Institut für Baustatik und Konstruktion

Seminar

16. November 2010

Aerodynamic vibration control of bridge cables through shape modification and the role of DTU's new Climatic Wind Tunnel

Tuesday, 16. November 2010
17:00
Auditorium HIL E 3
ETH Zürich, Hönggerberg, 8093 Zürich

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Professor Christos T. Georgakis, Technical University of Denmark, will visit the research group on Risk and Safety of Professor Michael H. Faber at ETH Zurich. Professor Georgakis leads the Civil Engineering Structural Dynamics group at DTU Civil Engineering, which is presently researching the idea that wind-induced cable vibrations can be effectively controlled through cable shape modification.

For cable-supported bridges, the cable is the main contributor to bridge span stiffness. So, as bridge decks become longer, so do the supporting cables. To retain stiffness, the cable's cross-sectional area invariably increases. This leaves the cable exposed to two major problems – high static wind loading, due to increased drag, and an augmented susceptibility to flow-induced vibrations, due to the lowered inherent structural damping. And so, wind-induced vibrations of cables on long-span cable-supported bridges are increasingly being reported. Examples of bridges with a history of cable vibrations include the Severn Crossings (UK), Øresund Bridge (DK-SE), Great Belt East Bridge (DK), and the Fred Hartman Bridge (USA), to name a few.

The owners of cable-supported bridges often revert to some form of externally placed dampers or crossties to reduce these vibrations. But, as bridge spans increase, these counter-measures also become increasingly less effective. Nevertheless, recent research has shown that aerodynamic vibration control of bridge cables through shape modification shows great promise not only at limiting cable vibrations, but also at reducing cable drag – regardless of bridge span.