Internal walls

Background to sound insulation

Sound insulation

Sound Insulation, otherwise known as sound reduction, is the prevention of sound being transmitted from one part of a building to another, for example by erecting a partition or wall.

Improving the sound insulation of separating elements between dwellings is the main way in which the sound transmission between dwellings can be reduced.

When considering sound insulation of constructions various types of sound may need to be considered. The air tightness of the construction is also critical.

Airborne sound

Airborne sound sources produce noise by vibrating the air immediately around them.

Typical sources include the human voice, musical instruments, home entertainment systems and barking dogs.

The ability of an element of construction to resist the passage of airborne sound is largely determined by three factors:

1. The sound absorbency of any cavities in the construction
2. The structural isolation between the two outer surfaces
3. The mass of the element of construction

Increasing the mass of a separating element will improve its sound insulation but in timber and steel framed systems, the amount of extra weight that can be safely supported is often limited. As a result, other design approaches are usually employed i.e. structural isolation and the inclusion of products that absorb sound such as glass and rock mineral wool.

Impact sound

Impact sound is generated by direct physical excitation of part of a building. Examples include slamming doors, stamping on the floor and vibrating washing machines.

With impact sound, a relatively small impact can result in a loud sound being transmitted through the structure and over long distances.

Impact sound can be controlled by:

- Providing a resilient layer at the point of impact - such as a carpet
- Structural isolation - such as adding a resilient layer between the floor deck and the floor structure

Flanking sound

Flanking sound transmission usually refers to sound that travels through 'flanking' structural elements, such as the external wall that flanks a separating element between two dwellings.

Flanking sound can also include sound that travels along unintended airpaths, such as unsealed gaps in the structure and around service penetrations.

Flanking sound can be controlled by:

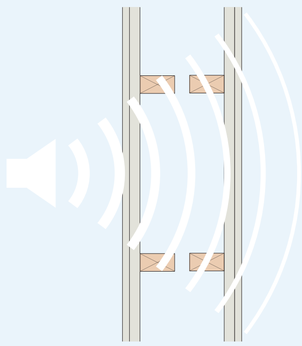
1. Sealing open airpaths
2. Forming a lining backed by a resilient layer to prevent sound energy entering the flanking element

Separating walls that meet the specifications in the Building Regulations can fail to meet the sound performance standard if the flanking junctions are poorly detailed. In order to meet the performance requirements when separating walls are tested, it is important to follow the guidance on the flanking details and not just the construction of the wall itself.

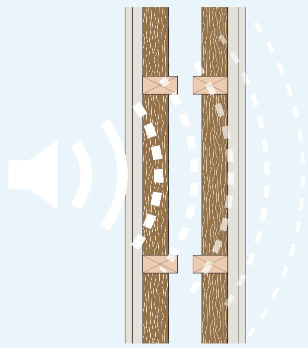
The rationale for using mineral wool as noise control

The sound absorption characteristics of mineral wool make it ideal for use in modern buildings to comply with Dubai Municipality Al Sa'fat 403.01 Acoustical Control Requirements, Estidama LBi-9: Indoor Noise Pollution requirements.
In addition, the thermal properties of mineral wool provide a secondary benefit of minimising heat loss either between attached dwellings or between storeys within a dwelling. A further benefit is to minimise the overall mass of the construction, easing construction processes.

How glass mineral wool works in a wall or floor cavity



In an unfilled cavity, the plasterboard linings and cavity alone provide the sound insulation which can result in poor performance and a hollow sounding construction.



Adding mineral wool improves the sound insulation by absorbing reverberant sound within the cavity therefore reducing the amount of sound energy transferred from one side of the construction to the other.

Internal walls

Internal walls design

Performance requirements

In UAE, the Dubai Municipality Al Sa'fat Green Building Rating System and Estidama Pearl Rating System sets out the requirement for the sound insulation of internal walls within houses and flats. The requirement is for all internal walls between a bedroom or room containing a WC and another room to have a minimum sound insulation of 40 Rw dB.

This applies to new walls built both in dwellings formed by a material change of use and new build extensions of existing dwellings.

Acoustic performance

In general performance requirements are set by client requirements, but in some purpose groups there are specific Al'Safat and Estidama requirements.

Schools

Al'Safat and Estidama refers to specific performance standards are set for airborne sound insulation between spaces by Building Bulletin 93 'The Acoustic Design of Schools'. This classifies each room for the purpose of airborne sound insulation by its activity purpose in terms of activity noise, as a source room, and noise tolerance, as a receiving room, and then sets the performance standard for sound insulation for each partition.

Hospitals

Similarly to schools the Healthcare Technical Manuals HTM 08-01 (previously HTM 2045) sets standards for privacy according to room type and from this the specific performance requirement for any partition can be obtained.

Fire performance

Generally fire performance of partitions will be determined in line with the appropriate Building Regulations if the purpose of the partition is to provide compartmentation. In certain buildings there may be specific fire performance requirements for partitions separating specific room types, for example in Hospitals where this is set by Civil Defence Code. The use of mineral wool helps to improve the fire rating of a partition by limiting the transfer of heat across the cavity.

Quality of detailing

A construction can only achieve its expected sound performance if it, and the surrounding walls and floors have no inherent faults in their detailing or workmanship. Acoustic performance will be impaired if there are:

- Gaps or holes in the construction – even hairline cracks can seriously impair sound insulation - seal all potential gaps with a flexible sealant
- Gaps in the absorbent layer within the cavity

Thermal insulation

Whilst thermal insulation is not generally a requirement of partitions, it may be desirable in certain circumstances. For example, insulated partitions around rooms with high internal heat gains would help to avoid overheating in adjoining rooms during hotter periods.

Performance standards for airborne sound insulation between spaces – minimum weighted BB 93 standardised level difference, $D_{nT\ (Tmf,max),w}$ (dB)

Minimum $D_{nT\ (Tmf,\ max),\ w}$ (dB)		Activity noise in source room (see Table 1.1)			
		Low	Average	High	Very high
Noise tolerance in receiving room (see Table 1.1)	High	30		45	55
	Medium	35	40	50	55
	Low	40	45	55	55
	Very low	45	50	55	60

1 Each value in the table is the minimum required to comply with the Building Regulations. A value of 55 $D_{nT\ (Tmf,max),\ w}$ dB between two music practice rooms will not mean that the music will be inaudible between the rooms. In many cases, particularly if brass or percussion instruments are played, a higher value is desirable.

2. Where values greater than 55 $D_{nT\ (Tmf,max),w}$ dB are required it is advisable to separate the rooms using acoustically less sensitive areas such as corridors and storerooms. Where this is not possible, higher performance constructions are likely to be required and specialist advice should be sought. It is also important to ensure that high-use corridors are not themselves a significant source of noise.

3. It is recommended that music rooms should not be placed adjacent to design and technology spaces or art rooms.

4. These values of $DnT_{\ (Tmf,max),w}$ include the effect of glazing, doors and other weaknesses in the partition. In general, normal (non-acoustic) doors provide much less sound insulation than the surrounding walls and reduce the overall $D_{nT\ (Tmf,max),w}$ of the wall considerably, particularly for values above 35 $D_{nT(Tmf,max),w}$ dB. Therefore, doors should not generally be installed in partitions between rooms requiring values above 35 $D_{nT\ (Tmf,max),w}$ dB unless acoustic doors, door lobbies, or double doors with an airspace are used. This is not normally a problem as rooms are usually accessed via corridors or circulation spaces so that there are at least two doors between noise-sensitive rooms.

Internal walls

Standard metal C stud partitions

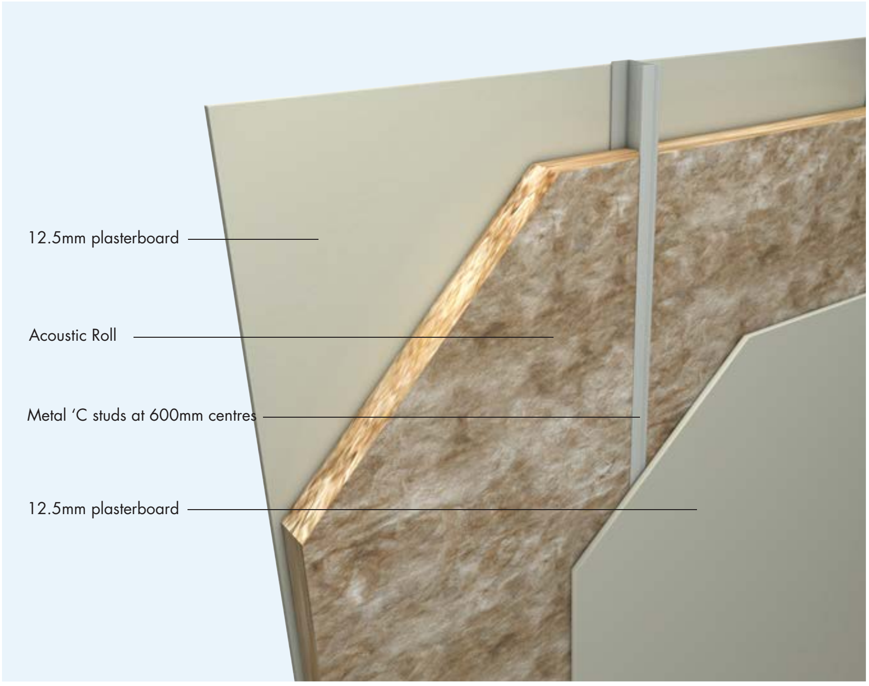
Acoustic Roll

NEW BUILD REFURB

- **Acoustic performance of at least 40 Rw dB**
- **Friction fitting between steel studs closes joints and helps to ensure sound insulation performance is achieved**
- **Provides a high degree of thermal insulation, enabling a greater degree of comfort control throughout the building**

Acoustic Roll

- **Non-combustible with a Euroclass A1 reaction to fire rating**
- **Zero Ozone Depletion Potential (ODP)**
- **Zero Global Warming Potential (GWP)**



Products

Acoustic Roll is a flexible, resilient glass mineral wool roll.

Typical construction

A metal stud partition infilled with Acoustic Roll and faced each side with 12.5mm standard plasterboard meets the requirements of the Building Regulations for a 40 Rw dB partition. The partition should be sealed with an acoustic sealant at its perimeter and at all service penetrations.

Installation

Construct the steel frame and apply a bead of acoustic sealant to the back of the steel studs that are fixed to the surrounding structure. Board out one side of the partition before inserting the insulation.

Acoustic Rolls are designed to friction fit between metal studs at 600mm centres. When installing 25mm of Acoustic Roll, support the roll at the head of the partition by means of a timber batten or light steel angle.

For maximum acoustic performance, hang the quilt in the centre of the partition void and fit snugly up against the studs on both sides.

50mm Acoustic Rolls are sufficiently rigid not to require supporting at the head of the partition.

Board out the second side and finish with a plaster skim coat or using standard drylining techniques.

Performance

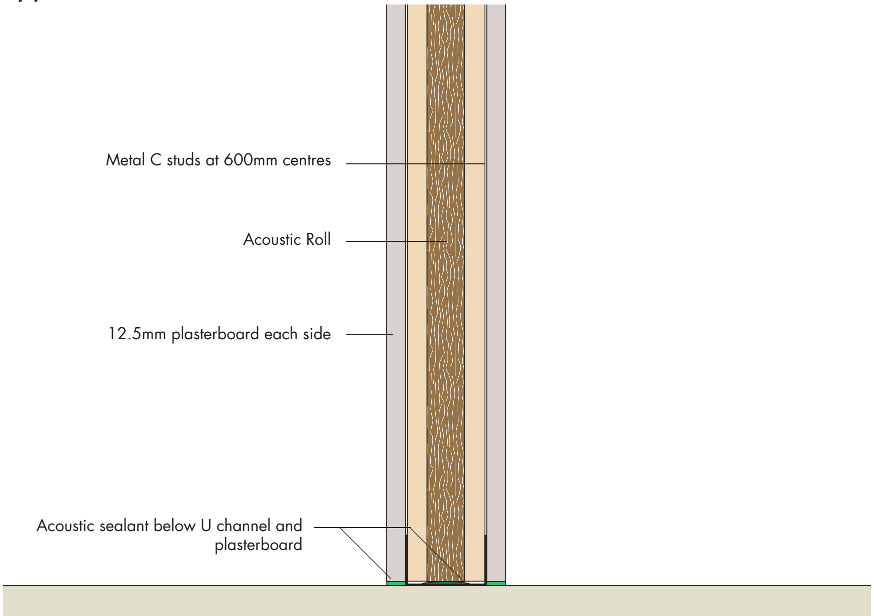
Fire performance

Acoustic Roll is classified as Euroclass A1 to BS EN 13501- 1.

Density

50mm Acoustic Roll has a density of 16 kg/m^3.

Typical section



Typical specification

In all …… (metal stud) partitions install Acoustic Roll, ……mm thick. Secure 25mm Acoustic Roll at head of partition using timber batten or light steel angle. Insulation to fit snugly between studs and at bottom of the structure to ensure that there are no air gaps. Seal partition at perimeter and all service penetrations with an acoustic sealant.

Sound insulation performance of metal stud partition

Stud type	Stud spacing (mm)	Facing	Infill	Sound insulation (R_wdB)	Fire resistance (hours)
50mm C stud	600 c/s	12.5mm Knauf Drywall RG each side	50mm Acoustic Roll	38	0.5
70mm C stud	600 c/s	15mm Knauf Drywall RG each side	50mm Acoustic Roll	44	0.5
70mm C stud	600 c/s	2 layers of 12.5mm Knauf Drywall FR Boards each side	50mm Acoustic Roll	52	1.5
70mm C stud	600 c/s	2 layers of 15mm Knauf Drywall FR Boards each side	50mm Acoustic Roll	53	2
2 X 50mm C stud	600 c/s	2 layers of 12.5mm Mada Gypsum FR Boards each side	100mm Acoustic Roll	55	2
2 X 50 mm C stud	600 c/s	2 layers of 12mm Knauf Drywall RG Boards each side	100mm Acoustic Roll	56	1
2 X 50 mm C stud	600 c/s	2 layers of 15mm Knauf Drywall FR Boards each side	100mm Acoustic Roll	58	2