Damping in high-rise buildings

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Description:

Nowadays buildings are becoming more slender and lighter. Those characteristics make buildings more sensitive to dynamic effects such as wind or earthquakes. The dynamic behavior of a building depends on the stiffness, mass and damping. Whilst mass and stiffness are quantifiable, damping due to its complex nature is very difficult to identify and quantify. At present there are empirical formulas to predict the total damping of a building. However, those formulas give an unacceptable scatter in damping values. The total damping comprises internal material damping, damping due to the energy loss in the structural joints and the energy dissipation by soil-structure interaction. In order to improve the damping accuracy, the different damping mechanisms should be identified and related to the several structural parameters.

Goal:

The aim of this project is to distinguish the total damping into the damping contributions from the main bearing structure, foundation and non-structural elements. To reach this goal, it is necessary to gain knowledge about the different damping mechanisms and relate them properly to the structural parameters. The relations will be implemented in a model with which more accurate prediction of the total damping can be made. Additionally, the development of a measurement technique is required to feed and validate the model. Furthermore, the effect of the amplitude of the building vibration in relation to the damping will be investigated.

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