence of structural uncertainties on wind-induced response and the finer damage states are defined.

REFERENCES

Fu Xing, Li Hongnan, Li Gang. (2016), "Fragility analysis and estimation of collapse status for transmission tower subjected to wind and rain loads", *J. Structural safety.*, 58:1-10.

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