MASTER'S DISSERTATION AT STRUCTURAL MECHANICS

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

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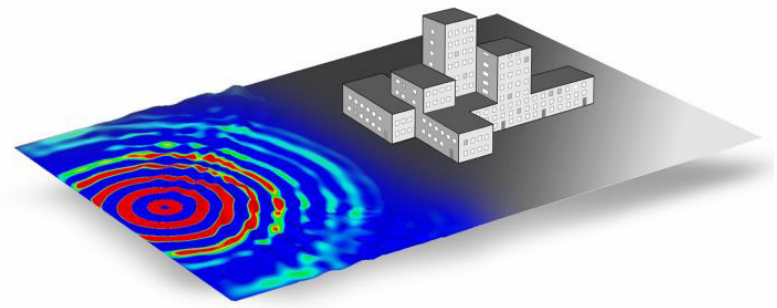
EFFECT OF STRUCTURAL DESIGN ON TRAFFIC-INDUCED BUILDING VIBRATIONS



BACKGROUND

Population growth and urbanisation results in densified cities, where new buildings are being built closer to existing vibration sources such as road-, tram- and rail traffic. In addition, construction of new transportation systems closer to existing building is conducted. Potential disturbing vibrations are one issue to consider in planning urban environment and densification of cities. The Building industry is in need of better knowledge and tools for predicting building vibrations both for early planning stage and detailed design phases.

Vibrations can be disturbing for humans but also for sensitive equipment in hospitals, for example. In determining the risk for disturbing vibrations to occur, the distance between the source and the receiver, the ground properties and, type and size of the building are governing factors.

OBJECTIVE AND METHOD

This study intends to analyse which factors that govern the dispersion of vibrations. One of these factors could be coinciding frequency between the load and the structures resonant frequency.

What type of structural system and foundation in the building should be chosen for avoiding disturbing vibrations, will be investigated. The choices may involve: the type of construction material (if it would be a light or heavy structure); the slab spans being allowed; or the size of the footprint of the building as well as the layout and types of foundations (slap, strip footings, piles).

The study aiming at investigating the influence of various parameters of structural design of a building on its obtained vibration levels caused by external loads from traffic. The study also seeks to find indicators, for which structural design solution is suitable for a certain vibration situation.

The Finite Element Method will be used for discretising the building structure, its foundation and the surrounding soil. A layered ground model will be employed.

Many degrees of freedom is expected when soil is implemented in the FE-model. This means that the model needs to be reduced to save computational time. Some dynamic model reduction technique together with Frequency Response Functions, FRF, will be used in that aspect.

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