

Sound insulation quality in Germany

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Introduction

Despite Europe has got a harmonised standard series to measure and evaluate the sound insulation in buildings in the last years, the national building constructions and given requirements are still under national responsibility. This is the reason why the sound insulation quality level differs extremely at least in some cases in different countries of Europe. According to the intention of the EAA symposium this paper summarizes the main aspects on sound insulation quality in Germany.

Legal requirements

The German legal requirements, which are given by the building law, are determined in DIN 4109 / 89. The quantities describing the sound insulation are R'_{w} and $L'_{n,w}$ for airborne and impact sound insulation and $L_{AF,max}$ for installation noise and noise from service equipment. The single number rating is done directly in accordance to ISO 717 part 1 and 2 considering only the minimum frequency range from 100 Hz to 3150 Hz. Although the frequency range can be extended on a voluntary basis, for legal purposes only the minimum frequency range is taken in to account. In addition to the minimum requirements two other levels of sound insulation quality are defined in VDI 4100. These levels are intended to be recommendations for the sound insulation of flats and houses which are designed to have a higher sound insulation comfort.

Tables 1 and 2 show the different values of sound insulation described in DIN 4109 and VDI 4100. SSt 1 corresponds to the minimum standard, SSt 2 to the enhanced level and SSt 3 to comfort standard. The luxurious level is not defined.

	Airborne Sound min. R'_{w} [dB]		Impact Sound min. $L'_{n,w}$ [dB]	Installation Noise $L_{in}/L_{AF,max}$ [dB]
	Wall	Floor		
DIN 4109 and VDI 4100 SSt I	53	54	53	30
DIN 4109/ Beiblatt 2	55	55	46	-
VDI 4100 SSt II	56	57	46	27
VDI 4100 SSt III	59	60	39	24

Table 1: Minimum requirements according to DIN 4109 and VDI 4100 for apartment houses and flats

	Airborne Sound min. R'_{w} [dB]		Impact Sound min. $L'_{n,w}$ [dB]	Installation Noise $L_{in}/L_{AF,max}$ [dB]
	Wall	Floor		
DIN 4109 and VDI 4100 SSt I	57	-	48	30
DIN 4109/ Beiblatt 2	67	-	38	-
VDI 4100 SSt II	63	-	41	25
VDI 4100 SSt III	68	-	34	22

Table 2: Minimum requirements according to DIN 4109 and VDI 4100 for double and semi-detached houses

Before starting the building process, a documentary proof of the minimum sound insulation must be given to the local authorities, normally done by a stress analyst or an acoustic expert. Measurements of the sound insulation are not obligatory. Only in case of complaints or for quality purposes test institutes carry out measurements according to the ISO 140 standard series. Due to the

lack of obligatory measurements, no balanced statistical basis of the average sound insulation values for different constructions in Germany is available.

In parallel to the building law the civil law requires to plan and construct flats and houses in accordance to the generally accepted engineering rules. In some cases., e.g. for double and semi-detached houses the civil law leads to higher sound insulation requirements than the building law.

Common building techniques

As separation walls between flats y massive single brick walls of 400 - 500 kg/m² surface density are normal used. For double or semi-detached houses a double-wall construction is required according to the generally accepted engineering rules. In that case brick walls of > 300 kg/m² (each leaf) with min. 3 cm cavity are used. Typically $R'_{w} \geq 62$ dB can be obtained easily, a construction without any mistake provided. In order to meet the requirements of impact sound insulation mostly floating-floor constructions are used. The resonance frequency of the construction is typically designed to be in the lower extended frequency range. Although this leads to low-frequency annoyance, no legal consideration is applied.

Future aspects

The German concept in DIN 4109 on calculating and describing the sound insulation is still based on the old German philosophy, where old measuring results from test facilities with a typical flanking transmission are taken as input data. Especially the given data of the implemented buildings construction catalogue and the calculation methods are no longer in accordance with the new European concept.

The main current work on the revision of DIN 4109 is the creation of a building-construction catalogue, which gives reliable data to be used for the EN 12354 calculation model. The catalogue shall treat massive constructions as well as light-weight and wood constructions. It is expected to have a revised standard available within a time period of two years.

The current revision process of DIN 4109 also gives the chance to open the discussion for further changes. So it is already agreed, that in the revised standard the quantity for describing the airborne sound insulation will change from R'_{w} to $D_{nT,w}$. In addition many acoustic experts see a need to introduce low-frequency evaluation, especially for impact-sound insulation. Even the discussion is not really opened yet, the consideration of the spectrum-adaptation terms (however this will be applied) seems to have many supporters.

References

- [1] DIN 4109, Schallschutz im Hochbau, Anforderungen und Nachweise, November 1989
- [2] Beiblatt 1 zu DIN 4109, Ausführungsbeispiele und Rechenverfahren, November 1989
- [3] VDI 4100, Schallschutz von Wohnungen, Kriterien für Planung und Beurteilung, September 1994