Modeling of Airborne Transmission in Floor System Including Flanking Transmission

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Abstract

Predicting vibroacoustic performance in buildings in terms of sound insulation is a challenging task.
As of today, no widespread standardised accurate method for predicting either impact or airborne sound insulation has been established. Rather, several software relying in the analytical methods proposed in the acoustic standard EN 12354-1to 6:2000 are commonly used. In there, the overall in-situ performance of a structure is estimated through combining the individual performances of the elements present in the building and a general parameter Dn,T is calculated. However, the complexity of the predictions increases with uncertainties related to factors such as craftmanship, frequency range involved and, above all, flanking transmission. Therefore, it is important to gain knowledge about the flanking transmission in buildings so that accurate predictions can be made in the early design phase of the building, which in turn saves also time and money for the actors involved.
The aim of this investigations reported here is to model the airborne sound transmission in a floor system in order to gain knowledge about the different phenomena involved and eventually be able to enable accurate numerical sound insulation prediction models. Firstly, a 2D model was setup and its performance was analysed by comparing the direct transmission case (i.e. just the floor) with the case where flanking transmission occurs (i.e. floor-wall system). With the knowledge gained from the latter investigations, a 3D model was then created, and further developments of the predictive tools were performed so that the airborne transmission could be compared with existing in-situ measurements. The predictions stemming from the models showed correct tendencies, however further refinements and calibrations of the model (in terms of modelling the source as well as connections) are needed in the next steps so that the absolute values can be accurately predicted.