Popular science summary of the PhD thesis

PhD student	Maja Rønne
Title of the PhD thesis	Aerodynamic stability optimisation of twin-box bridge girders
PhD school/Department	DTU Construct

Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology. Before the thesis defence, the summary is sent to DTU's Office for Communication and Media and to the media *Ingeniøren*:

Suspension bridges are used for long-span crossing, making them a crucial engineering solution for connecting cities and enhancing infrastructure. However, as the demand for longer spans grows, the need to ensure these structures remain stable in high winds becomes increasingly important. This PhD thesis explores the aerodynamic stability of twin-box bridge girder designs. Through extensive wind tunnel tests and advanced computational fluid dynamics (CFD) simulations, the thesis investigates various design factors, such as girder shape, wind screens, walkway porosity and gantry rails, which all play a role in enhancing the stability.

Central to this research is the phenomenon termed the "nose-up" effect. When subjected to strong winds, twin-box girders can exhibit a beneficial nose-up twist that enhances their aerodynamic performance. Key findings from this thesis establishes that increasing degree of nose-up rotation significantly increase the critical wind speed at which a bridge enters flutter and starts oscillating. This ensures that the bridge deck remains stable as wind speeds rise, effectively protecting the overall structure. The inner gantry rails for maintenance have shown to have a significant effect of the aerodynamic stability of the twin-box girder, as these promote the nose-up rotation. The research not only provides valuable insights into this crucial aerodynamic phenomenon of twin-box girders but also highlights the need for careful geometric design in the construction of future long-span suspension bridges.

Ultimately, the insights gained from this study aim to fostering the development of more robust and efficient bridge designs in the future.

Please email the summary to the PhD secretary at the department