Effects of ice accretion on the aerodynamics of bridge cables

Undesirable wind induced vibrations of bridge cables can occur when atmospheric conditions are such to generate ice accretion. This paper contains the results of an extensive investigation of the effects of ice accretion due to in-cloud icing, on the aerodynamic characteristics of bridge hangers and stay cables. The aim of this paper is twofold; first, it was investigated the ice accretion process and the final shape of the ice accreted; then the aerodynamics of the ice accreted bridge cables was characterized, and related to the ice shape. Different climatic conditions, i.e. combinations of temperature, wind speed and yaw angle of accretion, were reproduced in a climatic wind tunnel, giving rise to different types of accretion. These were chosen such to generate the most common natural ice formations expected to produce bridge cable vibrations. A description of the geometric characteristics of the ice accretions is given in the paper. Only for the bridge hanger case, a short description of the evolution of the ice accretions is given. The aerodynamic force coefficients were then measured with varying yaw angle, angle of attack and wind speed, and are presented and discussed in the paper; these are found to be significantly affected by the characteristics of the ice accretion.

General information
Publication status: Published
Organisations: Department of Civil Engineering, Section for Structural Engineering, Mediterranea University of Reggio Calabria, University of Naples Federico II
Contributors: Demartino, C., Koss, H., Georgakis, C. T., Ricciardelli, F.
Number of pages: 22
Pages: 98-119
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Journal of Wind Engineering and Industrial Aerodynamics
Volume: 138
ISSN (Print): 0167-6105
Ratings: BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.51 SJR 0.976 SNIP 1.919
Web of Science (2015): Impact factor 2.024
Web of Science (2015): Indexed yes
Original language: English
Keywords: Aerodynamic coefficients, Bridge cables, Bridge hangers, Ice accretion, Low-altitude atmospheric icing, Roughness, Shape distortion, Stay cables
DOIs: 10.1016/j.jweia.2014.12.010
Source: Findit
Source ID: 274039304
Research output: Contribution to journal → Journal article – Annual report year: 2015 → Research → peer-review