EU

Fire protection and sound insulation in interaction

FLAMRO® System solutions



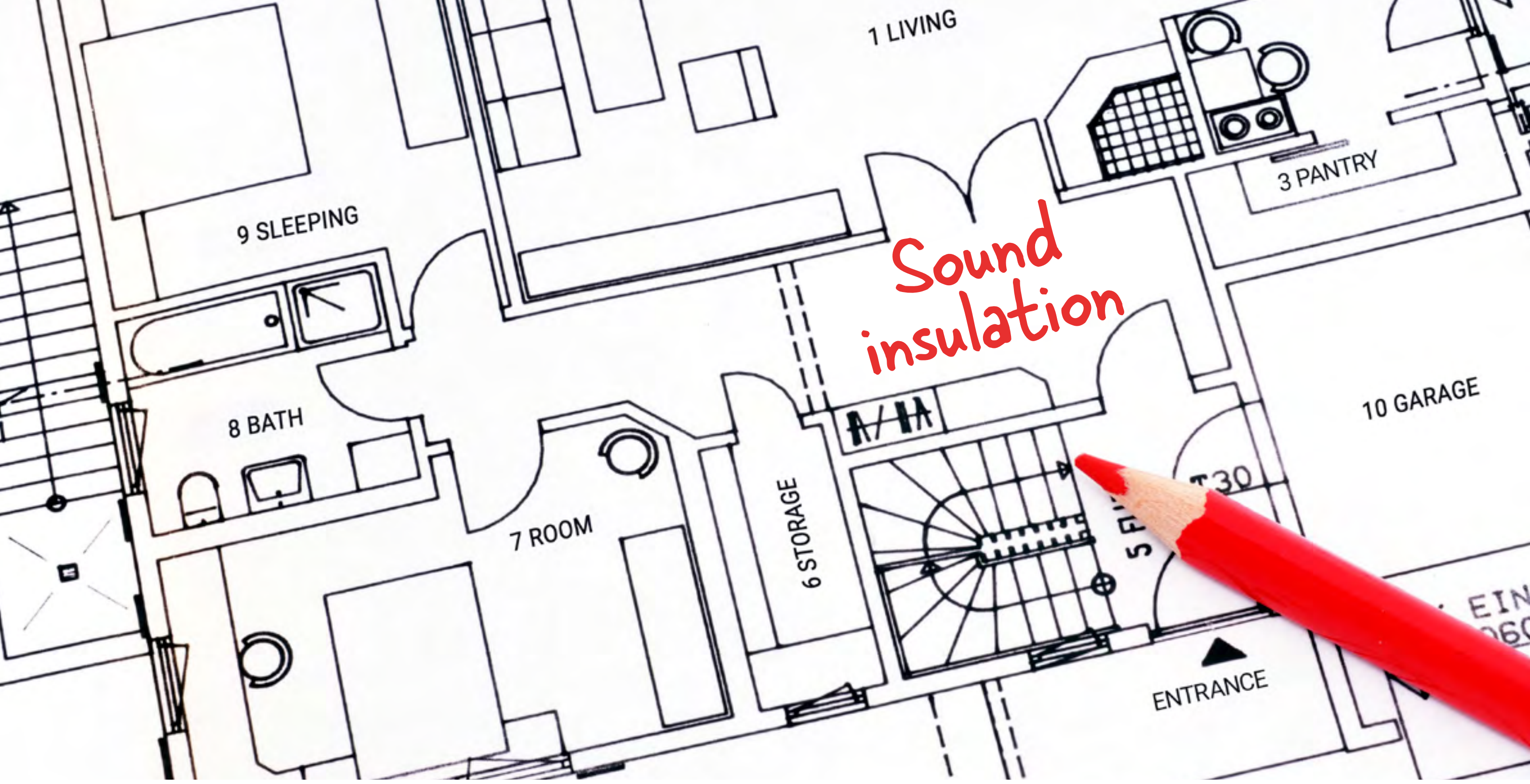

Why sound insulation …

Besides fire protection, acoustic properties are an important aspect of building quality and are particularly crucial to both the general well-being and the health of users. Noises from the environment, e.g. from other areas of the building or traffic noise, disturb the peace and quiet in one‘s own four walls and therefore reduce the residents‘ quality of life. Corresponding building regulations also pick up on this topic: „The construction shall be designed and built such that sound perceived by the residents or persons in the vicinity are kept to a level which poses no risk to health and ensures satisfactory sleeping, leisure and working conditions.“

Apartment buildings

Schools & day nurseries

Office buildings



... and where exactly?

However, adequate sound insulation is not only crucial in residential buildings. Further possible examples include administrative and office buildings, hospitals, schools, day nurseries and kindergartens, libraries and hotels etc. Concentrated work is difficult when noise pollution is high or confidential discussions can be heard in adjacent rooms.

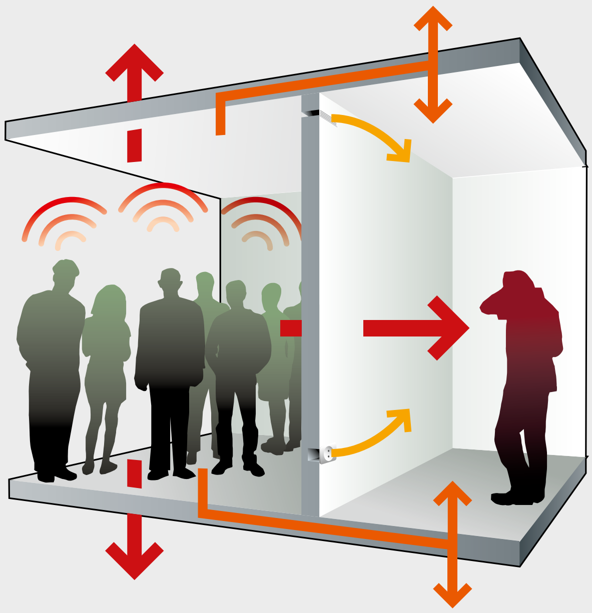
Interaction of fire protection and sound insulation
To pass installation and supply lines through them, openings are made in elements such as floors or walls. In the event of a fire, these would not only allow fire and smoke to pass through unhindered but also offer unimpeded passage to sound on a daily basis. This is why a holistic solution to the problem is always pursued.

Hospitals

Hotels

Naturally, we also offer our fire protection solutions with integrated and tested sound insulation in many other areas besides.

Feel free to contact us.



What types of sound and which parameters are there?

A distinction is generally made between airborne sound and structure-borne sound. Sound waves that spread via the air are referred to as **airborne sound**. The sound waves hit adjacent element surfaces and are emitted again on the other side. Depending on the characteristics of the elements, the sound waves are weakened on passing through them.

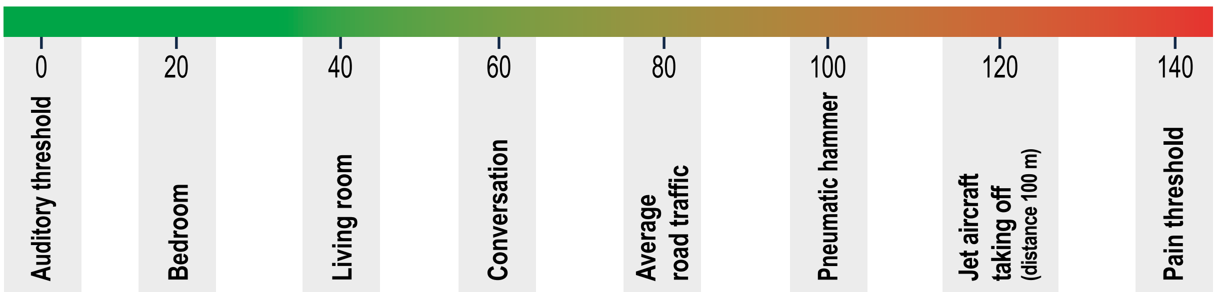
Structure-borne sound is the sound that spreads in solid structures such as walls and floors. Structure-borne sound also includes impact sound, which is produced by walking, knocking, falling objects or moving chairs, causing the floor to vibrate and thus transferring the sound to adjacent rooms.

The **frequency/vibration frequency** describes the number of complete vibrations per unit of time (per second: 1/s) and is specified in Hertz, where the following applies: the higher the pitch, the higher the frequency.

The variable that characterises sound propagation is **the sound pressure level**, which describes the strength of the existing sound field. The sound pressure level is specified in decibels [dB] and usually lies in ranges between 0 and 140 dB. The pain threshold of the human ear is reached at a sound pressure level of 140 dB. Hearing impairment can occur on regular exposure to sound pressure levels of more than 80 dB.

Identical sound pressure levels with varying frequencies are perceived as having different volumes, for which we use the **weighted sound** level [dB(A)], which also gives consideration to the frequency and therefore represents the physiological hearing capacity of the human ear.

Sound level [dB(A)]



The weighted sound level

The weighted **sound reduction index RW** is derived from the frequency-dependent sound reduction index R. Measurement is carried out in a frequency range from 100 to 3150 Hz and takes the human perception of sound into account through frequency-dependent correction.

The **spectral adaptation values** C and Ctr are used for orientation regarding whether an element offers good sound insulation against specific sound sources or frequency ranges.

C	=	medium- and high-frequency sounds	e.g. residential noises, railway noise, motorway traffic
C_{tr}	=	low-frequency sounds	e.g. urban road traffic, aircraft, discotheques

The **standard sound level difference** (Dn) is applied in the case of technical installations with very small areas such as ventilation grilles or the Cable Tube CT, as the calculation method of the sound reduction index would be incorrect or not applicable.

To attain the maximum possible practical relevance, in addition to the standard-compliant measurement of unconfigured penetration sealing systems, we also tested the sound insulation properties of penetration sealing systems with configurations, e.g. cables. The result of the tests was only a marginal deterioration in the sound reduction index in comparison with the identically designed empty penetration sealing system.

The requirements of sound insulation are described in national standards, e.g. DIN 4109 “Sound insulation in buildings” in Germany. These do not generally enable the achievement of sound levels corresponding to modern standards of quality and comfort, which is why civil guidelines such as e.g. VDI 4100 “Sound insulation between rooms in buildings” are used for higher sound insulation requirements.

Calculated data can only serve as a starting point; the actual sound insulation effect is dependent on the respective construction site circumstances (e.g. the type and size of the installed media lines, the type and design of the separating and connecting elements, etc.).
Deviation from the theoretical values can therefore occur in practice. Binding statements can only be issued through measurements on site.

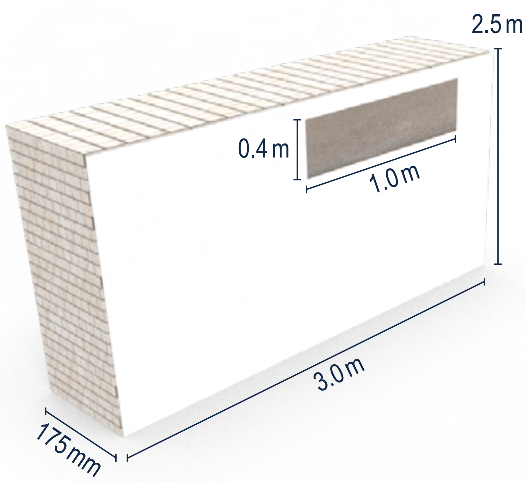
How are composed surfaces calculated?

Buildings often present the situation that separating elements are composed of surfaces with different sound insulation, e.g. walls with penetration sealing systems, which may impair the sound insulation of the surface as a whole. With a high-quality penetration sealing system such as the NOVASIT BM fire protection compound, the reduction of the overall sound reduction index, consisting of the sound reduction indices of the individual surfaces, is barely perceptible.

In our example, the composed surface consists of two elements:

1. **Plastered sand-lime brick wall**
   (gross density class 1.8)
   Wall thickness = 175 mm
   Weighted sound reduction index (RW) = 51 dB

2. **Penetration sealing system consisting of NOVASIT BM**
   (dry bulk density ≥ 900 kg/m³)
   Penetration sealing system thickness = 150 mm
   Weighted sound reduction index (RW) = 42 dB



Penetration sealing systems hardly achieve the sound reduction index of the overall surface (RW = 51 dB), but also cover only a small part of the building area, as shown here. As a result, the slightly lower sound reduction index (RW = 42 dB) therefore only has a minor effect.

In this case, the reduction for the overall surface is just 1 dB.

The penetration sealing systems

DIN systems (Germany)	Weighted sound reduction index ($R_w(C_{100-5000};Ctr_{100-5000})$	Weighted element-normalized level difference ($D_{n,e,w}$ ($C_{100-5000};Ctr_{100-5000}$))
Flammotect COMBI 90	40 (-2; -5) dB	–
Flammotect COMBI 90 (+50 mm air gap)	48 (-3; -6) dB	
Flammotect COMBI 90 in combination with single-stud wall (CW50 profile, 2x12.5 mm panelling, 40 mm glass wool filling), 12 m² test area	50 (-2; -6) dB	
Novasit COMBI 90	42 (-1; -5) dB	
System Bag	40 (-2; -4) dB	
System BK-N fire protection pillows	37.0 (-0.2; -3.7) dB	52.3 (-0.3; -3.7) dB
Opening closure with GFM fire protection mortar (100 mm thickness)	44.1 (-1.5; -7.3) dB	59.5 (-1.5; -7.4) dB
System BSB fire protection bricks (longitudinal installation)	42.2 (-0.8; -6) dB	57.5 (-0.8; -6) dB
System BSB fire protection bricks (longitudinal installation) with 1 cable penetration	42.1 (-0.9; -6.2) dB	57.4 (-0.9; -6.2) dB
System BSB fire protection bricks (longitudinal installation) with 4 cable penetrations	41.9 (-0.9; -6.2) dB	57.2 (-0.9; -6.3) dB
System BSB fire protection bricks (transverse installation)	39.2 (-0.7; -5.3) dB	54.5 (-0.8; -5.3) dB
System BSS 90	37.8 (-1.3; -7) dB	60.3 (-1.3; -7) dB
System BSS 30	33.2 (-1; -4.8) dB	55.5 (-1; -4.8) dB
System Cable Tube	42 (-1; -5) dB	64 (-2; -6) dB

EN systems (Europe)	Weighted sound reduction index ($R_w(C_{100-5000};Ctr_{100-5000})$	Weighted element-normalized level difference($D_{n,e,w}$ ($C_{100-5000};Ctr_{100-5000}$))
System Flammotect 1x60 mm	26 (-2; -3) dB	–
System Flammotect 2x50 mm	40 (-2; -5) dB	
System Flammotect 2x50 mm (+50 mm air gap)	48 (-3; -6) dB	
System Flammotect 2x50 mm in combination with single-stud wall (CW50 profile, 2x12.5 mm panelling, 40 mm glass wool filling), 12 m² test area	50 (-2; -6) dB	
System Flammotect 2x60 mm	45 (-2; -5) dB	
System Novasit BM	42 (-1; -5) dB	
Opening closure with GFM fire protection mortar (100 mm thickness)	44.1 (-1.5; -7.3) dB	59.5 (-1.5; -7.4) dB
System BK-N fire protection pillows	37.0 (-0.2; -3.7) dB	52.3 (-0.3; -3.7) dB
System DG-SC (with mineral wool backfilling)	30.8 (-1.8; -8)	61.1 (-1.9; -8.1) dB
System Cable Tube (300 mm length)	42 (-1; -5) dB	64 (-2; -6) dB

We welcome your inquiries!

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