KNAUF INSULATION

it's time to save energy

April 2012

Section 3.4.1

Internal Walls

energy saving | warmth | quietness | fire protection | sustainability

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 often 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:

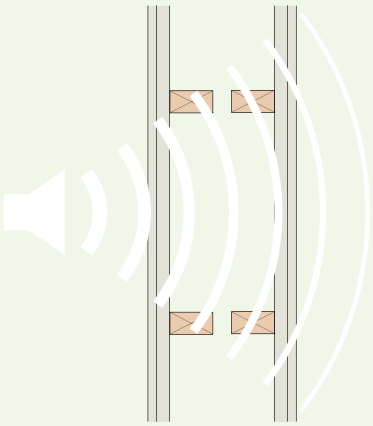
1. Sealing open airpaths
2. Forming a lining backed by a resilient layer to prevent sound energy entering the flanking element

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 Building Regulations and Robust Details include flanking details required to achieve the specified performance level.

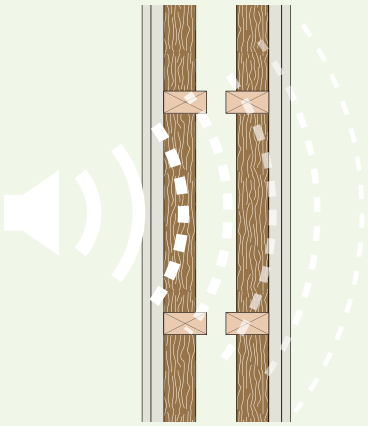
The rationale for using mineral wool as noise control

The sound absorption characteristics of mineral wool make it ideal for use in modern buildings to comply with Approved Document E of the Building Regulations in England and Wales, Technical Handbook, Section 5 for Scotland and Technical booklets G and G1 for Northern Ireland. 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 or rock 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 England and Wales, the 2003 edition of Approved Document E introduced a new 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.

Elsewhere in the UK, the National House Building Council (NHBC) have similar requirements for internal walls, but the minimum sound resistance is 38 Rw dB.

Acoustic performance

In general performance requirements are set by client requirements, but in some purpose groups there are specific Building Regulation Requirements or Government Departmental Standards creating common standards.

Rooms for Residential Purposes

In England and Wales, the 2003 edition of Approved Document E introduced a new requirement for the sound insulation of internal walls within rooms for residential purposes. 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.

Schools

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 Firecode HTM 05-02 and Building Bulletin 100 Design for fire safety in schools. 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.

Table 22 - BB 93 Table 1.2: 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

Timber stud

Earthwool Acoustic Roll and Earthwool Flexible Slab

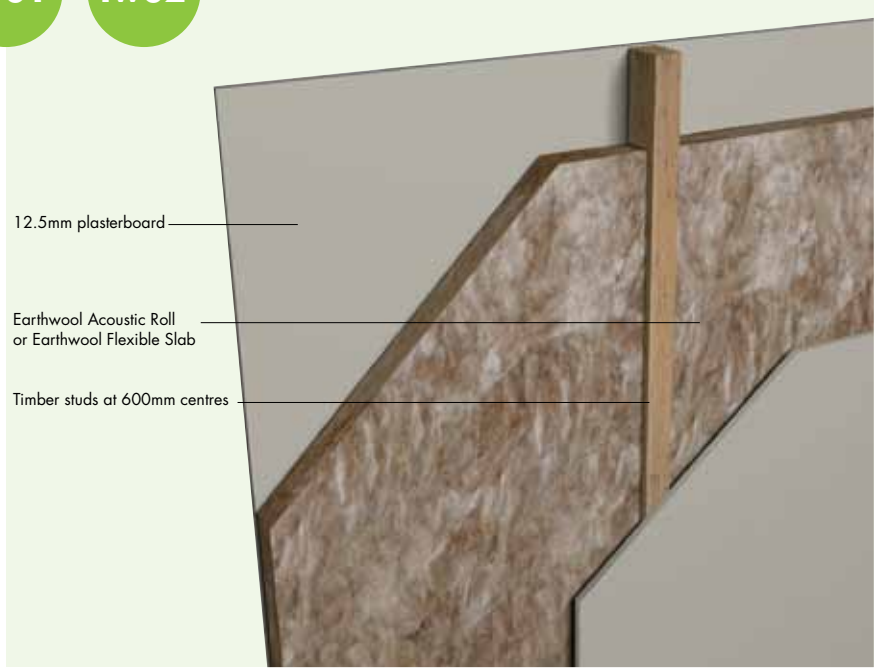
NEW BUILD REFURB

lw01 lw02

- Acoustic performance of 40 Rw dB, meeting Building Regulation requirements in England and Wales
- Friction fitting between timber 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

Earthwool Acoustic Roll and Earthwool Flexible Slab

- Non-combustible with a Euroclass A1 reaction to fire rating
- A+ Generic BRE Green Guide rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)



Products

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

Earthwool Flexible Slab is a flexible rock mineral wool slab.

Both products are designed for friction fitting between timber and metal studs.

Typical construction

A timber stud partition (minimum 63x38mm studs) infilled with 50mm of Earthwool Acoustic Roll or 50mm Earthwool Flexible Slab with 12.5mm standard plasterboard each side 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 penetrations.

Installation

Construct the timber frame, applying a bead of acoustic sealant to each piece of timber that is fixed to the surrounding structure. Board out one side of the partition before inserting the insulation.

50mm Earthwool Acoustic Roll and 50mm Earthwool Flexible Slab are designed to friction fit between timber studs at 600mm centres. 50mm Earthwool Acoustic Roll and 50mm Earthwool Flexible Slab are sufficiently rigid not to need supporting at the head of the partition.

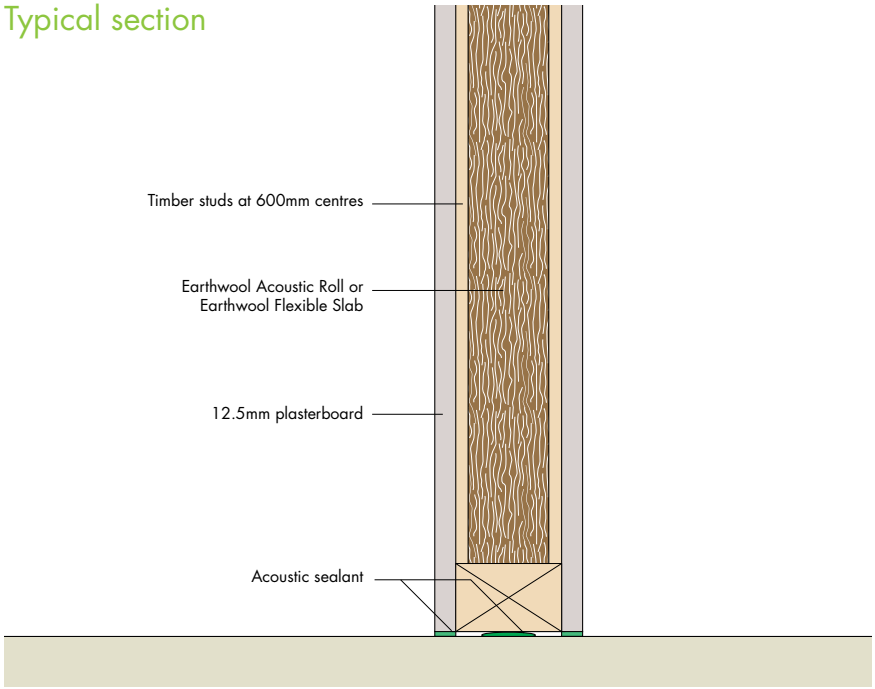
Alternatively, use 25mm Earthwool Acoustic Roll, friction fitted between timber studs at 600mm centres and supported at the head of the partition by means of a timber batten.

For maximum acoustic performance, fit all insulation tightly up against the stud sides.

Seal all gaps around the perimeter of the plasterboard with acoustic sealant.

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

Typical section



Typical specification

Earthwool Acoustic Roll, 50mm thick*/ Earthwool Flexible Slab 50mmthick*, fixed between vertical studs. Insulation to fit snugly between studs and at bottom of the structure to ensure that there are no air gaps.

Seal all gaps around the perimeter of the plasterboard with acoustic sealant.

(*Delete as appropriate)

Alternatively, consult the National Building Specifications, Standard version clause/clauses… K10/165A.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Performance

Fire performance

Earthwool Acoustic Roll and Earthwool Flexible Slab are classified as Euroclass A1 to BS EN ISO 13501-1.

Density

25mm Earthwool Acoustic Roll has a density of 19.5 kg/m^3.

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

50mm Earthwool Flexible Slab has a density in excess of 10.00 kg/m^3.

Table 23 - Sound insulation of timber stud partitions

	Stud Size (mm)	Facing	Infill	R_W dB
lw01	63x38	12.5mm standard plasterboard each side	None	35
	63x38	12.5mm standard plasterboard each side	50mm Earthwool Acoustic Roll	40
lw02	Stud Size (mm)	Facing	Infill	R_W dB
	63x38	12.5mm standard plasterboard each side	50mm Earthwool Flexible Slab	40

Internal walls

Standard metal C stud partitions

Earthwool Acoustic Roll and Earthwool Flexible Slab

NEW BUILD REFURB

lw03 lw04

- Acoustic performance of at least 40 Rw dB, meeting Building Regulation requirements in England and Wales
- 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

Earthwool Acoustic Roll and Earthwool Flexible Slab

- Non-combustible with a Euroclass A1 reaction to fire rating
- A+ Generic BRE Green Guide rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)

Products

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

Earthwool Flexible Slab is a flexible rock mineral wool slab.

Both products are designed for friction fitting between timber and metal studs.

Typical construction

A metal stud partition infilled with Earthwool Acoustic Roll or Earthwool Flexible Slab 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.

Earthwool Acoustic Roll and Earthwool Flexible Slab are designed to friction fit between metal studs at 600mm centres. When installing 25mm of Earthwool 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 Earthwool Acoustic Roll and Earthwool Flexible Slab 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

Earthwool Acoustic Roll and Earthwool Flexible Slab are classified as Euroclass A1, to BS EN ISO 13501-1.

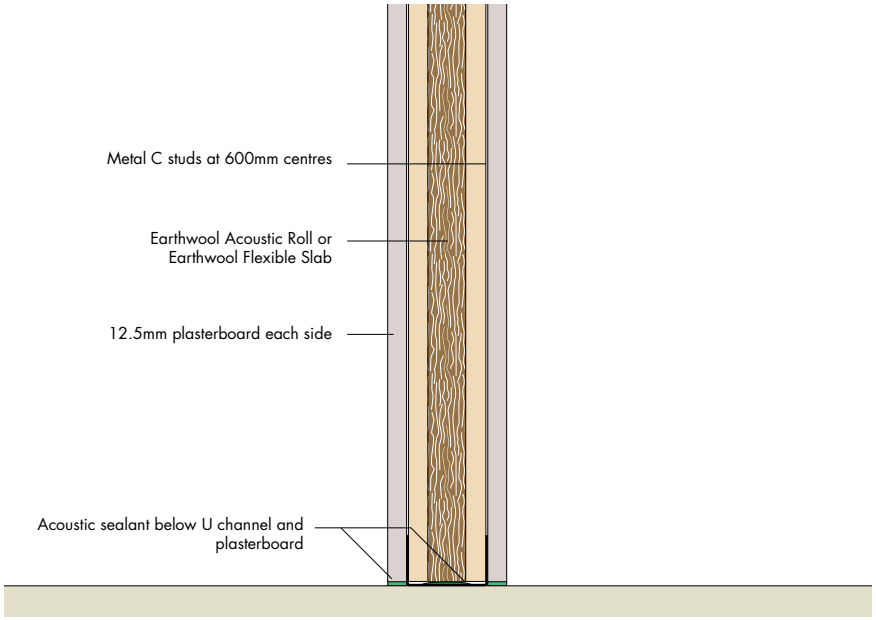
Density

25mm Earthwool Acoustic Roll has a density of 19.5 kg/m^3.

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

50mm Earthwool Flexible Slab has a density in excess of 10.00 kg/m^3.

Typical section



Typical specification

In all ..... (metal stud) partitions install Earthwool Acoustic Roll*/Earthwool Flexible Slab*, ...mm thick. Secure 25mm Earthwool 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.

(*Delete as appropriate)

(*only applicable to 25mm Earthwool Acoustic Roll)

NBSPlus

Alternatively, consult the National Building Specifications, Standard version clause/ clauses...K10/125.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Table 24 - Sound insulation performance of metal stud partitions

lw03	Stud type	Stud spacing (mm)	Facing	Infill	Sound insulation (R_wdB)	Fire resistance (hours)
Earthwool Acoustic Roll						
	50mm C stud	600 c/s	12.5mm plasterboard Wallboard each side	25mm Earthwool Acoustic Roll	42	1/2
	70mm C stud	600 c/s	15mm Knauf Drywall Fireshield each side	25mm Earthwool Acoustic Roll	49	1
	50mm C stud	600 c/s	2 layers of 12.5mm Knauf Drywall Soundshield each side	25mm Earthwool Acoustic Roll	54	1
	70mm C stud	600 c/s	2 layers of 12.5mm Knauf Drywall Fireshield each side	50mm Earthwool Acoustic Roll	54	2

lw04	Stud type	Stud spacing (mm)	Facing	Infill	Sound insulation (R_wdB)	Fire resistance (hours)
Earthwool Flexible Slab						
	50mm C stud	600 c/s	12.5mm plasterboard Wallboard each side	50mm Earthwool Flexible Slab	42	1/2

Internal walls

Staggered metal I-stud partition

Earthwool Acoustic Roll

NEW BUILD REFURB

lw05

- High acoustic performance within a relatively narrow partition width
- Both sides of partition isolated, reducing impact sound transmission
- Product knits together and closes joints to help ensure sound insulation performance is achieved
- Provides a high degree of thermal insulation, enabling a greater degree of comfort control throughout the building

Earthwool Acoustic Roll

- Non-combustible with a Euroclass A1 reaction to fire rating
- A+ Generic BRE Green Guide rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)

Products

Earthwool Acoustic Roll is a flexible, resilient glass mineral wool roll designed for friction fitting between timber and metal studs.

Typical construction

A metal stud partition formed from 'I' studs, staggered within floor and head U channels. The studs are spaced at 300mm offset centres, providing fixings at 600mm centres to each side of the partition. Two layers of Knauf Drywall Soundshield are fixed to each side.

The partition should be sealed with an acoustic sealant at its perimeter and at all service penetrations.

Installation

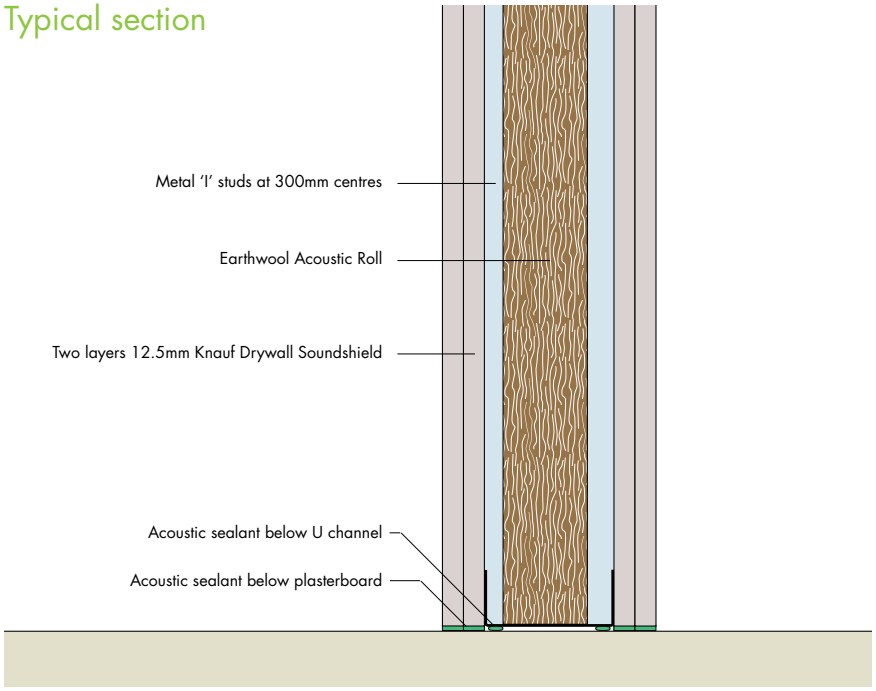
Construct the staggered stud steel frame and apply a bead of acoustic sealant to the steel studs that are fixed to the surrounding structure. Board out one side of the partition before inserting the insulation.

Earthwool Acoustic Roll is wound through the studs horizontally.

Ensure the insulation is installed without gaps at abutments or joints between rolls.

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

Typical section



Typical specification

In all ..... (metal stud) partitions install Earthwool Acoustic Roll, ...mm thick. Once the studs have been positioned and one side boarded out, the insulation to be wound through the studs horizontally. Ensure there are no gaps at abutments or between adjacent lengths of the insulation. Seal partition at perimeter and all service penetrations with an acoustic sealant.

Alternatively, consult the National Building Specifications, Standard version clause/clauses... K10/125.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Performance

Fire performance

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

Density

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

Table 25 - Sound insulation performance of staggered metal stud partitions

Stud type	Channel size	Facing	Thickness of insulation (mm)	Sound insulation (R_wdB)	Fire resistance (hours)
60mm 'I' stud	72mm	2 layers of 12.5mm Knauf Drywall Soundshield each side	50mm Earthwool Acoustic Roll	57	1
92mm 'I' stud	148mm	2 layers of 15mm Knauf Drywall Soundshield each side	50mm Earthwool Acoustic Roll	62	1½

Internal walls

High performance twin frame metal stud partition

Earthwool Acoustic Roll

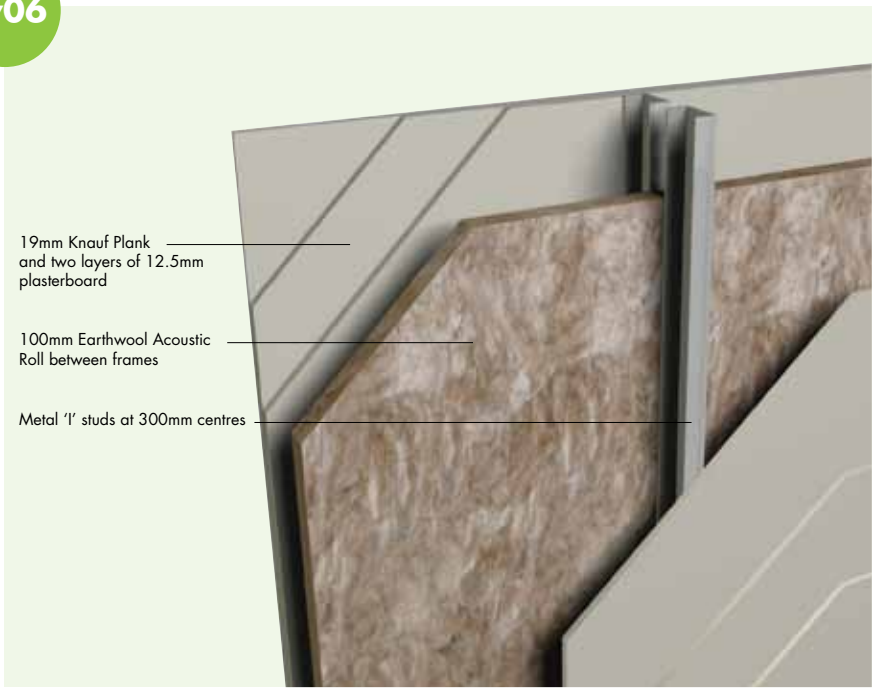
NEW BUILD REFURB

lw06

- Twin frame system providing very high levels of sound insulation
- Product knits together and closes joints to help ensure sound insulation performance is achieved
- Provides a high degree of thermal insulation, enabling a greater degree of comfort control throughout the building

Earthwool Acoustic Roll

- Non-combustible with a Euroclass A1 reaction to fire rating
- A+ Generic BRE Green Guide rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)



Products

Earthwool Acoustic Roll is a flexible, resilient glass mineral wool roll designed for friction fitting between timber and metal studs.

Typical construction

Twin steel frame construction with facing of three layers of plasterboard on each side.

100mm Earthwool Acoustic Roll between the frames. The perimeter of the steel frames are bedded on acoustic sealant and the perimeter of the plasterboard facings are sealed with acoustic sealant.

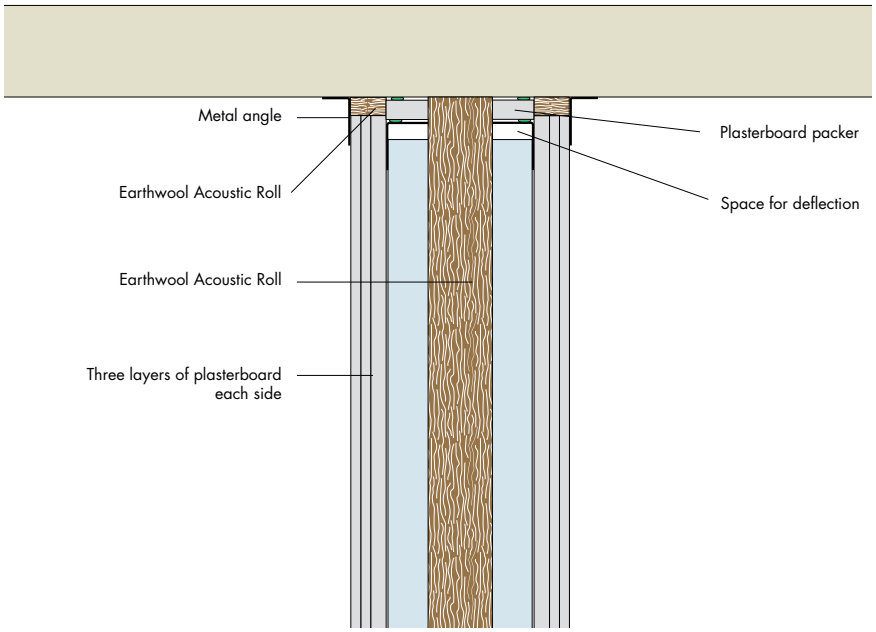
The isolation between the steel frames, the acoustic absorption of the mineral wool and the heavyweight plasterboard all contribute to achieving a high level of acoustic performance.

Installation

Two separate steel frame walls are constructed. Earthwool Acoustic Rolls are installed into the cavity between the two steel frames and butt jointed. There should be no gaps between the edges of the insulation rolls.

A layer of 19mm Knauf Plank is screwed horizontally to each side of the metal studs, all joints staggered. The Knauf Plank is then overlaid with two layers of 12.5mm standard plasterboard. Seal all joints in outer layer with joint tape or caulk with acoustic sealant.

Typical section



Typical specification

In all twin metal stud partitions install acoustic insulation of Earthwool Acoustic Roll, 100mm thick. The insulation to be installed into the cavity between the two steel frames and butt jointed. Ensure there are no gaps in the insulation. Face both sides of partition with plasterboard, as specified, and seal partition at perimeter and all service penetrations with an acoustic sealant.

Alternatively, consult the National Building Specifications, Standard version clause/clauses… K10/125.....

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Performance

Acoustic performance

The use of twin metal studs separated by a layer of mineral wool provides a high degree of acoustic insulation. The use of three layers of plasterboard adds mass to the partition and further improves its acoustic performance.

Fire performance

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

Density

100mm Earthwool Acoustic Roll has a minimum density of 10.00kg/m^3.

Table 26 - Sound insulation performance of twin metal stud partitions

Stud type	Facing	Thickness of insulation (mm)	Sound insulation (R_wdB)	Fire resistance (hours)
92mm C stud	19mm Knauf Plank and two layers of 12.5mm Wallboard each side	100mm Earthwool Acoustic Roll	69	2
146mm C stud	19mm Knauf Plank and two layers of 12.5mm Wallboard each side	100mm Earthwool Acoustic Roll	74	2

KNAUF INSULATION

it's time to save energy

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Wherever possible, products are manufactured to the appropriate British Standard (BS), or harmonised European Standards, (BS EN) and are supplied subject to our Terms and Conditions of Sale, a copy of which is available on request.

Information within this book

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