Abstract on the research project "Uncertainties of Values from Measurement Curves and Measurement Tables"

Currently, the German sound insulation standard DIN 4109 is being completely revised within the scope of European harmonisation. One feature of this revision will be that the proof which confirms that the sound insulation requirements of the building inspection authority are being fulfilled, will, in future, also contain an uncertainty calculation which will indicate how reliably a certain requirement is met. Within the scope of several projects funded by DIBt, verified values have been determined for the first time for the uncertainties of the respective measurement procedures in terms of building acoustics and for the individual products, as well as for the test certificates and the sound insulation proofs based on these products. The prerequisite of this was, however, that for the components used in a building, proof of the sound-insulation coefficients had been rendered by means of individual test certificates.

It is already becoming evident, however, that in the new version of DIN 4109, the very comprehensive catalogue of components (whose old version had been introduced by the building inspection authority) will contain numerous measurement curves which, in one way or another, have been composed from individual measurement results. To be able, in future, to carry out the required uncertainty calculation with such measuring curve values, it has now been investigated in which way it is possible to assign uncertainties to values from measurement curves and measurement tables.

The measurement curves have mainly been investigated by means of the so-called "mass curve", which represents the weighted sound reduction index as a function of the surface-related mass. As an example, 6 measured weighted sound reduction indices and the corresponding surface-related masses were available in this investigation. By means of a regression analysis, which is usual in such cases, an equation for the mass curve was determined. Hereby, it is presupposed that the uncertainty of the input data (weighted sound reduction index and surface-related mass) is negligible. If then, a weighted sound reduction index is predicted by means of the regression line obtained, its uncertainty lies between 0.9 dB and 1.0 dB, depending on the surface-related mass. If, however, the measurement uncertainty of those quantities is taken into account which form the basis of the regression analysis, then this range extends to uncertainties between 1.7 dB and 1.9 dB. In this way, these values are almost exactly of the same order of magnitude as the values for the individual measurements. For the drafters of the new DIN 4109, a guideline has been drawn up which gives instructions on how to determine measurement curves and the associated uncertainties.

If values from measurement tables are available, then the summarized scattering of the measurement results on which the table values are based and the summarized associated measurement uncertainty have to be taken into account. For realistic orders of magnitude, uncertainties are obtained for the values from the catalogue of components which are of a similar order of magnitude as in the case of the measurement curves and of the individual measurements.

Thanks to these project results, it is now possible to assign verified uncertainties to the acoustic characteristics from the catalogue of components contained in DIN 4109. These values can be fed into the prediction procedure, so that the characteristic value which is ultimately predicted for the building can be assigned a summarized uncertainty. In this way, it is possible to determine in a transparent way whether the values specified by the building inspection authority or agreed otherwise are being complied with or not.