

Which wind-vibration coefficient should be used for flexible PV support structures?

Considering the safety of flexible PV support structures, it is reasonable to use the displacement wind-vibration coefficient rather than the load wind-vibration coefficient. For the flexible PV arrays with wind-resistant cables discussed in this study, a recommended range for the wind-vibration coefficient is 1.5 to 2.52.

Does wind-induced vibration affect flexible PV supports?

Discussion The wind load is a vital load affecting PV supports, and the harm caused by wind-induced vibration due to wind loads is enormous. Aiming at the wind-induced vibration of flexible PV supports, a PV building integration technology [86, 87] was proposed to reduce the harm caused by wind vibration.

Does wind speed affect the vibration amplitude of PV panel?

The results indicate that under the boundary layer flow, the vibration amplitude of PV panel increases almost linearly with the square of wind speed, and vortex shedding induced vibration might occur at low wind speeds.

Does wind-induced vibration affect a cable-supported PV module?

Therefore, both aeroelastic and rigid model wind tunnel tests were conducted to investigate the wind-induced vibration (WIV) characteristics of a typical cable-supported PV module. The effects of module tilt angle, cable pre-tension, and wind speed on the vertical displacement response and the aerodynamic damping were evaluated.

What are the main wind load issues associated with PV supports?

Making full use of the previous research results, the following are the main wind load issues associated with the three types of PV supports: (1) the factors affecting the wind loads of PV supports--the main factors are shown in Figure 2; (2) the wind-induced vibration of PV supports; (3) the value and calculation of the wind load of a PV support.

Do flexible PV support structures deflection more sensitive to fluctuating wind loads?

This suggests that the deflection of the flexible PV support structure is more sensitive to fluctuating wind loads compared to the axial force. Considering the safety of flexible PV support structures, it is reasonable to use the displacement wind-vibration coefficient rather than the load wind-vibration coefficient.

GB50009-2012 [24]), which is a non-dimensional coefficient and can be estimated thus, $\beta = 1 + P_e / P_m$ where P_e is the equivalent static wind load considering the dynamic effects of wind-induced structural vibration, and P_m is the average wind load.

The time-series wind vibration coefficients are larger than the code values by a factor of 1.39-1.82. This study can provide a reference for evaluating the wind-induced vibration performance of early Chinese hall-style

timber buildings. ... The main characteristic of the hall style is that inner columns are obviously taller than outer columns ...

This study investigates the wind-induced vibrations (WIVs) of photovoltaic (PV) modules possessing unique characteristics such as lightweight construction, low frequency, and susceptibility to wind loads, in contrast to stationary PV systems installed on ...

This research focused on the safety and critical wind speed of flexible PV mounting structures, as well as the calculation of wind-vibration coefficients, and proposed reinforcement strategies for wind-induced vibration ...

The displacement wind-induced vibration coefficients (γ_{z_u}) for Point 1 corresponding to cases 1-3 are 1.68, 1.67, and 1.70, respectively. The corresponding support reaction wind-induced vibration coefficients ($\gamma_{z_{f1}}$) are 1.19, 1.20, and 1.21, respectively. The results suggest a minimal dependence of the wind-induced vibration ...

Tamura et al. and Kim et al. investigated the vibration characteristics of single-layer flexible photovoltaic systems through wind tunnel tests; the results indicated that the structural displacement response of wind-induced vibration was closely related to the cable sag-to-span ratio, wind speed, and wind direction angle. In addition, the research demonstrated ...

Solar panels installed on the ground receive wind loads. A wind experiment was conducted to evaluate the wind force coefficient acting on a single solar panel and solar panels arranged in an array.

Photovoltaic bracket products have been introduced, and photovoltaic flexible cable truss structure has emerged. ... By adding a wind-proof system based on the single-layer cable flexible photovoltaic bracket, the structure could well adapted to complex terrain. ... The modes, wind vibration coefficients and limit working conditions of ...

Wind-induced damage during the construction process and the evolution of damage over time are important reasons for the wind-induced destruction of large cooling towers. In fact, wind vibration coefficient and stability performance will evolve with the construction height and material properties over time. However, the existing studies generally ignore the impact of wind load ...

In addition, the wind vibration coefficient (WVC) of the new CSPS is recommended as 1.6, according to the experimental results. ... North America, and Asia. Therefore, it is an urgent need to develop new energy sources. Solar energy has significant advantages, such as safety and reliability, no noise, no pollution emissions, and no danger of ...

Xu et al. used an aeroelastic wind tunnel test to study the influence of the wind speed, module tilt angle, and cable pretension vibration on the vibration response of a single-row, cable-suspended PV structure without

Wind vibration coefficient of single-column photovoltaic bracket

regard to the wind load interference effect from other PV modules in an array. Most of the previous studies focused on the wind-induced vibration ...

The single-axis solar tracker has, in a certain range of tilt angles, large torsional vibration, but the critical wind speed varies at varied tilt angles (Martinez-Garcia, 2021; Martinez-Garcia et al., 2021; Young et al., 2020). For convenience, this study defines the tilt angle as follows: when the photovoltaic modules are placed horizontally, the angle is 0° ; when the ...

The complex aerodynamic shape and structural form affect the wind-induced vibration coefficient C_w of landscape towers with a twisted column and spiral beam (short for LTs). To clarify the C_w distribution characteristics, evaluate the applicability of existing load codes, and provide accurate design wind loads, wind tunnel tests and numerical simulations were carried ...

The findings indicated that both single- and multi-row PV modules experience flutter instability as wind speeds increase, resulting in significant vibrations at wind directions of 0° ; and 180° . Vertical vortex-induced vibrations (VIVs) were observed in multi-row arrays at lower wind speeds prior ...

The strongest WIVs were observed in the crosswind cases (Cases 0° ; and 180°), which are the most dangerous cases. The vibration amplitude decreases almost linearly when ...

There are, however, few studies concerned with the aeroelastic vibration of PV structures under the tension cable support system. Tamura et al. [14] studied the aerodynamic instability of a cable-supported solar system using wind tunnel experiments and found that vertical vibration is closely dependent on sag, wind speed, and azimuth, and cable sudden collapse ...

It should also be noted that the decrease in the largest negative wind load coefficient is subtle as the array edge setback decreases from 1.2 m to 0.5 m. Figure 17 (b) shows the wind load coefficients for the gable roof configurations. The largest negative net pressure coefficients of the PV array decrease significantly as the setback ...

Du Hang, Xu Haiwei, Yue long, et al. Wind pressure characteristics and wind vibration response of long-span flexible photovoltaic support structure [J] Journal of Harbin Institute of Technology ...

Solar panels installed on the ground receive wind loads. A wind experiment was conducted to evaluate the wind force coefficient acting on a single solar panel and solar panels arranged in an array. The surface ...

Recently, the authors (He et al., 2020) proposed a new cable-supported PV system by adding an additional cable and several triangle brackets to form an inverted arch and reduce the deflection of the PV modules and studied the wind-induced vibration and its suppression through a series of wind tunnel tests.

Wind vibration coefficient of single-column photovoltaic bracket

The wind-induced vibration of cables has been widely studied over the past decades because of cables' many applications in cable-stayed, suspension, and tied-arched bridges, and power transmission lines. They have been mostly investigated through research conducted on rigid model cables with a finite length and circular cross-sectional geometry that represents a ...

In solar power technology, flexible cable-supported photovoltaic (PV) systems (FCSPSs) offer an alternative to traditional ground-mounted supports due to their lightweight design, long spans, and resilience. Its adaptability proves invaluable in challenging terrains such as mountains, fish ponds, and sewage treatment plants. The wind-induced vibration coefficient ...

Physical simulation in wind tunnel facility is arguably one of the most widely-used techniques in wind engineering community to diagnose the wind load characteristics on structures [22][23][24].

The wind load is a critical factor for both fixed and flexible PV systems. The wind-induced response is also one of the key concerns. Existing research mainly concentrates on the wind-induced behavior of PV panels through wind tunnel tests and Computational Fluid Dynamics (CFD) simulations to determine wind pressure coefficients, which are used to ...

Flexible photovoltaic (PV) support structures are limited by the structural system, their tilt angle is generally small, and the effect of various factors on the wind load of flexibly supported PV ...

Firstly, an analysis approach for wind-induced vibration coefficients of FCSPSs is established, involving model equivalency, coefficient definitions, model creation, and grid and ...

The complex aerodynamic shape and structural form affect the wind-induced vibration coefficient ? of landscape towers with a twisted column and spiral beam (short for LTs).

The numerical analysis results of the dynamic wind load obtained a large discrete-type displacement-wind-vibration coefficient, suggesting the practicality of using stress-wind-vibration coefficients. In an ...



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