

**Abridged version of the research project: Quantitative criteria for the usability of measurement results in building acoustics and for the approval by the construction control board of test centres performing measurements in building acoustics in accordance with the new European measurement standards**

The main objective of the project was to determine quantitative criteria for the approval of test centres and measurement results in the field of building acoustics.

To achieve this objective, first of all the essential statistical bases of metrology as well as the principles for the detection and consideration of the measurement uncertainty were presented. On this basis, detailed proposals were elaborated for the approval of test centres in the field of building acoustics and the performance of comparison measurements, which considerably improve the existing procedures by an increased transparency of the decisions.

In a next step, the uncertainties associated with the airborne sound insulation were investigated. Starting point was an analysis of the different influence factors which finally resulted in the identification of a total of 16 uncertainty contributions. The order of magnitude of some uncertainty contributions could be estimated on the basis of the data available. In addition to intercomparisons results available from literature, the estimate also covered internal PTB data gained in the approval of test centres or comparison measurements and results of comparison measurements performed at the MPA Dortmund.

After that, the individual uncertainty contributions were assigned to the precision measures so far used in building acoustics repeatability and reproducibility according to ISO 140-2 which allowed the existing intercomparison results to be quantitatively compared with the values from ISO 140-2. It turned out that the values stated in ISO 140-2 are usually lower than the actually occurring uncertainties.

In conclusion, the consequences resulting from the uncertainties for building acoustics were shown. In addition to questions regarding the safety margin and re-measurements on the building it was investigated in detail, how many different specimens of a building element must be measured in how many different test facilities to achieve that the uncertainty assigned to the mean value from these measurements does not exceed specified upper limits. This knowledge was, among other things, required for the preparation of the building element catalogue of DIN 4109. In addition, the propagation of the uncertainties from the values of the building element catalogue up to the prognosis value was calculated on the basis of an example. It resulted that the uncertainty of the predicted value is still lower than, or maximally equal to, the individual uncertainties of the building elements involved.

In summary it can thus be stated that the essential project objectives have been reached. Handling of the project revealed, however, new aspects which should be dealt with in future. These comprise, among others, the determination of product variations, the calculation of the uncertainty of single-number values in the case of partially correlated third-octave values, as well as the question of the definition used for sound reduction. This question is of central importance, as use of different definitions in different contexts again and again leads to misunderstandings, and as an uncertainty budget cannot be established without an exact definition of the measurand either.