

How flanking walls modify the sound insulation of a partition wall

In a joint research project of EMPA and industry, the acoustic relevance of variations on how to construct masonry brick walls were investigated. The focus was on how the effects of sound transmission through flanking walls degraded the sound insulation of the partition wall. The findings are needed for the prediction of sound insulation according to EN 12354 (2000).

The sound insulation of a partition wall in a dwelling may be degraded by sound transmissions through the flanking walls. The investigations on sample constructions in the laboratory were centered on two different aspects: firstly, are there any acoustic differences for different construction methods of the walls, and, secondly, what are the coefficients associated with sound transmissions through the flanking wall for typical Swiss constructions. These coefficients have to be known for predicting the sound insulation for new constructions according to the standard EN 12354 (2000).

The measurements were made in the test facilities at EMPA. For normal tests according to ISO 140, the test wall is mounted between two reverberation rooms. Fig. 1 shows the modified arrangement to include flanking walls in the test, with a heavy partition wall (CALMO, about 310 kg/m²) and normal flanking walls (about 165 kg/m²). Two methods to build up the walls were compared: with mortar or without mortar in the header joints between the bricks. Five combinations of these two types of masonry for the partition and the flanking walls were investigated. Furthermore, two types of the T-shaped connection between the walls were measured: one

with bonded brick units and one with stirrups of reinforcing steel bars. By applying wall linings of plasterboards to increase the sound insulation on some walls, the different transmission paths could be measured separately.

Fig. 2 shows the sound insulation of the partition wall with and without the effect of flanking transmissions. The main results are:

- In the test set-up with the flanking transmission confined to one wall, the effects of flanking transmission decrease the "Weighted Sound Reduction Index" R'_w by 3 to 5 dB. The effect is more pronounced for wall constructions without mortar in the header joints between the brick units.
- No significant deviation can be determined between the two types of wall connections.

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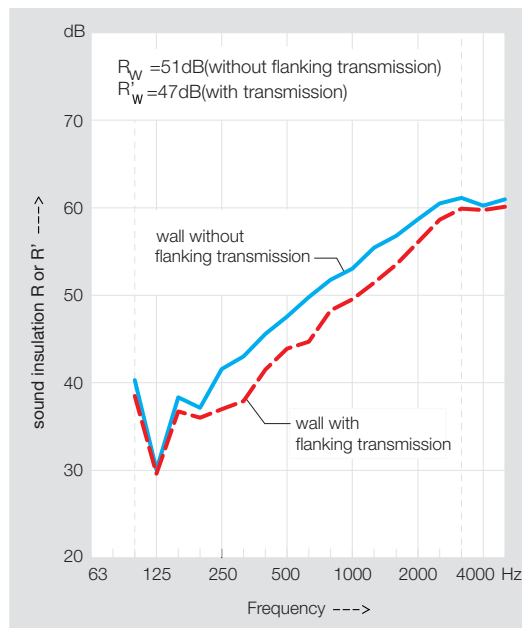


Fig. 2: Sound insulation of the partition wall with and without flanking transmission.

These effects have to be accounted for in the acoustical design of buildings. In most cases, the sound insulation of a single-leaf masonry partition wall is not sufficiently high to fulfil the requirements of sound insulation between apartments. Similar investigations will be necessary for other building elements and products for reliable predictions of the acoustic performance of usual buildings on the base of the EN 12354 standards.

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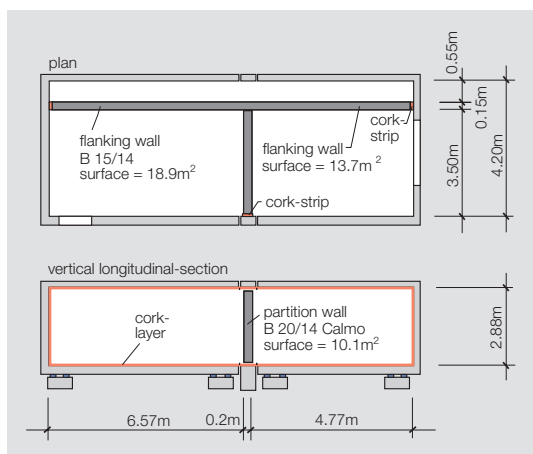


Fig. 1: Modified arrangement to include flanking walls in the test.

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References: EMPA Report 860'035 / int. 622.4682 (2001)