

Summary of the results of the research project

"Sound insulation of External Thermal Insulation Composite Systems with two-ply insulating layer"

carried out by Fraunhofer-Institute of Building Physics (IBP), Mai 2016

on behalf of German Institute for Building Technology (DIBt), reference: P 52-5-5.117-1467/15

Due to logistic and financial reasons external thermal insulation composite systems (ETICS) increasingly consist of two separate insulating layers which are glued together and usually fully bonded by means of mortar. To determine the effect of the bonding on the sound insulation, measurements in a building acoustical test facility were carried out. The main results of these measurements are:

- Apart from a second resonance at higher frequencies, two-ply ETICS have a sound insulation similar to otherwise identical single-layer systems.
- The existing prediction methods for the weighted sound reduction index of walls with single-layer ETICS thus can be used also for two-ply systems. It is a condition, however, for the applicability of the prediction methods, that the mass per unit area of the adhesive mortar between the insulating boards is
 - a) less than approx. 4 kg/m² and
 - b) no more than about 40 % of the mass of the exterior plaster coat.
- The previous statements are valid for all types of insulating materials, systems with and without dowels, as well as for ETICS consisting of two insulating layers of different thicknesses or of different materials. In the latter case the calculation of the sound insulation has to be performed using the resulting dynamical stiffness of the two insulating layers.

Furthermore, it was investigated how the prediction method for the sound insulation of ETICS according to E DIN EN ISO 12354-1: 2016-03 (CEN-method) differs from the prediction method presently used in Germany (DIBt-method), particularly with regard to the resulting calculation accuracy. The investigation was performed by comparing calculation and measurement values for about 200 data records and showed the following results:

- The CEN-method is a simplified variant of the DIBt-method. The calculation effort, however, is nearly the same.
- Because of the simplifications the CEN-method shows a considerably reduced calculation accuracy compared to the DIBt-method. Concerning for example the improvement of the weighted sound reduction index by the ETICS, ΔR_w , this causes an increase of the standard deviation from $\sigma = 2,0$ dB to $\sigma = 2,7$ dB.
- For the single number rating $\Delta(R_w + C_{tr})$ the CEN-method provides results, which are systematically 1,2 dB too high.
- In practice, the calculation error of $\sigma = 2,0$ dB mentioned in E DIN EN ISO 12354-1, appendix D.2.5 is mostly exceeded significantly.