MASTER'S DISSERTATION AT STRUCTURAL MECHANICS

DEPARTMENT OF CONSTRUCTION SCIENCES | FACULTY OF ENGINEERING LTH | LUND UNIVERSITY

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PRESENTATION

JANUARY 2023

REPORT

Will be published as
Report TVSM-5262

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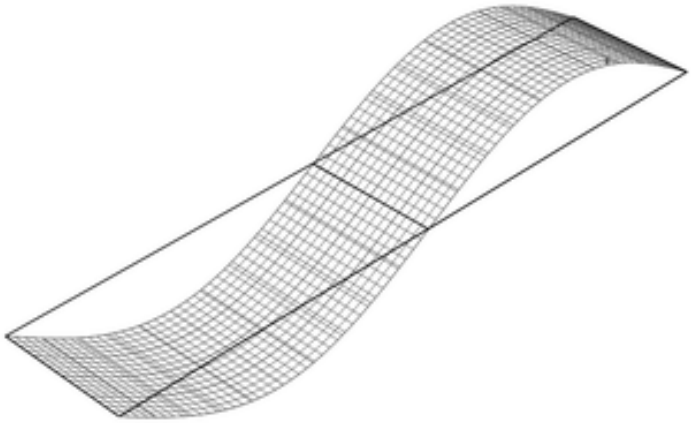
IN COOPERATION WITH

SWECO AB

DYNAMIC BEHAVIOUR OF FOOTBRIDGES



BACKGROUND

Due to their lower static design loads, footbridges are generally slender structures that are more vulnerable to vibration issues. Footbridges are often designed with excessive dimensions relative to the static loads for these reasons to avoid dynamic loads exceeding comfort criteria. The reason for this is that bridges are usually designed in the early stages for the ultimate limit state and that it is more difficult to design the bridge for the vibration requirements in the serviceability limit state. This often leads to more material being used to increase the bridge's stiffness or otherwise ensure that the bridge can handle the vibration requirements without directly designing the bridge for them. The utilization rate of the load-bearing construction elements will then be lower, and lead to an unnecessarily large use of materials and an increased amount of built-in CO2.

It is desirable to be able to determine at an early stage in a project whether a certain bridge will need to be designed specifically for the dynamic loads. There are several factors that may be decisive for the vibration criteria in footbridges, e.g. span, width, support conditions, material choice, etc. In this thesis, a number of these factors and their influences will be examined. Such knowledge is valuable at an early stage to guide the proceeding of a construction project.

AIM

The aim of this master's thesis is to increase the understanding of how several parameters affect the dynamic properties of footbridges. In the long term, this may reduce the amount of material required to ensure the vibration criteria in the serviceability limit state, and thereby increase the utilization ratio of the structures.

METHOD

To be able to determine the bridges' characteristics and impacts, the finite element analysis tool Abaqus will be used. A number of bridges will be modelled and from a study of parameters their dynamic behaviors will be examined. To evaluate the vibration criteria, the Eurocodes and the technical guide on Footbridges from Sétra are used.

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xpTVSM-5262 (2022-12)