Technische Hochschule Rosenheim

Engl. Kurzbericht

gem. Abschnitt 9.2 sowie Anlage 8 des Zuwendungsbescheides

Aktenzeichen: SWD-10.08.18.7-16.39

1 Title

Long title: Transmission functions in timber buildings – Prediction of machinery noise using a practical engineering method

2 Motivation

To proof requirements on sound emission from machinery prediction methods are required. However for timber constructions there are methods available to date. Hence it is only possible to proof the legal requirements using measurements in the actual building.

3 Research topic

To predict machinery noise a model is required, that concerns the whole transmission process including the emission, the transmission and the radiation of structure-borne sound. Airbonre and structure-borne sound can be treated separately. It is therefore possible to individually characterize sources in terms of their structure-borne sound emission using laboratory methods. The prediction of the transmission across the building structure is considered separately using the source data as input and this is the major topic of this project.

Therefore an empirical approach based on measured transmission functions is proposed. A transmission function describes the global transmission between the structure-borne sound power input and the spatial average sound pressure level in a remote receiving room. For the empirical model measured data in timber buildings is required. Hence the main aim of the project was to carry out

a range of field measurements to collect data. For this purpose an experimental procedure was developed which was included in ISO 10848-1:2017.

Measured transmission fucntions are uique for each situatio in the first place. For the prediction model groups of transmission situation with similar properties are formed. It is therefore required to find representative constructions and building types. Using combinations of different materials and technical solutions, a large variety of constructions is possible.

In cooperation with the industrial partners a range of representative building types was selected for the field measurements. These included detached houses, apartment buildings or office buildings for example. Based on that a broad range of constructions and transmission paths could be considered.

4 Conclusions

The proposed method for the prediction of machinery noise is practical and therefore likely to be applied in practice in foreseeable future. The data-set, required for this empirical approach could be increased significatley with this project. In total 120 measured trasnmission function from 19 buildings are available so far.

For the empirical model, the available data was grouped based on categories. From these groups representative spectra were derived that allow an estimation of machinery noise i timber buildings for the first time.

5 Project information

Short title:
Transmission function for prediction of machinery noise in timber buildings

Institution:
Technische Hochschule Rosenheim
Labor für Schallmesstechnik, LaSM
Hochschulstraße 1
83024 Rosenhein
Prof. Dr. Ulrich Schanda

Total costs: 257.367,50 €

Grant: 155.092,38 €

Project duration: 24 months (plus 2 months extension)

6 Figures

Figure 1: Abb1_10cm_300dpi.png
Skematic sketch of global transmission

Bild 2: Abb2_10cm_300dpi.png
Examples for transmission paths. The grenn arrow indicate excitation and the orange room indicates the receiving room. The drawings show sections (vertical sections in the upper row and horizontal sections in the lower row)

Bild 3: Abb3_10cm_300dpi.png
Impressin of field measurement

Bild 4: Abb4_10cm_300dpi.png
Excitation using an impulse hammer

Bild 5: Abb5_10cm_300dpi.png
Representative transmission functions. I) horizontal/direct, single-framework, interior wall, no facing, II) horizontal/direct, single-framework, interior wall, with facing, III) horizontal/direct, separated framework, party wall, no facing, IV) vertical, T-junction, CLT construction, exterior wall, no facing, V) vertical, T-junction, single-framework, exterior wall, no facing, VI) diagonal, x-junction, single-framework, interior wall, no facing, VII) verical, T-junction, concrete wall, basement exterior wall, no facing (RR in gournd floor), VIII) vertical, T-junctions, concrete wall, basement exterior wall, no facing (RR in 1st floor)