

Stay Cable Anti icing Technologies Developments

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1 Abstract

Stay cables are exposed to atmospheric icing which may lead to aerodynamic instability, and safety concerns when large sections of ice fall from the cables onto the bridge deck and unsuspecting users.

New technologies are currently being developed to provide a robust system to minimize ice shedding events for bridges facing this issue, without compromising stay cable aerodynamic requirements. Freyssinet's Ice Formation Control System has been developed as a combination of self-acting and active systems. The self-acting system is based on a duct with specific treatment and is studied to reduce significantly the frequency of ice shedding event, while the active system allows the removal of exceptional massive ice accretion on the cable duct before it poses a critical risk.

The combination of these systems offers preventive and de-icing solutions with an optimized efficiency and low energy costs. When coupled with a weather prediction system, it allows bridge owners to predict rare critical ice accretion occurrence and avoid unanticipated closure of the bridge while maintaining a high level of safety for bridge users.

Keywords: Ice accretion, Ice shedding, Stay cable protection, R&D

2 Introduction

Ice shedding, defined as the debonding of ice from the stay cable, poses a serious hazard for bridges in service. Several ice shedding events have been registered throughout bridges in North America, e.g. Portman Bridge in Vancouver or the Veteran Glass City Skyway in Toledo, Ohio, and in Northern Europe on the Øresund bridge, between Denmark and Sweden.

Aside from being an obvious health hazard for drivers and workers, ice shedding can lead to very high maintenance costs for the bridge owners, and

be the cause of large scale economic issues for the surrounding area due to the closure of the bridge to the traffic.

Accretion and shedding of ice blocks or packed snow are the consequence of certain weather conditions, and the combination of these conditions may lead to problematic ice shedding events, where large pieces of ice fall on the bridge deck. Since first issues were reported on Veteran Glass City Skyway Bridge in 2011, different systems of prevention or ice removal were studied or even implemented to solve the problem of falling snow and ice on bridges.